SETTING-UP A EUROPEAN SUSTAINABILITY FRAMEWORK FOR THE EXTRACTIVE INDUSTRY

Policy brief #1

April 2021

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SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The definition of sustainability and sustainable development is not as simple as it may appear, as there are plenty of different definitions, as well as operationalisations of these definitions in the form of models, frameworks, policies, etc.

From the so-called Brundtland Commission's report Our Common Future (WCED, 1987), we know the definition that *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*.

It has since moved from a needs-based approach towards one where **the ultimate goal of sustainability is more generally "inclusive human development or flourishing"** (oftentimes coined as broader societal welfare or social well-being).

SUMEX's mandate is sustainable management in extractive industries, which we see as the ability of society to use mineral raw materials in a way to enhance well-being. This, however, needs to be done in a way that does not harm the environment.

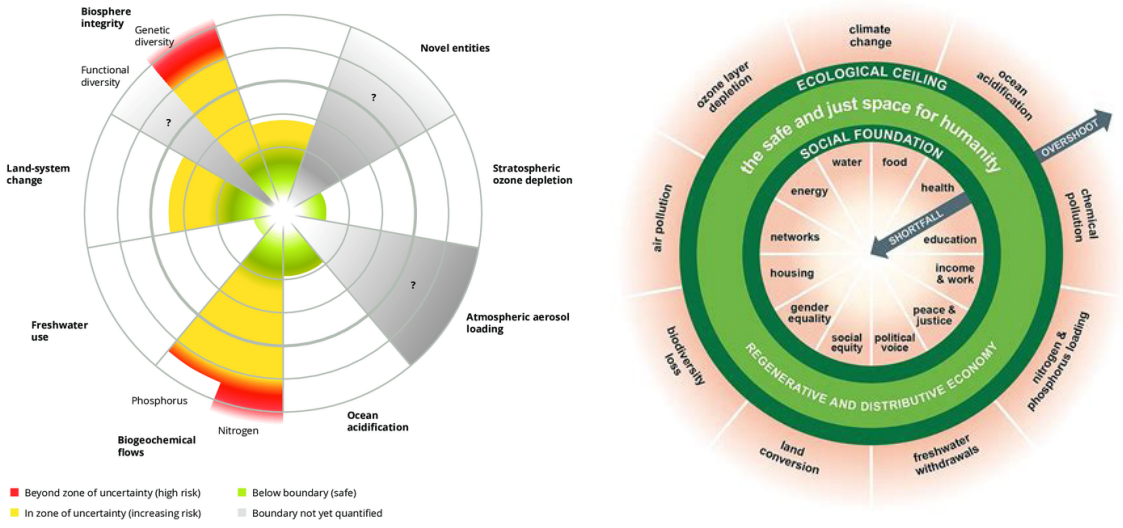

Figure 1: Planetary Boundaries (acc. to Steffen et al., 2015) and Doughnut economic model (Source: Wikimedia Commons).

We use the Planetary Boundaries and Doughnut Economy model as a starting point for our approach regarding sustainability. In the upcoming months in the SUMEX project, it will be investigated how these can be further operationalised in the context of sustainability aspects and correlating measures or other forms of operationalisation in general and, in particular, in the extractive sector.

SUSTAINABLE MANAGEMENT IN THE EXTRACTIVE INDUSTRY

To contribute to sustainable development, a mineral operation must minimise negative environmental and social impacts throughout its lifecycle. From an environmental perspective, this is best accomplished through effective environmental management. During exploration and development, effort must be made to avoid negatively impacting the biophysical integrity of the land. During operations, more environmentally-friendly extractive technologies (as defined as emitting less waste, treatment of effluent streams) need to be implemented through substitution or process modification. New concepts such as 'temporary nature' or biodiversity management plans should be developed and applied. During the closure and post-closure phases, technological measures must ensure air quality, that surface and groundwater resources are protected and that ecological production/alternate land use is accommodated. Economic sustainability involves creating economic value out of whatever decision is being acted upon and that decisions are made in the most equitable and fiscally sound manner while considering the other aspects of sustainability. In the extractive sector, economic sustainability generally applies to the notion of 'shared value', 'economic equity' or an equitable share of the economic benefits arising from the development. This may present as revenue sharing, job and business opportunity creation or local procurement of goods and services that the development would require. The economic connection to the communities of interest might be negotiated and secured under contract in the form of impacts and benefits agreements (Hitch, 2006).

The condition of social sustainability and how mineral resource development is reflected can be expressed in terms of 'resilience' and is subject to many factors from both of the other two spheres of sustainable development (i.e., economic and environmental). From the perspective of economic influence on social sustainability, such factors as economic market trends and the longevity of the resource being extracted affect how social sustainability persists (Black, 2005). How the various stakeholders perceive the environmental degradation or change influences their ability to accept extractive activity. Health concerns and other impacts on the community, occupational health and safety, loss of aesthetic, competing land use and inappropriate post-mining land use deeply affect social sustainability (Hitch, 2006) or, in other terms, an operation's social license to operate. The social resilience of the economic impacts of mineral development can distort local and regional economies with the loss of traditional economic drivers, local or artisanal ways of life, etc.

SUMEX will add to this debate elements of strong sustainability, i.e. what the limitations on natural capital (expressed through Planetary Boundaries) and inclusive well-being (expressed through the Doughnut Economy) mean for the extractive industry.

CONCEPTUALISING SUSTAINABLE DEVELOPMENT

The **United Nations** (UN) adopted a set of 17 goals in September 2015 to guide global policy towards sustainable development – the Sustainable Development Goals or 'SDGs'.

At first glance, there is no explicit mention of metals and extractives, except perhaps indirectly through energy and consumption. It takes a deeper assessment to realise that there are many aspects to work through. First, there are metals and minerals required for numerous renewable energy technologies (e.g., solar photovoltaics, solar thermal, wind, geothermal), energy storage systems (e.g., lithium storage cells), speciality alloys for infrastructure, medical technology, electronics and communications technology, and electric vehicles, and those metals and minerals required for agriculture.

Second, mines and extractive companies can make a meaningful contribution to helping a local area make substantial progress on most (if not all) of the SDGs, such as gender equality, economic activity and the revenue flows which support communities and host governments, environmental protection, education, water and so on. The Columbia Centre on Sustainable Investment (2016) demonstrated that extractive activity could advance all of the SDGs (see **Figure 2a**). Leading global extractive company AngloAmerican Ltd (AngloAmerican, 2018) believes that extraction interacts with all SDGs, with their framing of these relationships also shown in **Figure 2b**.

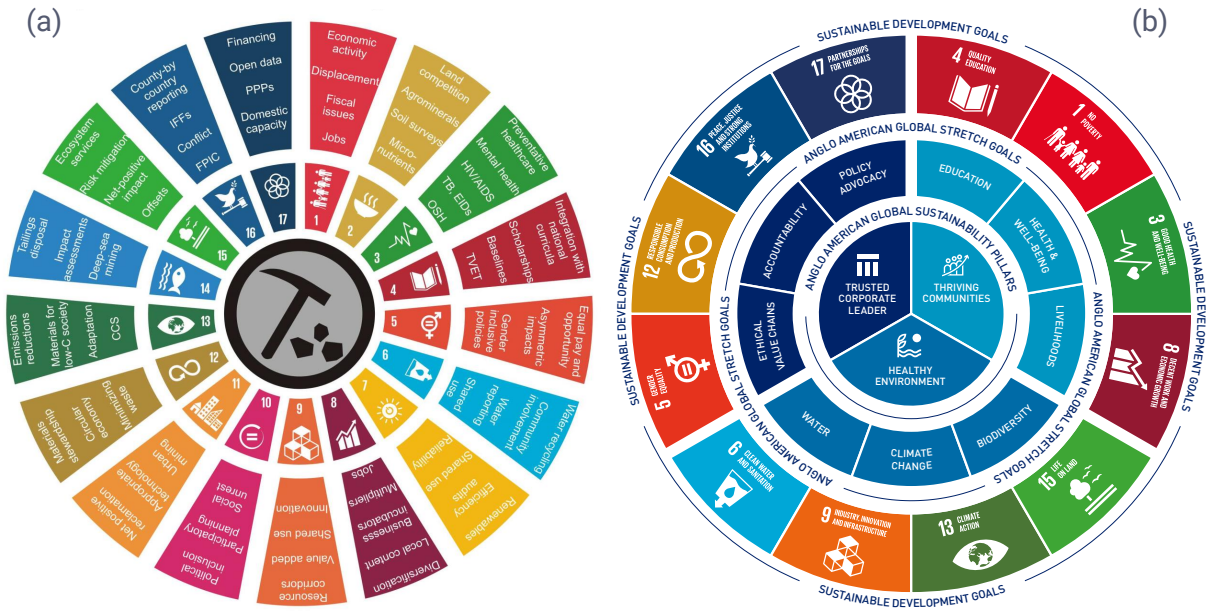

Figure 2: Potential relationships between extraction and the UN SDGs as demonstrated by (a) Columbia Centre on Sustainable Investment (2016) and (b) AngloAmerican (2018).

With the **European Green Deal**, climate change and environmental degradation will be counteracted through a new growth strategy. Moreover, by 2050, zero net greenhouse gas emissions are to be released, economic growth is to be detached from resource use, as well as all people and all regions are to be supported. Through the European Green Deal's action plan, the efficient use of resources is promoted by shifting from a linear economy to a clean and circular one. Restoring biodiversity and combating pollution are also included in this action plan (European Commission, 2021).

Looking at the European Green Deal from a raw materials perspective, it pursues access to resources of strategic importance that contribute to the achievement of the goals that have been set. This covers both primary and secondary raw materials which are to be sustainably extracted. (European Commission, 2019).

THE SUMEX SUSTAINABLE MANAGEMENT PRIORITIES

SUMEX suggests the following Sustainable Development priorities for the extractive industry in Europe. These should be seen as future-oriented, to some extent still aspirational and going beyond current legal requirements, which are the baseline.

Reinventing the economy (i.e. considering the Green Deal)

- Understanding of the role and indicators for extractives in an inclusive Green Economy that exists within Planetary Boundaries
- Valuing natural and social capital
- Defining what Benefit Sharing (or Shared Value) means (beyond taxes and jobs)
- Accountability (i.e., life-cycle considerations, various capitals, reporting)
- Extractives' role in closing cycles, both biological and technological (beyond recycling, focus on reduction/dematerialisation, multiple use and redesign of products)
- Planning beyond the mine life

Social and societal responsibility

- Developing value together with society, i.e. communities
- Taking responsibility for goods and services needed in a Green Economy
- Sustainable learning (systems thinking, distinguish between fact, opinion and supposition, and the ability to learn from mistakes)
- Share knowledge and information transparently
- Improving workers' well-being (zero harm, improved skills)

Environmental sustainability

- Integrated water management
- Efficient energy consumption, based on renewable energy and zero greenhouse gas emissions
- Multiple, co-operative land use and net positive impact on ecosystem services and biodiversity
- Enlightened waste management that considers secondary resources from traditional waste by-products

NEXT STEPS IN SUMEX

The SUMEX framework of priorities is preliminary to set the scene for a consultation process with stakeholders. After this consultation, SUMEX will develop a final framework that would be operationalised and will serve as a guide to identify good practise examples from other EU, national and regional projects, as well as from industry, focusing on five focus areas – permitting, environmental and social impact assessments, land use, health & safety and reporting.

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ABOUT SUMEX

SUMEX is a 36-month project funded by the European Commission that started on 1 November 2020. The project aims to establish a sustainability framework for the extractive industry in Europe, with the involvement of stakeholders from civil society, academia, industry and government backgrounds from all across the EU.

The SUMEX consortium includes:

For more information on the topic described in this policy brief, please download the source report (SUMEX Project Deliverable 1.1) from https://bit.ly/3l8dOYh.

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TRANSITION TOWARDS SUSTAINABILITY IN THE EXTRACTIVE SECTOR

Setting the stage to identifying good practices and developing a community of practicioners

Policy brief #2

April 2022

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Fostering a transition towards sustainability in the extractives sector is at the core of the SUMEX project. This policy brief summarises how SUMEX is assessing practices and their relevance for a transition towards sustainability in the extractives sector, alongside SUMEX's five focus areas – permitting, environmental and social impact assessments, land use, health & safety and reporting – through the analysis of tensions and trade-offs, Leverage Points, Institutional Resource Regime, and qualitative policy analysis. All data gathered on industry and policy good practices within the extractive sector is available in the SUMEX knowledge repository.

EXISTING TENSIONS AND TRADE-OFFS

An operationalisation of sustainable development often represents an isolated and one-sided perspective of what constitutes environment, society and economy. Such an isolationist view distracts from fundamental linkages between economy, society and the environment and assumes that trade-offs across these dimensions can easily be made. This problematic is exacerbated by the conceptualisation of sustainable development that society is dependent on the environment and exists within the boundaries of the earth system (Giddings, Hopwood, & O'Brien, 2002), as well as the fact that stakeholders' norms and values sometimes often prioritise one dimension, creating tensions due to conflicts between the different dimensions (McCollum *et al.*, 2018; Purvis *et al.*, 2019). Therefore, conceptualisation and interpretations of sustainable development inevitably result in tensions between stakeholders or trade-offs among goals across the dimensions of economy, society and the environment.

Pursuing sustainability in extractive industries and balancing environmental, economic and social sustainability aspects unavoidably introduces tensions and trade-offs. These tensions and trade-offs are present across the breadth of the extractive system, as extraction activities require land, interfere with nature and impact surrounding communities. Identifying these tensions and trade-offs among stakeholders is a first step toward realising the full potential of a sustainability discourse, as well as to determining and designing transformative action. Three follow up activities are necessary to overcome the isolated view of sustainable development:

i. identification of areas of disagreement among stakeholders, as well as the anticipation and transparency of conflicting goals across different dimensions,
ii. application of deliberative and participatory learning approaches with societal stakeholders, and
iii. development and deployment of mitigating measures to enable a more sustainable mineral extraction.

As part of SUMEX, a sustainability framework was developed that specifically targets the European extractive sector. The so-called SUMEX Sustainability Framework contains three main topics – i) transforming the economy (i.e., considering the Green Deal), ii) social and societal responsibility and iii) environmental sustainability – each broken down into sustainability aspects.

The primary information obtained shows that most of the tensions and trade-offs in the European extractive sector underlie the category 'social and societal responsibility'. Topics such as land use and social acceptance cause the most tensions and trade-offs. These thematic areas can be mapped to two SUMEX sustainability aspects of the SUMEX Sustainability Framework: ***"Arrangement of different land uses (spatial and temporal) and net positive impact on ecosystem services and biodiversity (incl. from indirect impacts)"*** and ***"Engage in continuous dialogue with stakeholders, create trusted grievance mechanisms and share investigation and problem-solving processes"***.

Tensions and trade-offs associated with the SUMEX sustainability aspect ***"Arrangement of different land uses and net positive impact on ecosystem services and biodiversity (incl. from indirect impacts)"*** mainly concern land-use planning and its dedication towards a certain type of use. The tensions and trade-offs related to land use are of different nature, comprising the competing land use between sectors/stakeholders, such as problems of dedicating land for extractive actions versus other uses such as residential areas. These tensions and trade-offs frequently exist between local communities and extractive companies, and between governments and extractive companies.

All tensions and trade-offs concerning the SUMEX sustainability aspect ***"Engage in continuous dialogue with stakeholders, create trust grievance mechanisms and shared investigation and problem-solving processes"*** are of social and societal character. The negative perception and image of the extractive industry, as well as the lack of trust and social acceptance towards the extraction of mineral raw materials, are increasingly a challenge for the European extractive industry. Furthermore, the absence of transparency and communication about future plans of companies, impacts on local communities, and the lack of understanding and unmet expectations of local populations lead to conflicts between extraction activities and communities.

It should be highlighted that a notable number of tensions and trade-offs originate from the need for mineral raw materials for green technologies (e.g. battery technologies or renewable energy provision), which matches with the SUMEX sustainability aspect ***"Understanding of the role and indicators for extractives in an inclusive Green Economy that exists within Planetary Boundaries (incl. innovation for technology "jumps", new business models, consumption patterns and "needs" considerations, linkages to other parts of the economy)"***. The area of tension and conflict here is that extractives are crucial for the transition to a more sustainable future, but the extraction itself impacts the environment and is not, strictly speaking, considered sustainable, as mineral raw materials are not renewable.

In contrast, tensions and trade-offs arising from thematic areas such as human rights violations, harmful air emissions, circular economy and recycling are scarcely mentioned in the context of the European extractive sector.

LEVERAGE POINTS AND SUSTAINABILITY ASPECTS

Leverage points are places in a system where relatively minor interventions can lead to significant changes in specific outcomes (Meadows, 1999). Donella Meadows (1999) postulated a hierarchy of 12 'places to intervene' in complex systems ranging from leverage points at which interventions are easy but limited in their potential to bring about transformative change (here, termed 'shallow') to leverage points where interventions are challenging but have great potential to bring about transformative change (here, termed 'deep'). The contextualisation of SUMEX sustainability aspects - which can be interpreted as stakeholder derived goals aiming for improved sustainable management of extractive land uses – within the Leverage Point framework (see **Tables 1, 2 and 3** below) shows that SUMEX sustainable development aspects are stronger aligned towards the edges of the leverage points scale, i.e., towards so-called shallow (material focused leverage points) and deep (design and (system's) intent) focused leverage points. Leverage points related to parameters and feedback might be supportive and incrementally improve single aspects towards sustainability, while the ones based on design and system intent are pursuing more systemic levels related to the transformation of the economic system towards a green economy and respect for Planetary Boundaries.

Table 1: Examples of Sustainable Development (SD) Aspects & Leverage point interplay in the SUMEX SD dimension of 'Transforming the Economy (i.e. Considering the Green Deal)'.

SUMEX SD Dimension: Transforming the Economy (i.e. Considering the Green Deal)	
SUMEX SD Aspect: Understanding of the role and indicators for extractives in an inclusive Green Economy that exists within Planetary Boundaries (incl. innovation for technology "jumps", new business models, consumption patterns and "needs" considerations, linkages to other parts of the economy)	
Leverage Point	**Interplay of SD Aspects & leverage point**
2 Mindset & worldviews in which the system is rooted	Planetary Boundaries, Consumption patterns and "needs" considerations
3 Goal & intent of the system	Green Deal (as a new means of developing economic growth = still the old system intent is the same)
5 Rules & Institutions to build/"operationalise" the (new) system	New business models, technology jumps, linkages to other sectors of the economy (in an institutional context
SUMEX SD Aspect: Valuing all forms of capital, i.e. natural and social capital	
Leverage Point	**Interplay of SD Aspects & leverage point**
2 Mindset & worldviews in which the system is rooted	Valuing all forms of capital, i.e. natural and social capital

SUMEX SD Aspect: Defining what "benefit sharing" means (beyond taxes and jobs)	
Leverage Point	**Interplay of SD Aspects & leverage point**
4 Power to change the rules & structure of the system (here structure means the structure of RULES)	Ways and forms of cooperation
5 Rules & Institutions to build/"operationalise" the (new) system	Defining what "benefit sharing" means (beyond taxes and jobs)
SUMEX SD Aspect: Accountability (i.e., life-cycle considerations and product labelling, various capitals, reporting)	
Leverage Point	**Interplay of SD Aspects & leverage point**
2 Mindset & worldviews in which the system is rooted	Various capitals
6 Structure of information flow & access to information	Reporting, life-cycle considerations and product labelling
SUMEX SD Aspect: Planning beyond the mine life (clear time horizons, after mine life use, reclamation of land towards prior or societally relevant use, extraction as an enabler for succeeding activities/livelihoods)	
Leverage Point	**Interplay of SD Aspects & leverage point**
5 Rules & Institutions to build/"operationalise" the (new) system	Planning beyond the mine life (operational, self-binding rules, new closure system, goals)
SUMEX SD Aspect: Holistic risk management and emergency preparedness	
Leverage Point	**Interplay of SD Aspects & leverage point**
5 Rules & Institutions to build/"operationalise" the (new) system	Emergency preparedness (in the context of a continuous PDCA process)
6 Structure of information flow & access to information	Holistic risk management (in the context of a continuous PDCA process)

Table 2: Sustainable development (SD) Aspects & Leverage point interplay in the SUMEX SD dimension of 'Societal & Social Responsibility'.

SUMEX SD Dimension: Societal & Social Responsibility	
SUMEX SD Aspect: Partner with host communities and society to deliver a shared vision of the future	
Leverage Point	**Interplay of SD Aspects & leverage point**
4 Power to change the rules & structure of the system	As new governance formats – depending if fundamentally changing the decision-making structure or new forms of decision-making procedures (i.e., ecologically oriented governance structures; i.e. River Basin District Management focused on Ecological Quality Standards within the EU Water Framework Directive)

SUMEX SD Aspect: Engage in continuous dialogue with stakeholders, create trusted grievance mechanisms and shared investigation and problem-solving processes	
Leverage Point	**Interplay of SD Aspects & leverage point**
4 Power to change the rules & structure of the system (here structure means the structure of rules)	Engage in continuous dialogue with stakeholders
5 Rules & Institutions to build/"operationalise" the (new) system	Trusted grievance mechanisms
6 Structure of information flow & access to information	Engage in continuous dialogue with stakeholders shared investigation
SUMEX SD Aspect: Protect cultural heritage, i.e. regarding indigenous people and ensure free, prior and informed consent	
Leverage Point	**Interplay of SD Aspects & leverage point**
2 Mindset & worldviews in which the system is rooted	Protect cultural heritage, i.e., regarding indigenous people
4 Power to change the rules & structure of the system (here structure means the structure of rules)	Prior and informed consent
SUMEX SD Aspect: Share data and information transparently (incl. payments and revenues, environmental and social data)	
Leverage Point	**Interplay of SD Aspects & leverage point**
6 Structure of information flow & access to information	Share data and information transparently
SUMEX SD Aspect: Diversity, inclusion & anti-discrimination (i.e. gender, young and old, indigenous people)	
Leverage Point	**Interplay of SD Aspects & leverage point**
3 Goal & intent of the system	Diversity, inclusion & anti-discrimination (i.e., gender, young and old, indigenous people) – done, but there are still societal / political discussions, e.g. Poland, Hungary
SUMEX SD Aspect: Improving workers' well-being (zero harm, improved skills, fair compensation and terms of work, involvement)	
Leverage Point	**Interplay of SD Aspects & leverage point**
3 Goal & intent of the system	Improving workers' well-being (zero harm, improved skills, fair compensation and terms of work, involvement) – culture change at company level
SUMEX SD Aspect: Holistic management and continuous learning (systems thinking, company and site impacts, the ability to learn from mistakes, social/peer learning, reflexivity, continuous monitoring and reporting)	
Leverage Point	**Interplay of SD Aspects & leverage point**
1 Power & capacity to transcend & change worldviews	Continuous learning, reflexivity
6 Structure of information flow & access to information	Continuous monitoring and reporting

Table 3: Sustainable Development (SD) Aspects & Leverage point interplay in the SUMEX SD dimension of 'Environmental Sustainability'.

SUMEX SD Dimension: Environmental Sustainability	
SUMEX SD Aspect: Integrated, watershed-based water stewardship (incl. a focus on water efficiency and avoidance of freshwater use)	
Leverage Point	**Interplay of SD Aspects & leverage point**
4 Power to change the rules & structure of the system (here structure means the structure of rules)	Integrated, watershed-based water stewardship
12 Parameters, metrics, numbers	Water efficiency and avoidance of freshwater use
SUMEX SD Aspect: Efficient energy consumption, based on renewable energy	
Leverage Point	**Interplay of SD Aspects & leverage point**
12 Parameters, metrics, numbers	Efficient energy consumption, based on renewable energy
SUMEX SD Aspect: Carbon neutrality	
Leverage Point	**Interplay of SD Aspects & leverage point**
3 Goal & intent of the system	Company level transition plan in a societal context
12 Parameters, metrics, numbers	Carbon neutrality
SUMEX SD Aspect: Zero harmful air emissions	
Leverage Point	**Interplay of SD Aspects & leverage point**
3 Goal & intent of the system	Company level transition plan in a societal context
12 Parameters, metrics, numbers	Zero harmful air emissions
SUMEX SD Aspect: Arrangement of different land uses (spatial and temporal) and net positive impact on ecosystem services and biodiversity (incl. from indirect impacts)	
Leverage Point	**Interplay of SD Aspects & leverage point**
12 Parameters, metrics, numbers	Net positive impact on ecosystem services and biodiversity
SUMEX SD Aspect: Advanced waste management (considering secondary resources from traditional waste by-products, zero waste to landfill, no impact on surrounding environment)	
Leverage Point	**Interplay of SD Aspects & leverage point**
4 Power to change the rules & structure of the system (here structure means the structure of rules)	Advanced waste management (in the context of stewardship, integrating companies and at a regional level)
10 Material Stock and flows	Considering secondary resources from traditional waste by-products
12 Parameters, metrics, numbers	No impact on surrounding environment, zero waste to landfill

INSTITUTIONAL RESOURCE REGIME

The discourse around sustainability over the past 30 years recognises the limits of traditional environmental policies, which tend to address only the use of the environment as a sink for pollution and therefore regulate only the emission of pollutants. In response to that, the Institutional Resource Regime (IRR) approach offers a resource-based method for sustainability. In the IRR, the focus shifts from pollution restriction to the management of "stocks" used from a resource in a way that will safeguard the reproductive capacity of the resource systems (Knoepfel *et al*., 2007).

Against this background, the IRR sustainability approach encompasses the SUMEX approach on planetary boundaries and sustainability since the IRR framework facilitates the analysis of the resource management practices and the regulatory measures associated with competitive (and sometimes conflicting) heterogeneous use situations. More specifically, the IRR explores the causal relation between the Institutional Regime in place (a combination of public policies and property rights), user constellation and their appropriation strategies on the one hand and the condition of the resource on the other. The underlying hypothesis of the IRR is that the closer the resource regime moves toward an Integrated Regime, the higher the likelihood of the creation of conditions for the sustainable management of the resource.

The application of the IRR framework for the analyses of case studies starts with the delineation of the boundary relevant to the management of mining sites, including the affected infrastructure and buffer zones. Next, an inventory of the existing and planned uses of land should be carried out and serve as a basis for identifying the user regime and stakeholder analysis. Stakeholders include public and private entities with use rights deriving from property rights or their representatives (owners, tenants, leaseholders, housing associations, mining permit holders and/or concessionaires, associations of miners, farmers/ farmers associations, etc.) and public authorities responsible for the elaboration and implementation of the policy instruments that regulate every land use included within the boundary of the use case (Mining Inspectorates, Directorate General of Energy Policy and Mines, Regional and Local Authorities responsible for Land Use Planning, Environment Protection Agencies, Water Boards, Forest Management Authorities, etc.). The stakeholder analysis is supported by semi-structured interviews with identified key stakeholders, which help define the context and formulate the corresponding challenges (scarcity, identification of rivalries between different users, etc.).

Qualitative policy analysis follows, covering the central policies that regulate use rights in the study areas, applying two main dimensions to define and categorize Institutional Resource Regimes: a) extent and b) coherence. In terms of extent, the policy analyses determines the extent to which all services and goods used are regulated, seeking to identify policy gaps that can lead to overexploitation of certain goods. In terms of coherence, the policy analyses focus on evaluating: 1) Internal coherence of the public policies, vertically (amongst different levels such as EU legislation, international conventions, National legislation, Court decisions, Regional/Local regulations) and horizontally (amongst different policies affecting the resource, i.e. mining policy vs water policy vs land use policy), and

2) External coherence, assessing the correspondence between the target groups of public policy on the one hand and the holders of rights under the Property Rights system in place, on the other.

Additionally, policy instruments (including permitting, land-use planning, access to land, and socio-environmental impact assessment) are assessed based on efficiency, effectiveness, legitimacy, and justice evaluation criteria.

QUALITATIVE POLICY ANALYSIS – THE INTERPLAY OF PUBLIC POLICY ALONG THE SUMEX SUSTAINABILITY ASPECTS

Next to the IRR, the qualitative policy analysis investigates the implementation of policy instruments on the regional and local levels, as this is most relevant for the analysis of case studies. The qualitative analysis looks explicitly into evaluation criteria of effectiveness, justice, and legitimacy. Building on the IRR, SUMEX will apply qualitative policy analysis and investigate policy instruments (including permitting, land-use planning, access to land, socio-environmental impact assessment) based on the evaluation criteria of efficiency, effectiveness, legitimacy and justice.

Regarding the evaluation criteria justice, policy analysis includes distributional and procedural justice. The assessment of distributional justice considers ownership and its relation to benefits and burdens. The analysis of procedural justice scrutinises stakeholder's participation in governance regimes and how it supports policy agenda setting, design and implementation along with different policy regimes.

Legitimacy is an essential part of justice and policy implementation since it relates to the long-term goals and interests of authoritative decision-makers representing society's acceptance of their legitimate claims to govern (Wallner, 2008): Both the substantive as well as procedural elements of public policies, along with the entire policy cycle, influence (the perception of) legitimacy held by both stakeholders and the public. Along the substantive dimension, policy content should reflect the dominant attitudes of stakeholders and, if possible, the general public. Along the procedural dimension, aspects such as adequate stakeholder involvement, co-design processes in policy design and implementation or policy windows (of opportunity) outlined by Kingdon (1984) or appeals to garner support for an initiative influencing the legitimacy of public policies and the public authorities promoting them.

THE SUMEX KNOWLEDGE REPOSITORY

The SUMEX knowledge repository is a collection of EU industry and policy good practices within the extractive sector. The repository is available on SUMEX's webpage, and it highlights examples of sustainable practices in the extractive sector.

It offers the following benefits for SUMEX and other interested stakeholders:

- A baseline for learning actions: introducing well-described good practice information into personal learning actions
- Comprehensive data mapping: account for more differentiation, contextual information, and clear-cut topic demarcations
- SUMEX expert validation & editorial process: structuring of data according todata quality & reliability as well as verification by SUMEX.
- A meta-data section for transparency: display information on the methodology of good practice identification and systematisation

The repository is open to all stakeholders looking for information about potential solutions to challenges posed by extractive activities. The repository functionalities enable the identification of good practices from broad sustainability topics (e.g. Diversity, inclusion & anti-discrimination or Land-use and biodiversity) to a high degree of differentiation (e.g. different extractive life cycle stages or commodity types). Once an aspect or factor is identified as relevant, visitors can access the source where the practice is discussed in more detail via the links provided (**Figure 1**).

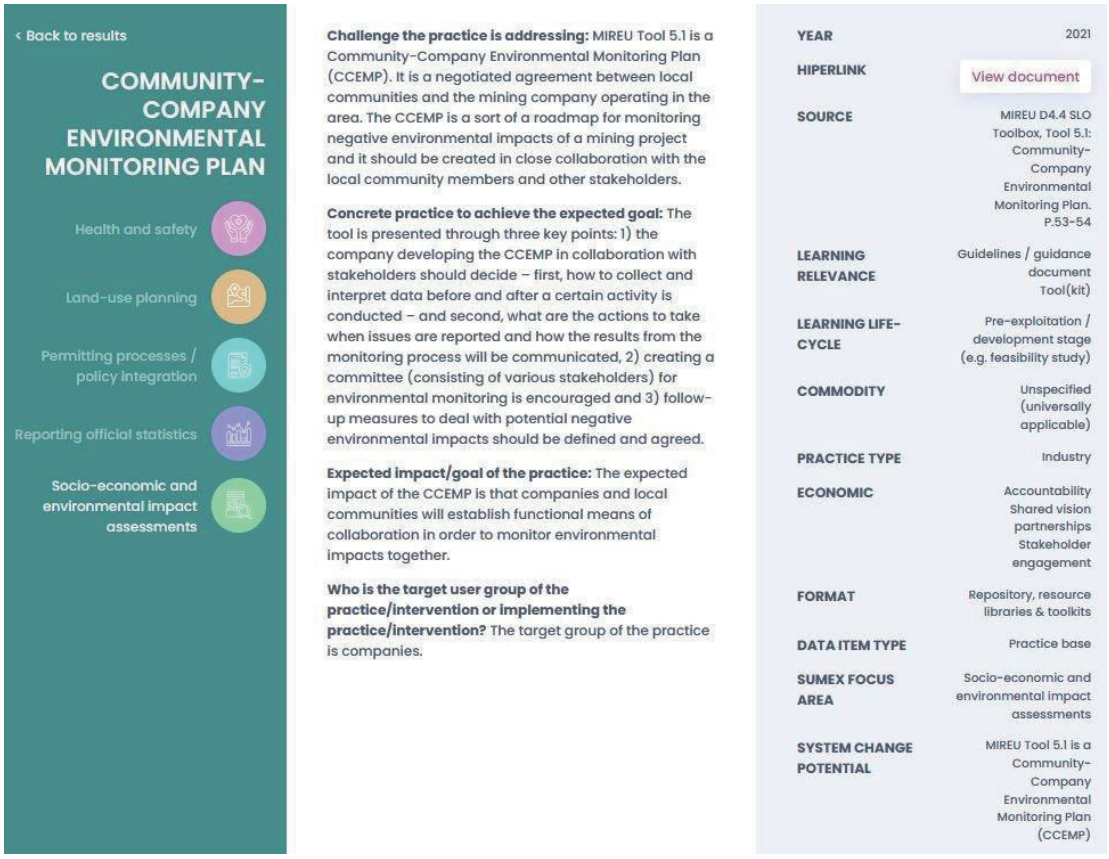

Figure 1: SUMEX knowledge repository: Screenshot of the single data item view – i.e. when clicking on a search result.

What is in it?

The data on the knowledge repository are classified according to their relevance to several different criteria relating to the SUMEX approach to sustainability. These start with descriptive criteria such as the extractive life-cycle stage, the commodity type, the relevant SUMEX focus area they are addressing, and their relevance for industry or policy stakeholders (or both). Furthermore, these criteria highlight the format of the data (i.e. report) and how it can be used for good practice learning (i.e. guidance document). Lastly, the practices are classified according to their sustainability scope in terms of economic, social and environmental sustainability and various subtopics, as well as their system change potential using the concept of Leverage Points.

In addition to classifying information on these different criteria, all data have a short description attached to it to give readers a brief overview of the good practice at hand. This overview discusses the specific challenge the practice is addressing, highlights the concrete approach to address the challenge and its expected impact, and mentions the target group for which this practice is relevant.

NEXT STEPS IN SUMEX

While the broader network & dissemination activities as well as the publicly available SUMEX knowledge repository will be benefitting all target audiences to tap into the potential of learning from good practices and training materials compiled throughout SUMEX, only a limited number of people and organisations will benefit from the in-depth and informal learning and engagement components of the project. For the purpose of engaging with people and organisations with similar learning needs and organisational backgrounds as well as thematically narrowing down the focus, SUMEX will foster a Learners and Leaders League (3L) and a Community of Practice (CoP) along the project five topic areas, i.e. socio-economic and environmental impact assessments, land use planning, health and safety, reporting official statistics, permitting processes / policy integration.

The CoP and particularly the 3L Community play a fundamental part in the design and implementation of both the SUMEX knowledge repository and learning component.

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ABOUT SUMEX

SUMEX is a 36-month project funded by the European Commission that started on 1 November 2020. The project aims to establish a sustainability framework for the extractive industry in Europe, with the involvement of stakeholders from civil society, academia, industry and government backgrounds from all across the EU.

The SUMEX consortium includes:

For more information on the topic described in this policy brief, please download the source report (SUMEX Project Deliverable 1.1) from https://bit.ly/3l8dOYh.

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TRANSITION TOWARDS SUSTAINABLE DEVELOPMENT IN THE EXTRACTIVE SECTOR

Current practices in five focus areas and their system change potential

Policy brief #3

April 2023

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Fostering a transition towards sustainability in the extractive industry stands as the fundamental objective of the SUMEX project. Generally, sustainability in the European extractive industry should consider the concept of ecological boundaries, interdependencies among social, environmental and economic dimensions and look into wider societal paradigms beyond the framing of an industry sector (SUMEX D1.2, p. 5). In this regard, the present policy brief encapsulates central insights pertaining to the efficacy of current practices across five focus areas of SUMEX: permitting, environmental and socio-economic impact assessments, land-use, health and safety, and reporting. These insights are of paramount significance in terms of driving systemic change and promoting the adoption of sustainable development goals and actions.

The investigation into the five focus areas used the Leverage Points (LPs) concept, pioneered by Donella Meadows (2008). This concept provides a tool and lens to assess sustainability interventions and 'sustainable management' measures applied to the extractive industry regarding their potential to initiate system change and evaluate the varying degrees of impact. Leverage points can occur individually or as chains or cascades, operating at different points in the system, simultaneously or across different scales, policy sectors and time periods. Meadows (2008) suggests a hierarchy of 12 LPs subdivided in shallow and deep leverage points: shallow leverage points cover items such as buffers, stock and flows or feedback loops; deep leverage points cover information flow, institutions and structural components, the goal of a system and its underpinning paradigm and values. The twelve LPs can be organised into four main categories: 1) Material, 2) Feedbacks 3) Design And 4) Intention (Table 1). Interventions at different LPs should not be considered competitively but rather complementary with one another. Although policy makers and managers tend to implement interventions and measures that focus on "shallow" LPs, those that address "deep" LPs are challenging to target and change. This is because they extend beyond traditional political election cycles and require societal paradigm shifts, which are difficult to achieve through policy and regulatory mechanisms alone. Figure 1 shows the leverage points approach adapted for the extractive industry.

Table 1: 12 different types of leverage points that describe 4 main characteristics of a system.

System Characteristics		Leverage Points		
Material	Modifiable, mechanistic characteristic (e.g., taxes, incentives and standards, or physical elements such as sizes of stocks or material flows; those are the ones typically addressed by policy makers	12	Parameters	Shallow Leverage Points
		11	Size of buffer stocks, relative to their flows	
		10	Material stocks and flows, e.g. transport and infrastructure	
Feedback	Interactions between elements that impact the internal dynamics of a system or that provide information regarding desired outcomes	9	Lengths of delays, relative to the rate of a system change	
		8	Strengths of balancing feedback loops, relative to the impacts they are trying to correct against	
		7	Gain around positive, reinforcing feedback loops	
Design	Characteristics that relate to the core structure of a system: rules, power and self-organisation; social structures and institutions that manage feedback and parameters	6	Structure of information flows and the access to information (who does and does not have access to information)	Deep Leverage Points
		5	Rules and institutions that build the structure of the system	
		4	Power to add, change or self-organise the system structure	
Intention	Underpinning value, attitudes, goals and/or worldviews of actors and stakeholders that shape the direction of a system, the other 3 characteristics are directed towards the intent	3	Goals of the system	
		2	Mindset, paradigms and underpinning worldviews in which the system is rooting	
		1	Power to transcend paradigms	

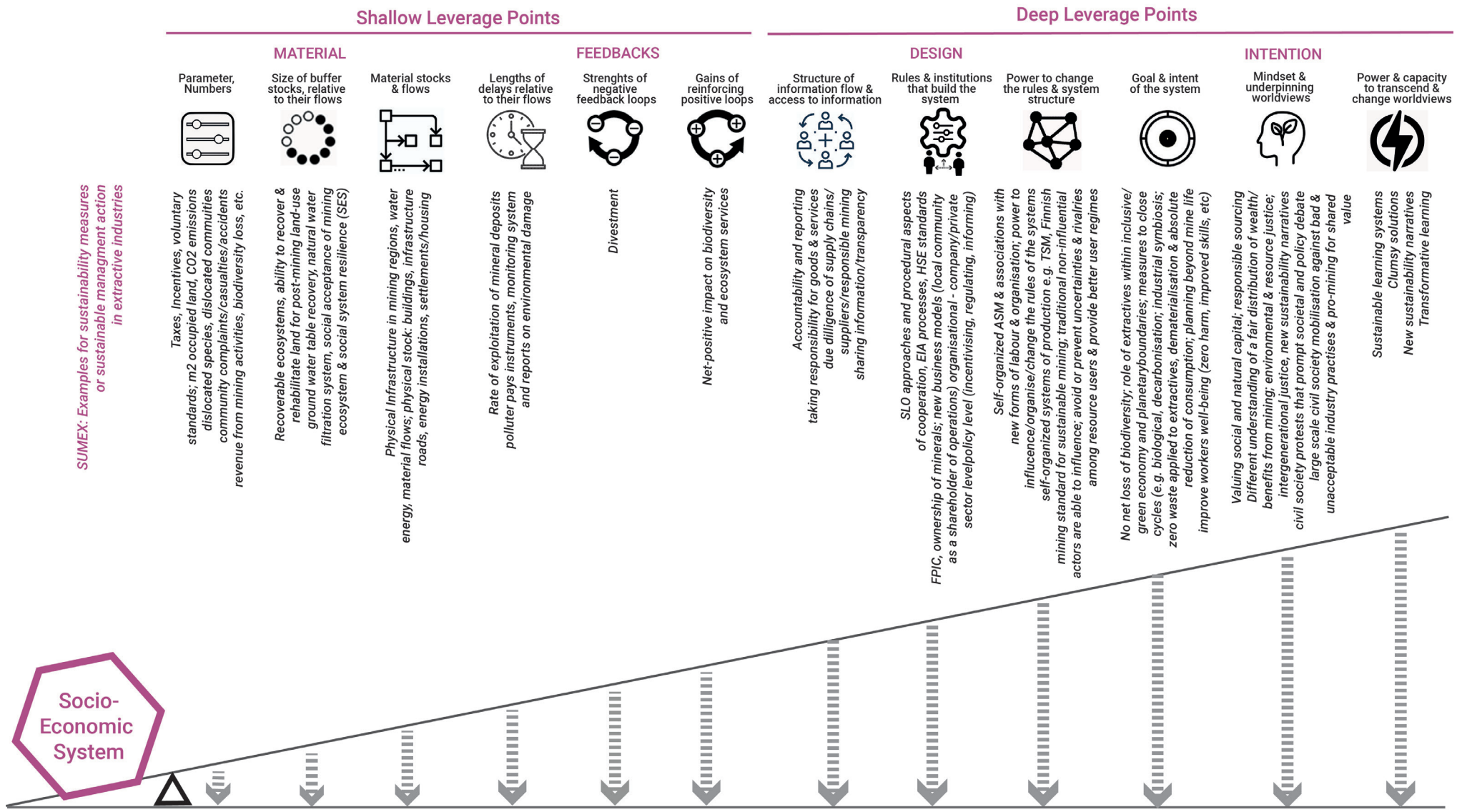

Figure 1: Leverage Points Perspective adapted to the subsystem of the extractive industries (Source: SUMEX D1.2).

In terms of its relevance for SUMEX, this methodology provides a framework to identify the transformative potential of underlying public policies and legal provisions, while also offering insights into the levers that can facilitate the extractive sector's transformation towards sustainability. The analysis presented in this policy-brief is based on the extensive information available in the SUMEX knowledge repository (***https://repository.sumexproject.eu/***). This repository is an extensive collection of data, case studies, and best practices sourced from various countries in the European Union. It is organised into five core areas that SUMEX focuses on: permitting, environmental and socio-economic impact assessments, land-use, health and safety, and reporting. This valuable resource can benefit policymakers, industry stakeholders, and researchers alike by providing a wealth of information and insights.

PERMITTING

CURRENT PRACTICES AND UNDERLYING POLICY REGIMES

The administrative process and company efforts to define a new extractive site are pivotal moments that determine the location, infrastructure, operations, and post-mining activities. These decisions, bound by geological and technological constraints, exert a significant impact on the environment and society. As such, this phase plays a crucial role in promoting sustainable management of extractive operations, ensuring that they are carried out in an environmentally responsible manner and benefitting local communities.

SUMEX identified 13 distinct permitting practices, each aimed at targeting different leverage points along the leverage point scale (Fig. 2). The majority of these practices focus on the Design category, with nearly half of them specifically targeting the way in which information is provided and accessed (LP6). Although in the comment above more shallow leverage points are considered to be the majority, with respect to permitting, this finding is not surprising since administrative procedures and company processes related to new extractive site proposals are closely intertwined with interventions in the system design characteristics and underlying policy regimes. It is also noteworthy that out of the thirteen identified practices, only two represent different forms of institutional changes or new sets of rules (LP5). Furthermore, it is significant to observe that none of the identified practices pertains to the sub-categories Material or Feedback.

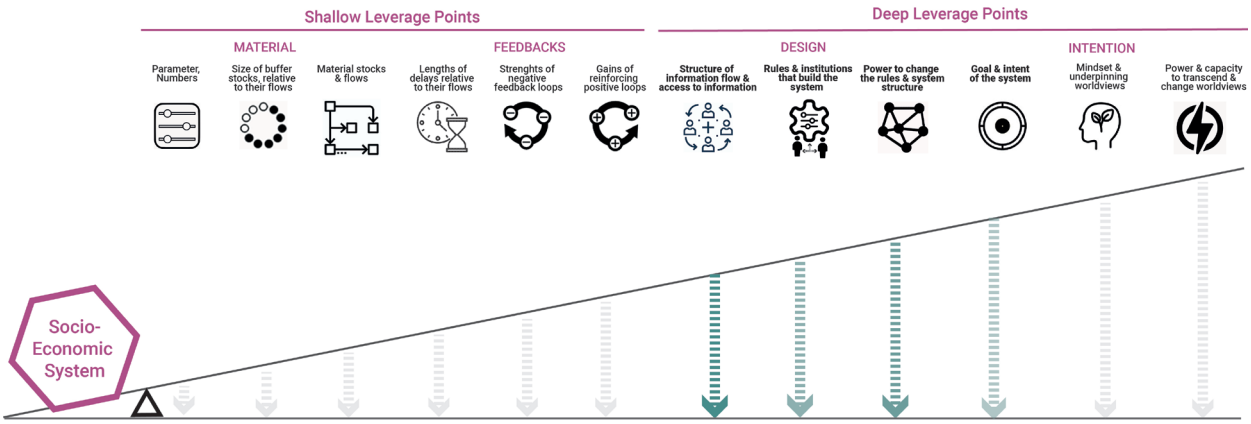

Figure 2: Leverage Points addressed by different permitting & related policy practices.

The majority of permitting practices in EU Member States are primarily focused on addressing leverage points that seek to overhaul information provision and access to enhance decision-making procedures and policy design. These practices typically involve providing data on mineral deposits, facilitating their comparability across national jurisdictions, ensuring the quality of data, and informing decision-makers in public authorities. Additionally, some practices involve developing innovative approaches to policymaking by integrating various policy areas horizontally. For example, they involve amalgamating mineral exploration and

mapping data with land use planning to provide novel concepts for safeguarding mineral deposits. They also utilise this data to inform land use planning, impact assessments, and permitting processes, demonstrating a commitment to enhancing the overall sustainability of extractive operations. Furthermore, one particularly noteworthy practice involves examining new legal provisions that may be required to ensure the health and safety of workers and environmental protection in the event of novel extractive processes utilised in future permitting applications. This demonstrates an awareness of the evolving nature of extractive operations and the need for adaptable regulatory frameworks that can respond to new technological developments while ensuring the protection of human health and the environment.

However, none of the permitting practices analysed by SUMEX address issues of a deeper nature in the leverage points scale. These may entail addressing inconsistencies in policy objectives, streamlining the permitting process to reduce the time-to-permit duration, or developing more efficient mine designs and feasibility studies. Addressing these issues presents valuable opportunities to bolster permitting processes and establish more sustainable extractive practices.

Implications and outlook

The analysis conducted by SUMEX highlights the importance of addressing attitudes, values, and worldviews within permitting processes, in addition to system design. While providing comparable, assessed, and transparent information on mineral deposits is essential, and designing policies and integrating policy areas horizontally and vertically is a promising starting point for system-wide transformation, there is a need for transformative actions that challenge established norms and paradigms. For instance, exploring alternative land use options, such as continuous site rehabilitation and onsite biodiversity areas in new permitting applications, could foster more sustainable extractive practices. Moreover, when considering new permit applications, it is crucial to more explicitly weigh the public importance of extractive operations against other goals, such as nature conservation.

ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT ASSESSMENTS

CURRENT PRACTICES AND UNDERLYING POLICY REGIMES

The significant role of Impact Assessments is evidenced by the vast number of identified practices in the SUMEX repository. A total of 96 practices focused on environmental and socio-economic impact assessments, spanning the entire leverage points spectrum have been identified, with a particular focus on the Design and Material or Feedback categories. It is important to note that impact assessments are typically a part of the regulatory and permitting system, which underscores the importance of design characteristics, accounting for 43% of the identified practices, including the attributes ‘rules and institutions’ and LP6 ‘information structure and flows’ (Fig. 3).

Aside from design, a considerable focus is placed on material characteristics, which accounts for 38% of the identified practices. This group encompasses interventions targeting parameters, buffer stocks, and material stocks and flows. Technical innovations and measures aimed at reducing or mitigating environmental impacts are emphasised, such as new exploration and surveying technologies (e.g., seismic), novel tailing techniques (e.g., dry stacking), and technologies to reduce water contamination. Many interventions also aim to enhance the ecological capacity and quality of (post-)extractive ecosystems at the level of buffer stocks, specifically targeting groundwater levels. In addition, infrastructure interventions, such as digitalisation, reducing road infrastructure, decarbonisation, or the construction of covered drainage systems, have also been identified as crucial practices in Impact Assessments.

It is worth noting that the broader scope of environmental impact assessments enables a more thorough evaluation of a project’s dimension. This, in turn, facilitates the identification of a greater number of leverage points for intervention.

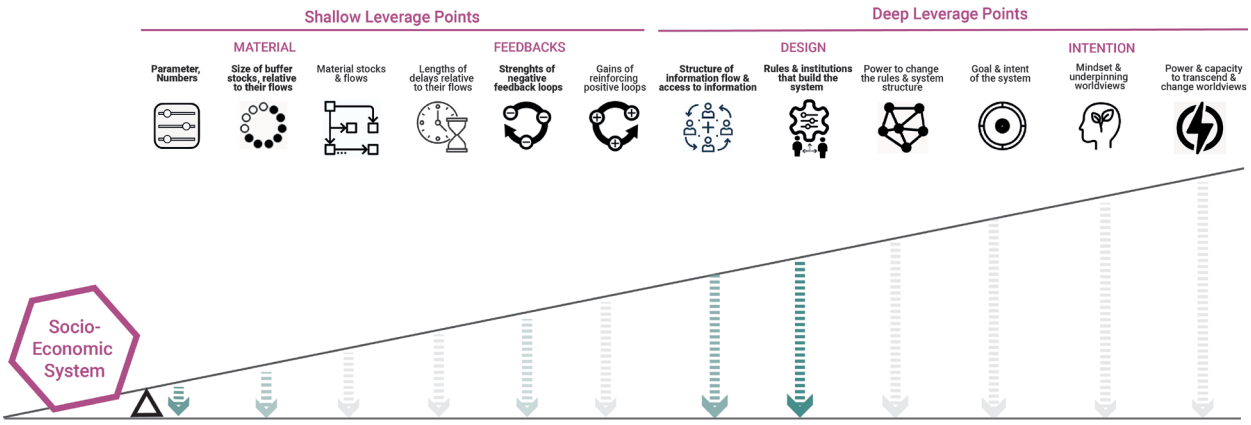

Figure 3: Leverage Points addressed by environmental and socio-economic impact assessments practices.

Interventions in Design category remain the focal point, highlighting the paramount significance of sustainable development aspects. Numerous regulatory frameworks have been established to promote environmental sustainability, which are subsequently executed by public authorities. Concerning social sustainability, process interventions such as the introduction of grievance mechanisms, stakeholder engagement and consultation protocols, social awareness programs, and structured communication approaches have been identified. These interventions are typically guidelines derived from international agreements like the UN's Guiding Principles on Business and Human Rights. In addition, several interventions redirecting information flows (LP6) and ensuring information access and transparency have been presented. Nonetheless, interventions in the feedback dimension have received comparatively less attention, accounting for only 12% of identified practices, primarily targeting reporting systems and measures that reduce mineral exploitation rates, such as the recovery of valuable materials from tailings and residues or the substitution of materials (e.g., lithium substitution).

Given the fundamental importance of technical measures and design characteristics in impact assessment practices, policymakers, public authorities, and industry stakeholders are the primary target groups for these interventions. This presents a valuable opportunity to fortify public consultations and enhance dialogues with a more diverse range of stakeholders.

Implications and outlook

The analysis highlights the critical importance of considering both design and material dimensions in conducting environmental and socio-economic impact assessments. The research indicates a notable emphasis on leveraging shallow points, with considerable efforts directed towards improving the sustainable management of extractive industries. While such efforts may yield gains in terms of enhanced efficiency (such as reduced pollution or improved health outcomes), they may not hold significant transformative potential. Furthermore, interventions appear to be predominantly focused on system design, with a clear chain-of-interventions between design and parameter or feedback level interventions. Despite this, the material dimension suggests that impact assessment practices are well-integrated and adapted to the current system. However, it is worth noting that interventions targeting deeper levels and questioning the adequacy of the current system for effecting societal transformations appear to be lacking.

LAND USE

CURRENT PRACTICES AND UNDERLYING POLICY REGIMES

The extractive sector relies heavily on land at every stage of its life cycle. However, the utilisation of land is subject to numerous development pressures and interests from multiple stakeholders, including agriculture, water, tourism, residential development, and the provision of ecosystem services, among others. Therefore, effective land-use planning and governance are essential to regulate land use, balance public and private interests, and prevent surpassing ecological carrying capacities and planetary boundaries. This process involves procedural and governance aspects of collaboration and decision-making among diverse actors to ensure equitable access to resources for sustainable functioning ecosystems and future resource stocks.

A total of 37 land-use practices have been identified in the SUMEX knowledge repository targeting various leverage points (Fig. 4). More than two-thirds of the examined practices are focused on the Design category, encompassing the attributes 'information structure and flows' (LP6, 32%), 'rules and institutions' (LP5, 29%), and 'power to change rules and the system structure' (LP4, 8%). These practices comprise different institutional and regulatory aspects of land use, such as land-use decision-making support tools (e.g., Logical Framework Approach), public policies (e.g., Austrian Minerals Plan), and other land-use policy instruments (e.g., financial incentives, funding, subsidies). They also include private sector approaches, such as voluntary industry sector-wide or individual company standards that condition their practices and standards regarding land use (e.g., Anglo American Social Way Toolbox).

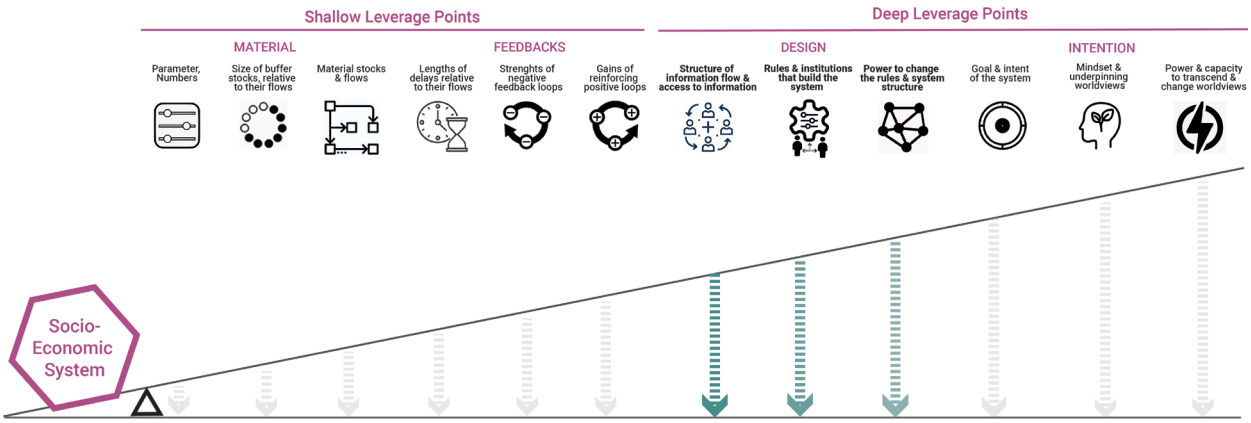

Figure 4: Leverage Points addressed by land use regimes.

It is noteworthy that significant efforts have been made to develop multi-stakeholder approaches that involve a diverse array of actors, including the establishment of formal and informal collaborative networks and partnerships (e.g., Finnish Network for Sustainable Mining) to facilitate improved involvement in decision-making and the development of joint rules for collaboration and decision-making throughout various stages of the extractive cycle, from pre-exploration to post-exploitation. Despite the introduction of new governance approaches, interventions targeting information structure and flows within networks (as in LP6) have received much less attention. The few interventions in this area almost exclusively address the implementation of transparent and publicly accessible reporting systems, land-use, and geological data.

In contrast, Material categories (LP 10-12), which focuses on altering and sustainably managing material stocks and flows, accounts for almost a quarter of the interventions in the land-use area. These interventions primarily aim to mitigate spatial-environmental impacts of extractive activities, restore sites, and minimise the impact on ecosystems, subsequently improving buffer stocks through improved land use. How-

ever, the remaining two system dimensions, 'processes' (feedback) and 'intent' (e.g., purpose of the system and mental models), are addressed to a much lesser extent. Efforts have been made to alter the system's intent by extending and re-conceptualising the extractive life cycle and holding companies accountable for post-extractive use forms such as rehabilitation and closure plans. It is worth noting that interventions in the infrastructure component are characterised by high longevity, and thus, the development of and links to the construction sector and urban and residential development (public and private sector) will be crucial.

The analysis reveals that little or no attention has been paid to deeper leverage points in the context of land-use and extractive industries. Addressing critical issues such as sustainability of land use, drastic reduction of land sealing (e.g., infrastructures), impacts of land intensity, and what sustainability and sustainability transformation mean for land uses with small spatial footprints is an opportunity to enhance land use and foster sustainable extractive practices.

Implications and outlook

In practical terms, achieving sustainable land-use transformations requires interventions targeting material characteristics, particularly the parameters and infrastructure involved. When targeting these leverage points, it is essential to consider their close relationship and interaction with rules and regulations. Although both can be addressed separately, new rules and regulations in land-use planning and governance may indirectly lead to lower parameters, such as reduced land consumption, improved spatial qualities, fewer land-use conflicts, lower biodiversity impact, or improved and flexible infrastructure provisions.

Currently, interventions mainly focus on the technical and instrumental aspects of land use planning and governance, primarily mobilising land and accelerating processes, such as implementing one-stop shops. While these objectives are understandable from the industry perspective, public interests are equally important. Therefore, institutions, including rules and regulations, must account for distributive and procedural justice and the fair distribution of benefits and burdens related to the extractive sector. Approaches and interventions in this regard play a crucial role in addressing climate change and providing mineral resources for green technologies, such as battery materials, necessary for the energy transition.

HEALTH AND SAFETY

CURRENT PRACTICES AND UNDERLYING POLICY REGIMES

In the context of sustainable extractive management, health and safety considerations transcend the boundaries of the mining operation and encompass the well-being of individuals and communities adjacent to the extractive site. Hence, addressing occupational safety, which pertains to the safety, health, and welfare of individuals within the confines of the mining site, alongside process safety, which aims to prevent mining-specific incidents such as tailings dam failures, fires, or roof support system collapses, is paramount.

A total of 27 health and safety practices have been identified by SUMEX across multiple system dimensions. Nearly half of these practices fall under the Design category, which focuses on different rules and institutions that operationalise and implement health and safety objectives (Fig. 5). The institutional dimension is further reinforced by a strong emphasis on information practices, particularly in providing information to communities, communicating risks, identifying workers at risk, and providing tools for assessing plans for crisis management, health and safety management, or tailings management performance.

The emphasis on the design dimension, coupled with the use of information and rules, can be attributed to the significance of the legislation and regulatory measures for health and safety, complemented by company-level regulations, guidelines, and management plans, which are supported by sector-wide good practice guidelines, such as those published by or the Initiative for Responsible Mining Assurance (IRMA) or by

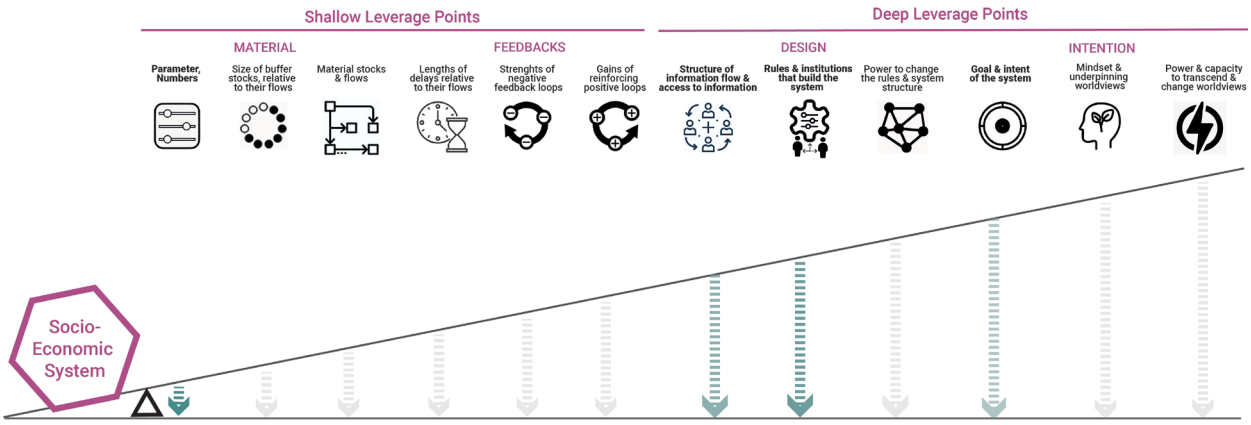

Figure 5: Leverage Points addressed by health and safety practices.

the International Council on Mining and Metals (ICMM). These health and safety practices underscore the vital interplay between the public and private sectors in achieving sustainable management of extractive industries.

Another focus of these practices is on the material dimension (LP12), which entails parameters aimed at reducing pollution, risk, and contamination of soil or water that may compromise human health, such as mercury in small-scale gold mining. Moreover, efforts are directly aimed at preventing health and safety hazards for local communities through technical innovation and process safety.

However, current actions on a deeper system level, which target intentions and fundamental values, do not receive as much attention. Nonetheless, minor efforts have been noted in this area, underscoring holistic management and emergency preparedness that goes beyond the traditional mine life and potentially involve shifting fundamental values, such as zero harm, active care, and people-centric approaches at the company level.

Implications and outlook

The analysis has shed light on the current importance of the design and material dimensions in tackling health and safety concerns, promoting sustainable management, and mitigating the impacts of extractive industries. Nevertheless, comparatively less attention has been directed towards interventions at deeper system levels, which may be attributed to the narrow and specific focus of health and safety concerns. The analysis also indicates that health and safety practices primarily aim to mitigate sustainability challenges and address lower leverage points, such as reducing incidents and preventing water or soil contamination that may jeopardise human health. While these are undoubtedly crucial aspects of health and safety, they may only play a supporting and facilitating role in the broader context of sustainability transformations. Thus, there is a need to place greater emphasis on operationalising fundamental values such as zero harm, active care, and people-centric approaches and comprehending the role that these values can play in driving broader sustainability transitions.

REPORTING

CURRENT PRACTICES AND UNDERLYING POLICY REGIMES

Reporting is of critical importance as it entails the disclosure and dissemination of a company's economic, environmental, and social performance to the public. From a company's perspective, it represents a tool to reinforce and internalise its commitment to sustainable development and transparency. While reporting is indispensable for tracking progress towards sustainable performance, it also serves as a crucial tool for communicating the company's endeavours to stakeholders, thereby enhancing its Social License to Operate and attracting investment opportunities. Thus, establishing and implementing effective approaches for identifying, monitoring, mitigating, and communicating potential economic, social, and environmental risks is imperative for initiating change towards sustainable management of extractives.

A total of 16 reporting practices have been identified by SUMEX, targeting different leverage points. Most of these practices pertain to leverage points within the Design category, with only a handful of them addressing leverage points in the Feedback, Material and Intention categories.

Interventions on reporting represent leverage points concerning the collection, assessment, and utilisation of information. The majority of these interventions are directed at extractive sites and how they are monitored and data assessed. Such monitoring approaches are typically implemented by companies or external auditors, encompassing protocols, guidelines, and assessment schemes for monitoring information on resources, safety, mine closure, biodiversity, and conservation management.

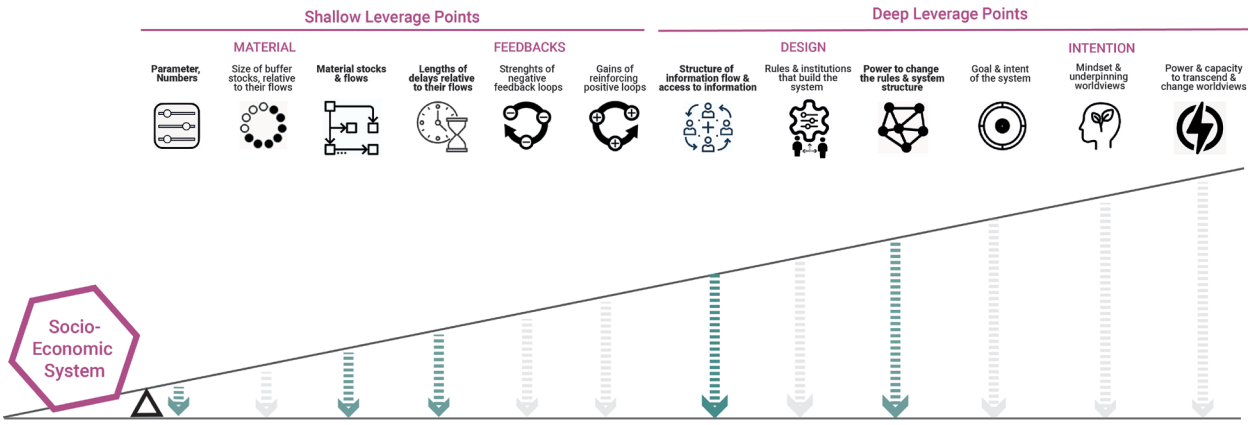

Figure 6: Leverage Points addressed by reporting practices.

While some reporting practices incorporate information regarding affected stakeholders, typically with the aim of building trust and establishing a social license to operate, regrettably, only a limited number of these practices actively engage with individuals or groups of society that are impacted by extractive activities. In most cases, communication and information provision actions are not designed to facilitate two-way communication processes. In rare instances where industry players have developed such interventions, they are designed to address individuals or groups of society impacted by extractive activities and offer them grievance mechanisms.

The lack of interventions or practices targeting leverage points in the intent category is indicative of the fact that existing practices are predominantly geared towards enhancing the sustainable management of the existing system. However, they may not be sufficient to provide the necessary impetus for significant transformation of the extractive sector towards sustainability. This is a critical issue to consider in terms of what, how, and to what extent extractive companies monitor, assess, and report.

Implications and outlook

The majority of the identified reporting practices entail the implementation of company protocols, guidelines, and tools for monitoring and assessing site-level operations (leverage points within the Design category) and are primarily executed by industry actors. The absence of participation from independent auditors or affected stakeholders (such as citizens, municipalities, or NGOs representing nature conservation interests) is likely to impede trust in these reporting systems, thus hindering efforts to enhance transparency. This, in turn, undermines endeavours to cultivate a social license to operate. To counteract this trend, the establishment of networks and other governance bodies, including affected stakeholders or independent reporting authorities, or reporting standards with stringent and independent company certification and auditing, could be enforced. It is noteworthy that while design interventions are crucial levers for system change, their impact may be limited to well-known and established system parameters (such as increased dam safety levels or mitigating impacts on species and habitats), which only contribute incrementally towards sustainable management.

SUMEX RESOURCES

The analysis presented in this policy-brief is based on the extensive information available in the SUMEX knowledge repository. This repository provides a wealth of insights that decision-makers can leverage to design evidence-based policies that promote sustainable extractive operations, ensuring that the sector contributes positively to economic growth, environmental protection, and social well-being.

To promote targeted engagement and focused learning, SUMEX established a Community of Practice (CoP) aligned with the project's five topic areas: socio-economic and environmental impact assessments, land use planning, health and safety, reporting and permitting. This CoP is a space (hosted on LinkedIn; see *https://www.linkedin.com/groups/14134912/*) where people and organisations with similar backgrounds and learning needs can connect and work collaboratively towards achieving sustainable extractive practices.

SUMEX also developed a Massive Open Online Course (MOOC) that invites participants to explore the importance of sustainability and offers best practice strategies and insights about how to respond to sustainability challenges faced by the extractive industry.

The SUMEX knowledge repository, the CoP and the MOOC are relevant contributions to the transition towards sustainable extractive practices. By tapping into the repository's insights and engaging in collaborative learning, decision-makers can stay informed, updated and better equipped to make informed decisions that balance economic, social, and environmental objectives.

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