TRANSITION TOWARDS SUSTAINABLE DEVELOPMENT IN THE EXTRACTIVE SECTOR

Current practices in five focus areas and their system change potential

Policy brief #3

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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	

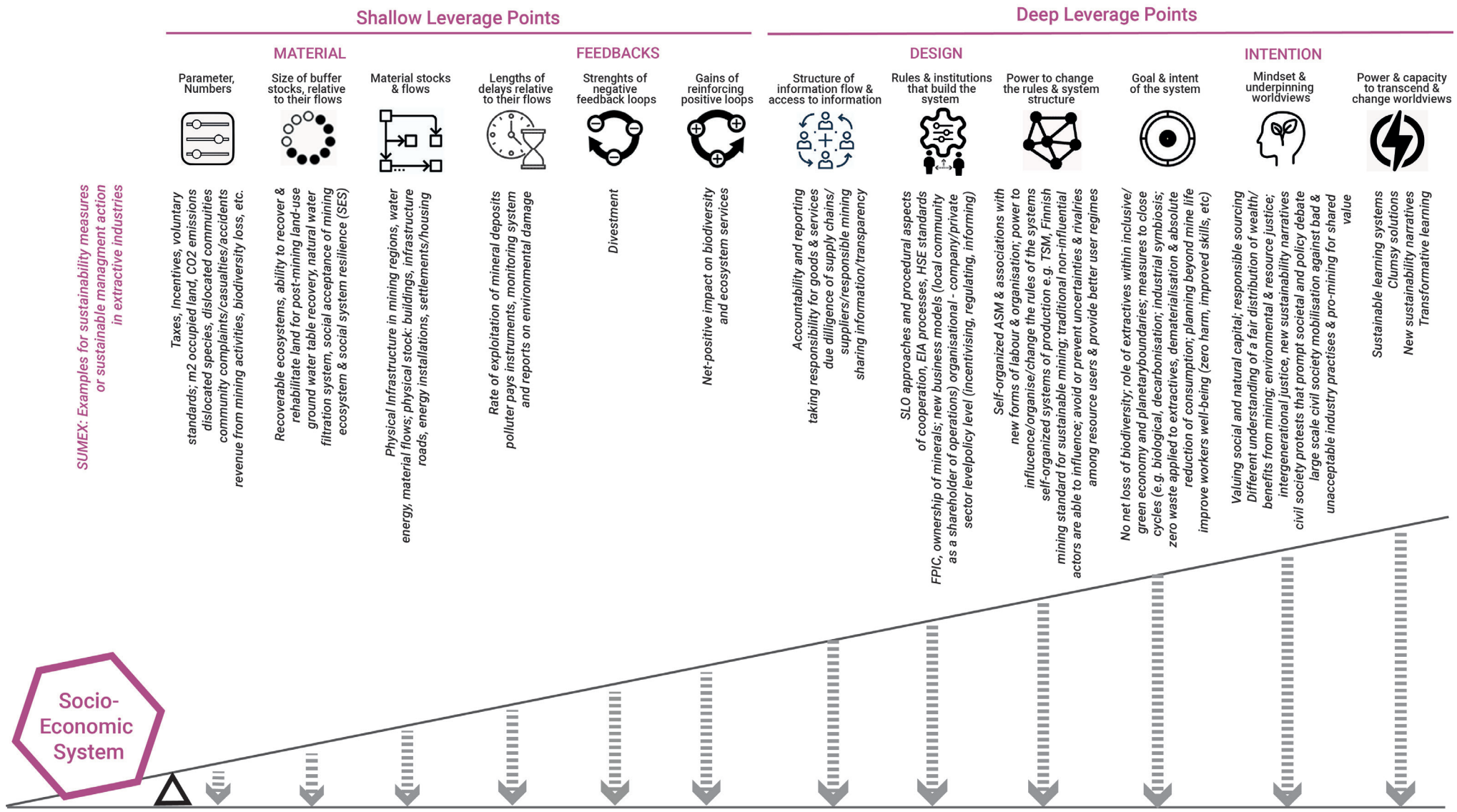

Figure 1: Leverage Points Perspective adapted to the subsystem of the extractive industries (Source: SUMEX D1.2).

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.

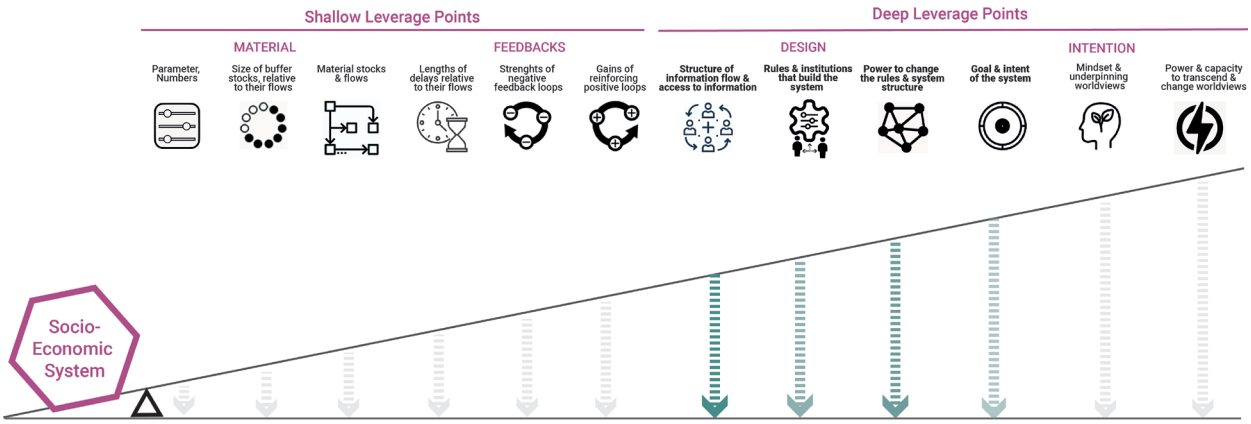

Figure 2: Leverage Points addressed by different permitting & related policy practices.

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.

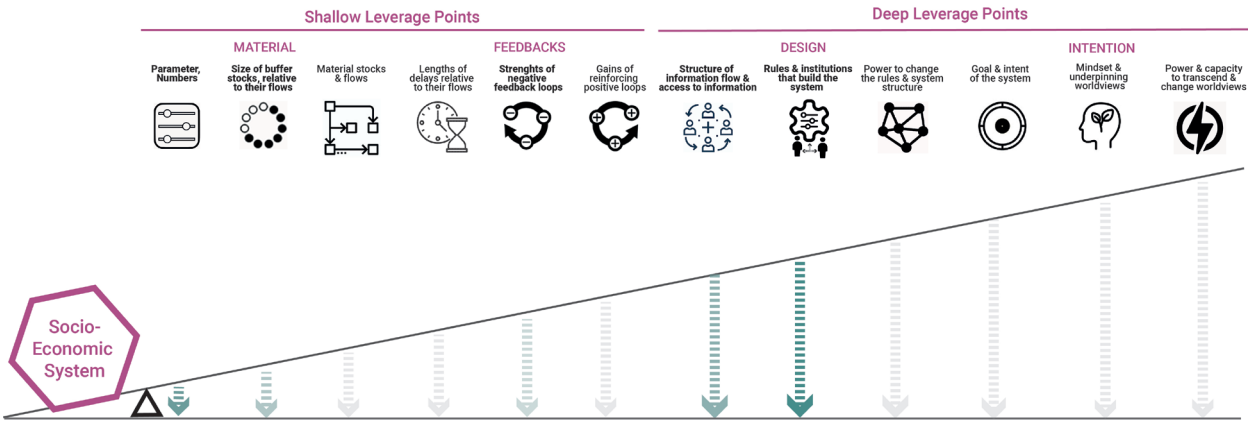

Figure 3: Leverage Points addressed by environmental and socio-economic impact assessments practices.

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).

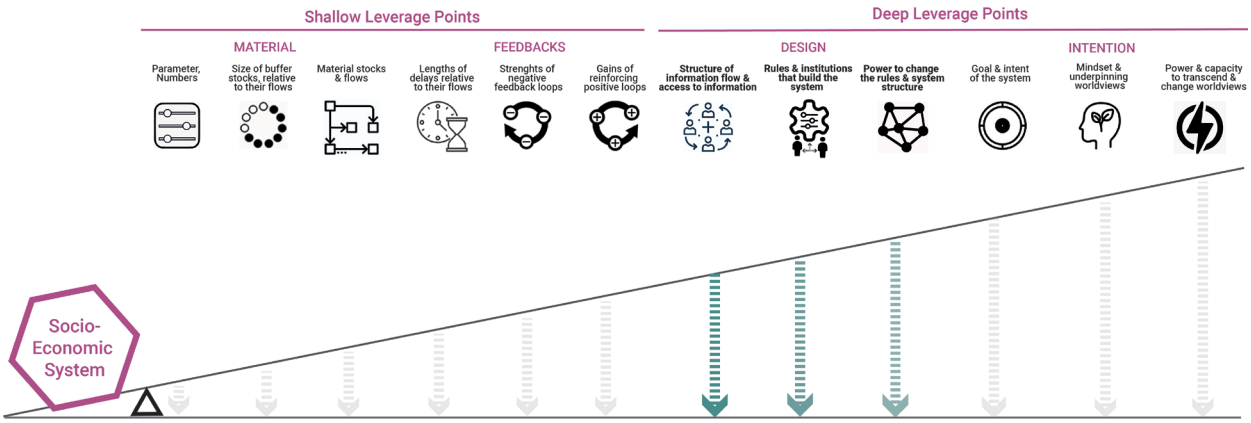

Figure 4: Leverage Points addressed by land use regimes.

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

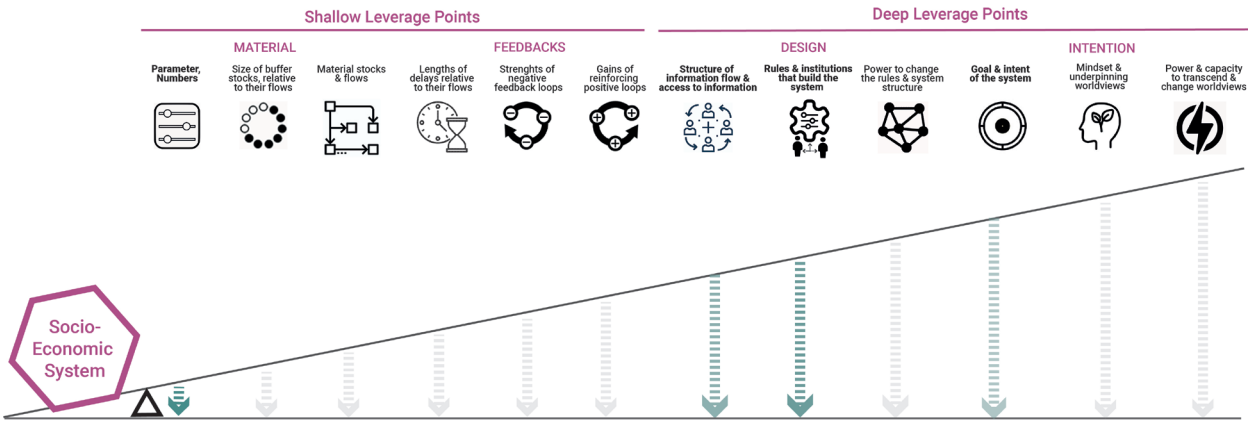

Figure 5: Leverage Points addressed by health and safety practices.

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.

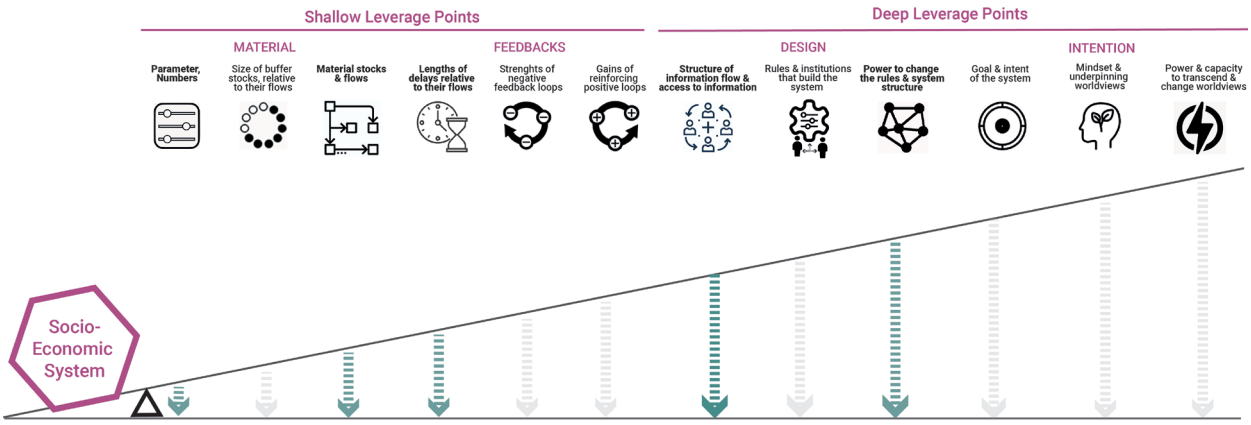

Figure 6: Leverage Points addressed by reporting practices.

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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ABOUT SUMEX

SUMEX is a 36-month project funded by the European Commission that started on November 1st, 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:

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