CRM-GEOTHERMAL DELIVERABLE D4.2

SOCIAL LICENCE TO OPERATE
GUIDELINES FOR COMBINED GEOTHERMAL – METAL EXTRACTION PROJECTS

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Social Licence to Operate
Guidelines for Combined Geothermal – Metal Extraction Projects

Executive Summary

Many minerals and metals are required to support the current shift away from fossil fuels and towards the implementation of low-carbon technologies, electrification and improved energy storage, as well as the ongoing digital transformation. The minerals and metals that are the most important economically and have a high supply chain risk are often collectively called critical raw materials (CRMs). Although historically CRMs have been produced by traditional mining and recycling methods, extracting them from geothermal waters represents a new way of supplementing or replacing materials produced by traditional mining, with the prospect of reducing the environmental, social and societal risks and negative impacts associated with mineral and metal production.

The successful development and operation of combined extraction projects is underpinned by obtaining and maintaining a social licence to operate (SLO) from local communities and other relevant stakeholders. SLO reflects the degree to which a company and its activities meet the expectations of local communities and other stakeholders throughout the life of a project. However, while there is a wealth of academic research on the theoretical basis for SLO, there is little guidance on how to obtain and maintain SLO and integrate such activities with wider stakeholder strategies.

The objective of these Guidelines is to distil the large volume of research into practical guidance that project staff can use in planning their day-to-day activities. Making them publicly available means the Guidelines also serve to inform stakeholders of what they should expect from responsible combined extraction projects.

This is presented in two sections: 1) the principles that underpin SLO and 2) a range of potential approaches to obtaining and maintaining SLO.

1) The principles comprise:
    - **Ensure legal compliance** – although complying with laws and regulations is not the same as SLO, the latter is not possible without the former.
    - **Do no harm** – in effect, the implementation of appropriate measures to protect health, safety, the environment and internationally recognised human rights.
    - **Employ engagement experts early** – ensuring activities to obtain and maintain SLO are integrated with project activities from the earliest possible point in the project lifecycle.
    - **Understand a project's context** – the specific cultural, historical, political, economic, environmental and social context that can influence the concerns and view of local communities and other stakeholders.
    - **Identify and engage stakeholders** – these are the individuals, groups or institutions that have a direct or indirect interest in, and can impact or be affected by, a project.
    - **Communicate honestly and transparently** – SLO is closely linked to trust, legitimacy and credibility with communities and therefore stakeholders expect those leading a project to be honest and transparent about what it is doing and why, the likely risks, negative impacts and benefits, making information and data available and accessible on a consistent, ongoing and frequent basis.
    - **Understand stakeholder concerns and views** – acknowledging that stakeholder concerns and views may be quite different from a project's own analysis of risks, negative impacts, opportunities and benefits

If a project fails to consider or apply these principles, it is likely to find obtaining and maintaining SLO more complicated, time-consuming and expensive.

2) Potential approaches to obtaining and maintaining SLO has been broken down into:
   - **Preparation** – getting ready by identifying stakeholders, identifying and assessing risks and negative impacts and how these differ from stakeholder perceptions, and defining the benefits and opportunities a project is expected to deliver. This stage may also include building internal and external capacity for stakeholder engagement, ensuring all parties are able to engage meaningfully.
   - **Engaging effectively and obtaining SLO** – developing clear communication materials and effective methods of engagement, tracking progress and ensuring available resources are used as efficiently as possible.
   - **Maintaining SLO**– continuing to conform with the underlying principles and implement stakeholder engagement processes and activities, recognising that some aspects may need to be adapted as the project evolves, or remedial actions developed when issues arise.

The Guidelines have been developed as part of an EU funded project, a region where regulations, governance and wider societal context represent collectively a stringent framework that limits the potential for industrial projects to cause harm. Nevertheless, with appropriate adaptation the Guidelines may be useful in other regions and countries, where differences in regulatory frameworks, legal enforcement capacity and cultural, socio-economic and natural environment contexts may represent a different set of challenges to those seen in the EU. Usefulness outside the EU is based on the core concepts of establishing legitimacy, credibility and trust to build SLO, which are relevant everywhere in the world.

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Glossary

The following glossary defines terms relative to how they are used in these Guidelines; some terms may have different definitions when applied in a different context.

Ambassadors	Project staff trained as consistent points of contact for local communities and other stakeholders
Benefit	A positive outcome for a local community, other stakeholder or society that arises from a combined extraction project
Combined extraction project	A planned or operational site for the combined extraction of critical raw materials and energy from geothermal fluids
Critical raw materials	Minerals and metals that are economically important and subject to a high risk of interruption of supply; the list of critical raw materials is normally defined by the national government or regional institutions (e.g. the European Union) and may vary from one country to another
CRMs	See **Critical raw materials**
CRM-geothermal project	A project running from 2022 to 2026 funded by Horizon Europe to develop an innovative technology solution combining the extraction of CRMs and energy from geothermal fluids
Dialogue	The two-way exchange of information, ideas and opinions
Environmental and social impact assessment	A process to predict and assess potential negative environmental and social impacts and develop suitable measures to avoid or minimise such impacts
FAQ	See **Frequently asked questions**
Feasibility study	An assessment that considers, technical, economic, legal, environmental and social factors to determine if a planned project will be successful
Fossil fuels	A natural fuel such as coal, oil or gas formed over many millions of years from the remains of living organisms
Frequently asked questions	A list of questions and answers to help project staff to give clear and consistent answers to queries raised by local communities and other stakeholders
Geothermal energy	Thermal energy extracted from the Earth's crust, which can be used as a source of heat or to generate electricity; classified as a renewable energy source
Grievance mechanism	A procedure that provides a clear framework to receive complaints from local communities and other stakeholders and to track how a project has responded and resolved such complaints
Legal compliance	Compliance with relevant laws, regulations and other requirements a government uses to regulate the business practices of a project

Lifecycle	See **Project lifecycle**
Local community	A community hosting, adjacent to or near a combined extraction project
Mitigation hierarchy	A tool designed to reduce negative environmental impacts by promoting – in preferred order – avoidance, minimisation, restoration and compensation
Negative impact	A negative outcome for a local community, other stakeholder or society that arises from a CRM-geothermal project
NGO	See **Non-governmental organisation**
NIMBY	See **Not in My Backyard**
Non-governmental organisation	An organisation that operates independently of government influence and control
Not in My Backyard	The situation where an individual or organisation opposes a development in their area due to perceived or actual risks and negative impacts, but would not raise the same objections if the development occurs elsewhere
Permitting	The process by which permission to operate is provided to a project based on the submission of adequate information about how the project will effectively manage its risks and negative impacts
Project lifecycle	The life of a combined extraction project, from exploration, through project development and construction, operation and eventual site closure and rehabilitation
Risk	The possibility that something bad or unwanted will occur with respect to something that humans value such as health, well-being, wealth, property or the environment)
Risk assessment	A formal process to identify how different hazards might cause something bad to happen and what measures should be taken to avoid or minimise this
Risk perception	The informal assessment by local communities and other stakeholders of the likelihood that hazards will cause something bad to happen
SEP	See **Stakeholder engagement plan**
Silent majority	The typically sizeable group of stakeholders with undisclosed interests and perceptions of a combined extraction project
SLO	See **Social licence to operate**
Social licence to operate	The degree to which a company and its activities meet the expectations of local communities and other stakeholders throughout the life of a project
Societal acceptance	A regional or national consensus that a development is necessary to deliver an important societal benefit without

	considering in detail the localised positive and negative impacts of such development
Stakeholders	Individuals, groups or institutions that have a direct or indirect interest in, and can impact or be affected by a project
Stakeholder engagement	An inclusive and iterative process based on the identification and analysis of stakeholders, the two-way exchange of information, a grievance mechanism through which concerns and complaints can be raised, and consultation, all of which support the development of a positive and robust relationship between a project and its stakeholders
Stakeholder engagement plan	A written document that a project uses to plan and organise and promote continual and transparent communication with local communities and other stakeholders
Stakeholder map	A visual representation of stakeholders most closely linked to SLO using different factors to help prioritise engagement activities
Trusted messengers	Independent people trusted by the local community that a project can work with to distribute factual information and messages

1 Context and background

1.1. Critical raw materials and the *CRM-Geothermal* project

Many minerals and metals are required to support the current shift away from fossil fuels and towards the implementation of low-carbon technologies, electrification and improved energy storage. The minerals and metals that are the most important economically and have a high supply chain risk are often collectively called critical raw materials (CRMs).

At the moment, CRMs are produced largely from two sources:

- Primary – historically, this has been 'traditional' mining where a mineral-rich deposit is physically extracted and processed, with the potential for significant environmental and social impacts that must be carefully managed.
- Secondary – recycling of CRMs present in post-consumer products and wastes.

Demand for CRMs is rising rapidly and in the short- and medium-term, increased primary production will be necessary to meet this demand. In the longer term, as recycling of CRMs becomes more efficient and economic, it will play an increasing role. The International Energy Agency notes that if national climate pledges are achieved, recycling can reduce the need for new mining by 25-40% by 2050.

'Traditional' mining primary production will remain an important source of CRMs. Research to identify ways to reduce the negative environmental and social impacts of traditional mining has been underway for decades and continues to deliver positive results. Nevertheless, the impacts at even well-managed traditional mining sites can still be significant as a result of large-scale mineral extraction and waste disposal activities. This has driven a change in thinking, looking beyond traditional mining for alternative ways to produce CRMs. As part of this, there has been a growing realisation that the hot waters extracted from underground geothermal projects as a source of clean energy, can contain valuable metals and minerals including CRMs that can be economically and sustainably recovered, whilst still generating power and supplying heat to communities.

The 2024 European Union (EU) Critical Raw Materials Act aims to ensure that the EU can rely on strong, resilient, and sustainable value chains for critical raw materials. Related to this and the potential of geothermal waters as a source of CRMs, the Horizon Europe[1]-funded **CRM-geothermal** project (see https://crm-geothermal.eu/). has been developing an innovative technology solution which combines the extraction of CRMs[2] and energy from geothermal fluids. While the primary focus of this programme is to assess and test technical and economic aspects of recovering CRMs from geothermal fluids, the programme also embedded from the outset the development of guidelines for obtaining and maintaining social licence to operate (**SLO**) at planned and operational combined geothermal – CRM extraction projects (hereafter, **combined extraction project(s)** or **project(s)**[3]), taking the view that the role of communities and other stakeholders in providing SLO can ultimately underpin the successful development and operation of such projects.

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1 Horizon Europe is the European Union's key funding programme for research and innovation.

2 The list of CRMs defined by the European Union in 2020 (as of March 2025, this was the most recent update) is available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474.

3 In these Guidelines, 'project' encompasses both planned and operational sites. The terms 'planned project' and 'operating project' are used when the guidance is specific to one or other of these.

Levin Sources[4] developed these Guidelines for combined extraction projects in collaboration with CRM-geothermal project partners in the period 2023-2025. The Guidelines build on the recently completed H2020 project MIREU (www.mireu.eu), which proposed a set of guidelines for obtaining SLO for mining and metallurgy in the specific context of Europe but also drawing on world-wide SLO experience. Also relevant is the CROWDTHERMAL project (www.crowdthermalproject.eu), which mainly focused on innovative ways to finance geothermal projects through crowdsourcing, but also considered public perception and engagement aspects.

Complementing this solid foundation, the Guidelines draw on experience in understanding social licence constraints for extractive projects, desk research, including an extensive review of academic and other literature as noted in the **Annotated bibliography,** and in-person and online stakeholder consultations[5] and interviews. Collectively, these helped to understand the environmental, social, economic and technical issues that can constrain or support the long-term, sustained acceptance of combined extraction projects and identify potential external triggers that can reinforce or undermine SLO, such as news in social media, changing views of on the reliability of scientific experts, negative incidents associated with geothermal projects, and demographic changes.

The objective of the Guidelines is to distil the large volume of academic and other research into practical guidance that project staff can use in planning their day-to-day activities. This is presented in two sections – the principles that underpin SLO (Section 4) and a range of potential approaches to obtaining and maintaining SLO (Section 5).

1.2. The meaning and importance of social licence to operate

The idea that mining should be conducted in a socially acceptable way dates back centuries to the earliest books on mining. But it was not until the late 1990s that the concept of SLO originated in the mining industry as a tool to address criticism of, and opposition to, mining projects, and build the legitimacy of mining as a socially acceptable industrial activity. Since then, it has been applied in a wide range of industries such as forestry, agriculture, renewable energy, and pulp and paper manufacturing and is also referenced in the United Nations Global Compact, the world's largest corporate sustainability initiative, which considers obtaining SLO an important part of demonstrating responsible business conduct.

Although the term is widely used in the mining industry and by some of its stakeholders, providing a simple definition of SLO that is universally applicable is a challenge. Local communities in particular may have little awareness of the phrase or what it means, even in broad terms, as its casual use in most contexts is unlikely. In some cases, communities may misconstrue SLO as a mechanism for preventing an industrial project going ahead, rather than a means of encouraging companies to set and achieve high standards. Establishing a straightforward definition is therefore important: in the context of these Guidelines, **SLO simply reflects the degree to which a company and its activities meet the expectations of local communities and other stakeholders throughout the life of a project**.

[4] A consultancy based in Cambridge, UK enabling governments, businesses, investors and civil society to build sustainable, valuable and equitable minerals value chains. https://www.levinsources.com/

[5] Consultation workshops with local communities and stakeholders were undertaken in two historic mining areas in Cornwall (UK). Cornwall was selected as a region with significant opportunities for the future development of combined extraction projects and as it is the host for the CRM-geothermal project's pilot trial of a CRM extraction technology in 2025-2026.

SLO is not binary. Instead, it exists on a sliding scale, which is reflected in the relationships a local community and other stakeholders have with the project. SLO can be affected by factors such as the technologies a project is proposing or using, the status of legal licences and compliance, reputation of a project's owner and operator, and the leadership's core business values. SLO cannot be transferred from one project to another, meaning that project developers and operators cannot 'piggyback' on previous or current SLO in the same area for a different project: every company needs to develop its own SLO for each of its projects. While there is no specific threshold that a project can use to determine it has 'enough' SLO, weaker SLO results in higher risks to the project and stronger SLO results in lower risks.

SLO is important for a combined extraction project throughout its lifecycle, although the steps necessary to obtain and maintain SLO may vary depending on whether a project is at the planning stage, already operating or approaching closure. SLO can change over time as a project develops or as the project context is modified. Maintaining SLO and preventing its erosion or loss is therefore an ongoing process that requires a commitment from a project throughout its life, ideally from the earliest planning stages, through construction and operation and on to eventual closure, decommissioning and rehabilitation of affected areas.

Projects that have no SLO, or that have lost their SLO, are less likely to be considered legitimate, while increasing SLO will help to establish a project's credibility, where stakeholders believe project information. At the next level, SLO is reflected in trust in a project, where stakeholders believe the project is 'trying to do the right thing' and develop a more collaborative relationship. SLO that is built on legitimacy, credibility and trust with stakeholders will pass through acceptance and ultimately achieve approval and support for a project. At its best, SLO is based on a joint vision, shared values and intrinsic motivation as well as a transparent and trustworthy communication between a project, local communities and other stakeholders. The relationships between SLO and legitimacy, credibility and trust are shown in Figure 1.

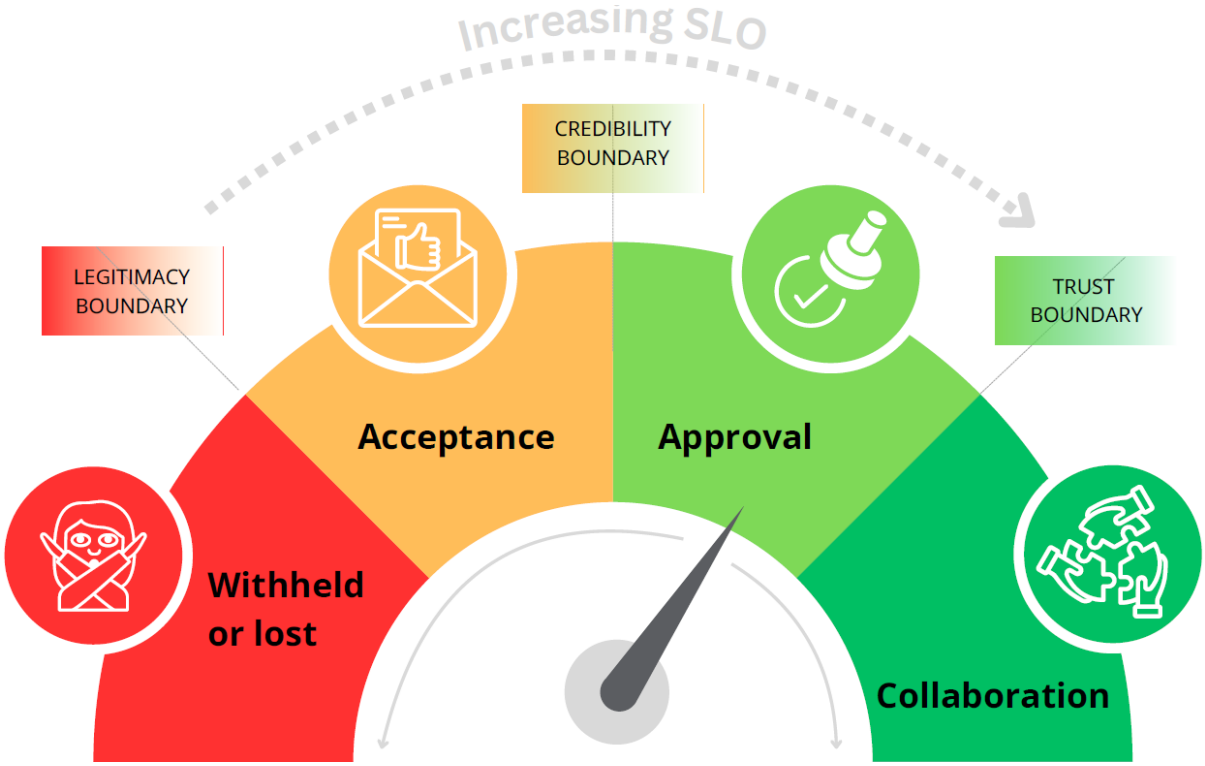


Figure 1 SLO and legitimacy, credibility and trust

The failure to obtain or maintain SLO may ultimately lead to the withdrawal of support and active opposition to a project. Stakeholders can use formal processes to slow or block a planned or operating project by, for example, raising objections during planning and permitting processes or opposing the renewal of environmental licences. In some cases, opposition can extend to direct action by stakeholders such as demonstrations, blockades and even sabotage.

The consequences of opposition to a project are well-known and can include significant delays, cost overruns, reputational damage and the cancellation of activities or halting of the project's operations. Opposition to one specific project can rapidly spiral into a wider resistance: stakeholder perceptions of performance at one site can be shared and disseminated quickly in a way that companies cannot control and may struggle to meaningfully respond to. Ultimately, this can have a negative effect on the future development of similar projects run by the same or different companies, whether in the same country or further afield. This is the opposite of the desired outcome, where a well-run project supports the future development of similar responsible projects.

While universal acceptance should always be the aim, in reality this is unlikely to be achievable in most cases, given the diversity of viewpoints and opinions amongst those likely to be affected by a project. The question then arises – how much SLO is enough?

Against a backdrop of declining public trust in government and authorities, including regulators, **approval by the regulator does not automatically equate to social approval.** Consequently, the fact that a project has the licences and permits necessary to legally operate does not mean that it can ignore SLO. If a project wants to reduce its risk, it will aim for higher levels of SLO, which will generally require going beyond legal compliance. Although SLO and a legal licence to operate come from two distinct sources, each can influence the other. For example:

No actual licence is granted by anyone for SLO and unlike a legal licence, SLO does not have a fixed duration, status, or scope. SLO is not fixed and its strength can vary over time according to the activities and performance of a project and changes in the views and opinions of local communities and other stakeholders. The project needs to commit to maintain SLO throughout its life.

- If the absence of SLO manifests in the form of public objections and active opposition, this may result in a project's legal licence being delayed, refused or withdrawn and the pausing or termination of project activities.
- Positive SLO that manifests as solid support for a project may make the legal licencing process more straightforward.
- The absence of a legal licence or the ability for a project to obtain such, is highly likely to negatively impact a project's ability to obtain and maintain SLO.

Although they are connected, societal acceptance should not be confused with SLO. The former typically exists at a larger regional or national scale and reflects a general consensus that a development is necessary to deliver an important societal benefit without considering in detail the localised positive and negative impacts of such development. By contrast, SLO has a much greater emphasis on stakeholders that are close to or likely to be directly impacted by a development and who are very much concerned with the positive and negative impacts and the effects of these on the local area. The challenge of misaligned SLO and societal acceptance can be caused by a range of factors, including:

- The absence of a clear link between a project's development and societal benefits in the view of a community.

- A community accepting that a development will deliver a societal benefit but believing there is a better alternative location.
- Community concerns about negative impacts they will be exposed to outweighing the societal benefits.

These factors are not unique to combined extraction projects and many other developments, such as infrastructure and housing face similar challenges. However, while the routing of roads and powerlines, or the location and boundary of a housing development can be significantly modified, if necessary, the location of a combined extraction project is largely fixed by the geothermal-mineral resource that is being extracted. This means that a combined extraction project may have limited options to adjust its location as part of obtaining SLO.

1.3. The stakeholders relevant to social licence to operate

In many countries, it is quite normal for stakeholders to expect, and have, a say in activities that affect large areas over long periods with significant negative and positive impacts. Engaging with stakeholders is therefore central to obtaining and maintaining SLO. Identifying the types of stakeholders that define to what extent SLO exists is both critical and challenging. The nature and mix of stakeholders will vary from one area to another and from one project to another. In broad terms, these stakeholders are those that are geographically close to a combined extraction project, and those that are more remote but with some interest in how a project is planned and operated, as summarised in Figure 2.

Figure 2 Example stakeholder groups relevant to a combined extraction project

These stakeholder groups are considered in more detail in Section 0.

The views of national and international stakeholders such as regulators and investors can significantly influence a project and sometimes shape local attitudes, but their role in SLO is generally indirect and outweighed by the stakeholders with more direct geographical links to a project and its surrounding environment. Therefore, a permitted and licenced project with available capital and investment for construction and operation can still lack SLO. Equally, strong public opposition and the loss of SLO can bring a project to a halt irrespective of how well the planning and licencing processes are proceeding.

The remoteness of stakeholders does not, however, always diminish their influence on SLO. For example, remote academic institutions and non-governmental organisations (NGOs) may influence the establishment and maintenance of SLO, if they are considered a more trusted source of information than a project itself and formal sources such as the relevant regulators and government authorities. In such cases, engagement with these stakeholders is also critical to obtaining and maintaining SLO.

2 Who are the Guidelines for?

These Guidelines are primarily for the management and staff of combined extraction projects that wish to engage with stakeholders and develop and maintain SLO. They are designed both for social responsibility and community engagement teams and non-experts. The extension of the Guidelines to non-experts reflects the reality that technical staff may be responsible for engaging with stakeholders in the early stages of a project, with engagement experts only employed when technical and economic studies indicate there is a reasonable chance a project can be successfully developed. Consequently, the Guidelines avoid the use of jargon, instead, providing useful information for communicating effectively with stakeholders and building SLO in a way that is clear and straightforward.

In addition, the Guidelines can be used by stakeholders as a source of information on what they should expect from responsible combined extraction projects in terms of inclusive stakeholder engagement, the communication of information or other good practice linked to SLO. In this way, the Guidelines will also help communities and other stakeholders hold projects accountable for ensuring good practices that minimise risks and adverse impacts and maximise benefits and positive opportunities. To assist with this, Annex 1 provides a summary of the Guidelines in a form that could be adapted by a project and distributed to its stakeholders, to explain the concept of SLO and how the project intends to obtain this through ongoing engagement.

The Guidelines have been developed as part of an EU funded project, a region where regulations, governance and wider societal context represent collectively a stringent framework that limits the potential for industrial projects to cause harm. Nevertheless, with appropriate adaptation the Guidelines may be useful in other regions and countries, where differences in regulatory frameworks, legal enforcement capacity and cultural, socio-economic and natural environment contexts may represent a different set of challenges to those seen in the EU. While there is no 'one-size-fits-all' approach to obtaining and maintaining SLO, the core concepts of establishing legitimacy, credibility and trust to build SLO are relevant everywhere in the world.

3 How to use these Guidelines

As these Guidelines are not designed as a prescriptive list of tasks, projects using the Guidelines should consider what will work in the local context and what needs to be adapted or refined. Companies with established stakeholder / community engagement teams may already be doing some or all of what is suggested in these Guidelines or may have identified alternative ways of obtaining and maintaining SLO. There is no single right way and it is not the intention of these Guidelines to force unnecessary changes to existing successful approaches. The Guidelines may be more useful for projects beginning on their journey to obtaining SLO or that are underway and looking to refine and improve their performance.

The potential approaches noted in Section 5 are presented in linear and logical order. However, in reality, many of the suggested activities will be undertaken in parallel and iteratively – it is for the reader to consider how best to plan and execute a programme of work that will ultimately deliver SLO considering the area in which a project has been or will be developed and the specific stakeholders with which the project must build trust, credibility and support. Finally, it is important to note that the Guidelines do not assume the combined extraction of CRMs and geothermal energy should be allowed irrespective of the environmental and social impacts and risks. Whether and how a project proceeds should be evaluated according to the requirements of relevant planning and permitting processes and the outcome of technical, economic and environmental feasibility studies.

4 Principles

Obtaining and maintaining SLO is underpinned by several key principles (Figure 3). These are summarised below and the themes developed further in the guidance presented in Section 5. Failure to consider or apply these principles is likely to make obtaining and maintaining SLO more complicated, time-consuming and expensive.

Figure 3 The principles underpinning SLO

4.1 Ensure legal compliance

While the purpose of these Guidelines is not to define how projects can achieve legal compliance, it is important to recognise the role that such compliance can play in obtaining and maintaining SLO.

Although legal compliance is not the same as SLO, the latter is not possible without the former. At a minimum, to develop and maintain SLO, **projects need to comply with the national laws and regulations**. This includes environmental, social, governance and other planning, licensing and permitting related requirements of the countries where they operate and, potentially, where the operating company is registered.

Although SLO is not a legal requirement, some of the activities necessary to achieve regulatory compliance – in particular, those related to stakeholder engagement – are similar to, or support, parts of the SLO process. In this respect, **legal requirements may imply a need to obtain SLO**, even if not this is not explicitly regulated. Companies proposing combined extraction projects should therefore consider how to **extend and build on the mandatory activities necessary to achieve legal compliance** in a way that helps to develop and maintain SLO. A good example is the stakeholder engagement which runs throughout a well planned and executed Environmental and Social Impact Assessment and interactions with stakeholders that inform routine environmental and social management activities.

Good governance by permitting and regulatory authorities contributes to mitigating the adverse impacts of combined extraction projects and can enhance the positive, economic, social and environmental outcomes of such projects, but it is not a given. In some jurisdictions outside the EU, laws and regulations may be absent, incomplete or poorly enforced, enabling a project to easily meet the legal requirements without addressing all, or sometimes any, of the concerns of affected stakeholders. In these cases, a legal licence to operate may hold little value for stakeholders that believe the licencing process is flawed. In other jurisdictions, stakeholder trust in government authorities and scientific experts may have been eroded or lost, undermining their belief that relevant standards will be defined and enforced at combined extraction projects. Consequently, legal compliance may mean little in terms of how a project is performing with respect to environmental and social issues. In such cases, legal compliance provides little or no support for SLO. Even in jurisdictions with strong laws and enforcement, such as the EU, a project is expected to do more than just meet the minimum legal standards to obtain and maintain SLO by addressing societal concerns around the social, economic, environmental and cultural impacts and sustainability of their activities. This is aligned with the broad observation that companies and projects focused on regulatory compliance seek to avoid penalties and legal consequences, while those **companies that are keen to go beyond compliance aim to achieve continuous improvement** and take a strategic approach to achieving long-term positive environmental and social change.

4.2 Do no harm

Exploitation of geothermal energy and the combined extraction of metals brings with it the potential for environmental impacts, although there are strong arguments that these can be less significant than those arising from other energy generation or mining operations. These potential impacts are typically associated with land use, emissions, waste generation and disposal and related changes in the natural and social environments, all of which are common to many types of industrial operations. It is therefore important that negative impacts are avoided whenever possible or otherwise minimised through appropriate project design and management of a project's construction, operation and closure activities. At the very least, obtaining and maintaining SLO should be underpinned by legal compliance (see Section 4.1) and the implementation of appropriate measures **to protect health, safety, the environment and internationally recognised human rights**. In simple terms, these collectively equate to the concept of 'do no harm'. The protection of health, safety, the environment and human rights is closely linked to whether a project is considered to be operating ethically.

What constitutes protecting health, safety, the environment and human rights may vary according to the nature of the project and its stakeholders, for example:

- Some stakeholders may be focused **on mainstream issues** such ensuring there are no adverse changes to water quality and minimal impacts on land, soil and air resources and that there are no adverse impacts on the livelihoods of local people.

- Others may be concerned by **less obvious – but no less important – issues**, such as the movement of equipment and people to and from a site and the impact on the safety of other road users.
- Some stakeholders may be concerned that metal extraction introduces the **use of chemicals** that are not required for pure geothermal projects.

To do no harm, a project must therefore understand both the risks and negative impacts associated with its activities and stakeholder perceptions.

4.3 Employ engagement experts early

Obtaining and maintaining **SLO requires engagement with local communities and other stakeholders throughout the lifecycle of a project**, ideally from early planning and design stages through to eventual closure and rehabilitation. To deliver the best outcomes, SLO needs to be integrated with – and influence the design of – a project, avoiding problems before they begin. To be effective and sustainable, SLO cannot just be a tool for managing communities and public opinion but should help to drive positive change and reduce risks and adverse impacts. Meaningful two-way dialogue is essential.

Some engagement may be mandated by local laws and regulation, but to obtain effective SLO, it is likely the level of effort will need to exceed what is required for legal compliance. A project therefore needs to have the **right people in place at the earliest opportunity**, with the necessary skillsets to develop and implement engagement plans and proactively manage the process of obtaining SLO.

This can be a challenge, as **engagement experts may be required well before the feasibility of a project has been established**. In the early stages of project development, even though SLO is ultimately as important for overall project viability as being able to demonstrate technical and economic viability, the proponent may be hesitant to divert significant funds from technical and economic studies. Most project staff are typically focused on highly technical and scientific topics and even if they recognise the importance of communicating these topics to stakeholders in a form that can be understood, technical staff are unlikely to be experts in SLO. Diverting technical staff away from their tasks to deal with SLO-related work also has negative cost implications.

Given that local communities and other stakeholders may wish to contribute their views and perspectives on the most fundamental aspects of a project, such as site screening and selection, **early community and stakeholder engagement will support obtaining and maintaining SLO**. Consequently, a project must build its own (internal) capacity and ensure that from the earliest possible stage, engagement experts, ideally with local knowledge and existing community connections, are identified and employed. Using a locally based community engagement expert provides local knowledge and experience and reduces the research needed to identify local stakeholders.

4.4 Understand a project's context

A project often actively analyses risk and potential negative impacts associated with its activities. This is part of the business planning process and can also be driven by legal requirements, such as the need to complete an environmental and social impact assessment as part of the approval process for a planned project. The risk and context analysis derived from impact assessments and other company activities can inform the SLO process. Similarly, information from the SLO process can inform and potentially change an impact assessment through, for example, enhanced understanding of the local context and stakeholder concerns and the mitigation measures likely to be required to address such concerns.

Understanding the specific social / cultural, historical, political, economic and environmental context in the area hosting a project is central to obtaining and maintaining SLO, as the concerns and view of local communities and other stakeholders are potentially informed by all these factors, for example:

- Social / cultural – the habits, traditions, beliefs and interactions of local communities.
- Historical – the history of the area and how it has developed over time.
- Political – local government attitudes and approach to industrial developments.
- Economic – the state of the local economy, employment levels and investment.
- Environmental – the presence or absence of area considered sensitive.

In particular, a project must be able to see the area as it currently exists through the eyes of local people and position the positive and negative changes the project will cause in that context – in effect, recognising the importance of site-specific variations in risks and risk perception. This means understanding what affected communities and stakeholders value, which in turn helps to understand how they may perceive risks, negative impacts and beneficial opportunities related to development of a project.

4.5 Identify and engage stakeholders

In the context of a combined extraction project, stakeholders can be defined broadly as individuals, groups or institutions that have a direct or indirect interest in, and can impact or be affected by, a project.

The approach to identifying and engaging stakeholders should be as inclusive as possible. Everyone should be able to have their opinions and concerns heard by a project. This should include disadvantaged or marginalised groups[6] that may not otherwise readily engage.

In broad terms, **stakeholder engagement is an inclusive and iterative process** based on the identification and analysis of stakeholders, the two-way exchange of information, a grievance mechanism through which concerns and complaints can be raised, and consultation, all of which support the development of a positive and robust relationship between a project and its stakeholders.

Inclusivity is about more than who is asked to engage – it is about how they are engaged and ensuring they can provide input that accurately reflects their questions, ideas, concerns and views. This helps them to be actively engaged rather than playing a more passive role. Inclusivity also means not only listening to the stakeholders with the loudest voices and strongest opinions. It can require a project to find ways to work with or around those acting as gatekeepers who may control access to the full range of opinions that typically exist in a community.

There are, of course, some stakeholders that choose not to engage for a wide range of reasons, but the option should be there for all. This can be time consuming and represent a significant ongoing commitment of staff and resources by a project to manage engagement effectively. **Employing engagement experts (who understand the local dynamics) is likely to make stakeholder identification and engagement more efficient and effective**.

Projects should seek to achieve effective stakeholder engagement by proactively planning for the management and engagement of stakeholders at inception, with a long-term view of maintaining

[6] Depending on the cultural, socio-economic and political context, these groups may include those with limited formal education, women, the elderly, persons with disability, youth and minorities.

relationships, and enjoying long term operational success that has the full buy-in of the relevant stakeholders.

Done well, engagement gives stakeholders a voice in the decision making and approval processes. However, done badly, engagement can be, or be seen as, a form of manipulation by a project, leading to stakeholders being involved without a voice or allowed a voice without influence. Therefore, **stakeholder engagement must give participants the genuine capacity to engage, contribute, and where appropriate, shape decisions and outcomes**.

4.6 Communicate honestly and transparently

Communities and stakeholders want – and expect – projects to be honest and transparent about what they are doing and why, the likely risks, negative impacts and benefits, making information and data available and accessible on a consistent, ongoing and frequent basis. Where this is not possible (for example, commercially sensitive information) it should be made clear why information is being withheld to avoid concerns that a project is 'hiding' something. **The absence of information limits the capacity of stakeholders to understand and engage with a project**. It also creates space for rumours and misunderstandings to begin and spread.

A project should also be clear about what it does not know and what steps it plans to take to address such knowledge gaps. Every project has the challenge of dealing with uncertainty, but if a project is transparent about what the uncertainties are, the public is more likely to have more confidence in it. An open, honest and transparent approach also helps a project to manage the good and bad expectations of local communities and other stakeholders. It also ensures there is good alignment between the risks and impacts identified by a project and those perceived by local communities and other stakeholders, limiting the space for unfounded theories to grow and spread.

SLO can help to reduce the risks of unfounded public criticism and social conflicts, protecting private sector investment in industrial projects and supporting positive relationships between a project and its local stakeholders based on transparency, trust and inclusiveness. However, obtaining SLO is not and cannot be a means of deflecting warranted criticism or undermining concerns and issues about environmental or social performance raised by local stakeholders. Owning mistakes and being honest and transparent about performance shortfalls and identifying ways to correct these are in fact integral elements in a company maintaining SLO its project, given that every project will at one time or another face an unexpected impact or issue that it needs to rectify. There is evidence that trying to manage SLO to the benefit of the project and not the community is likely to result in a worse outcome than not engaging at all.

SLO is an expression of, and therefore closely linked to, trust, legitimacy and credibility, factors which are more easily lost than built. The highest level of SLO requires full trust between a project and its stakeholders, dissolving the 'us and them' boundary, allowing a project in effect to become a part of the community, while community members actively defend the project against outside criticism, moving SLO from acceptance (signifying tolerance of the project) to approval and collaboration (signifying active support from stakeholders). Conversely, if a project is not considered credible or legitimate in some way, SLO may be eroded, withdrawn or withheld.

4.7 Understand stakeholder concerns and views

Stakeholder concerns and views can vary according to a wide range of socio-cultural, environmental, economic and other factors. Consequently, stakeholder groups encompass a diversity of concerns and views, strongly or weakly held, for or against a project or with a generally neutral outlook. **This spectrum is not fixed and can vary over time as a project evolves**, in

response to perceived or actual events, risks and impacts or through the receipt of new information and opinions from a very wide range of credible and less credible sources.

It is essential that a project understands stakeholder concerns and views and how these differ from its own analysis of risks, negative impacts, opportunities and benefits. There must also be a **grievance mechanism through which local communities and other stakeholders can register concerns with a project** in writing, verbally (face-to-face or by phone), by email or via a contact form on the project website. The grievance mechanism should include a formal process setting out how concerns are documented and resolved quickly, effectively and transparently. The option should exist for local communities and other stakeholders to raise concerns anonymously.

The science or reality of risks and impacts and perception of risks and impacts can be quite different. Stakeholders' concerns and views are often influenced by their perception of risk rather than actual risk, by their belief that they hold the moral high ground or by a reluctance to accept new information that does not align with their current world view. This can be an issue if it leads to a project misdirecting resources to activities that have little or no impact on the actual risk (although this can nevertheless help to build trust with stakeholders) or if a project is perceived as not taking risks seriously. A project will need to consider risks and negative impacts from what might occur from a technical perspective and what might be considered as likely by local communities and stakeholders.

The idea that closing the knowledge gap that exists between stakeholders and the experts ultimately allows stakeholders and experts to hold a collective understanding of risks and impacts has been discredited, and knowledge is no longer considered the only factor influencing stakeholder perception of risk. **A project should dig deeper to understand stakeholders' concerns and views and not expect the provision of comprehensive information to be sufficient.**

Limited understanding amongst many stakeholders of how mining, minerals and metals support modern life and the potential role of geothermal energy in the move away from fossil fuels makes it more difficult to counter potential concerns about why combined extraction projects may be justified. Equally, some stakeholders may be comfortable with broader concepts such as renewable energy technologies and the need for related critical raw materials so long as such developments are not in their area and somewhere else instead. This 'Not in My Backyard' (NIMBY) issue can give rise to significant delays for planned projects. One other aspect to consider is that stakeholders may consider industrial heritage, such as signs of past mining, to be 'part of the landscape', while still being resistant to the idea of new combined extraction projects.

A totally shared vision may not always be possible, but the aim is to ensure stakeholders are consulted partners in problem solving, rather than taking the role of anti-project protestors hoping to delay or prevent a project progressing. While understanding does not always mean accommodating or agreeing, stakeholder engagement should result in an understanding of each stakeholder's concerns and views. Nevertheless, a **project has an obligation to attempt to correct misconceptions and misinterpretations** as part of its risk management process, noting that strong opinions about risks and negative impacts, once embedded in a particular social and cultural context, can be very difficult to change even when clear contrary evidence exists.

5 Potential approaches to obtaining and maintaining social licence to operate

5.1 Overview

An example of the process that can be followed to obtain and maintain SLO is shown in Figure 4, with the individual steps explored in more detail in subsequent sections. Although shown as a sequential process, a project may begin multiple activities at the same time and undertake these in parallel rather than sequentially. Depending on the project's position in its lifecycle and previous activities undertaken, the starting point may not be at the beginning of the example process sequence shown in Figure 4.

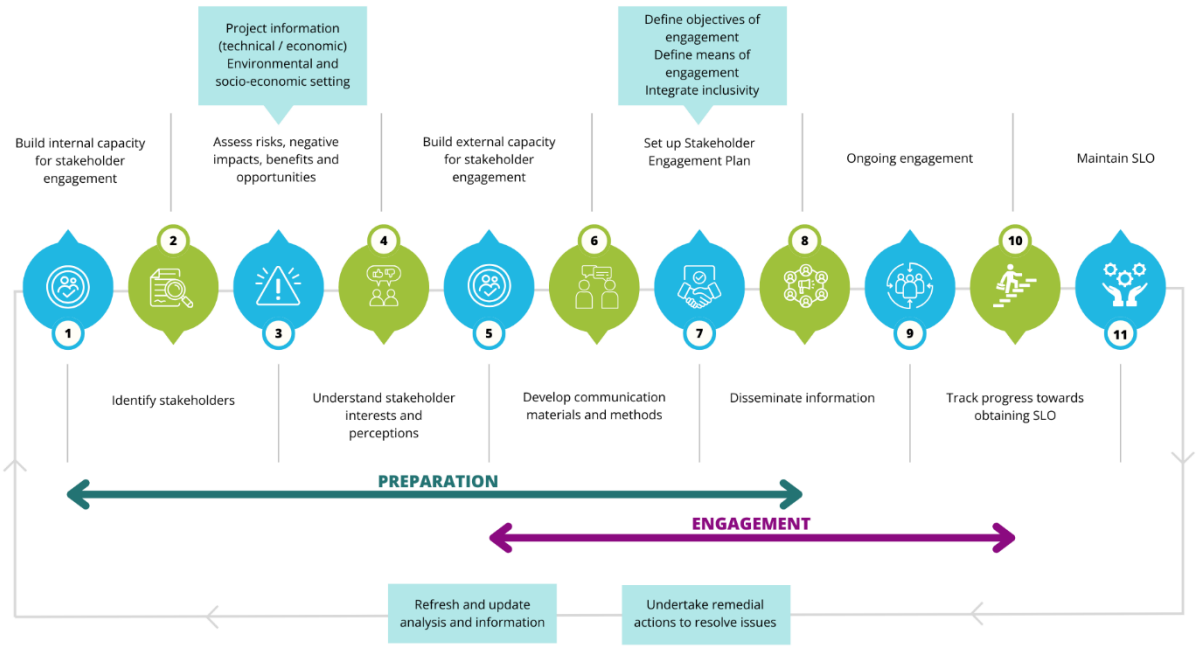


Figure 4 Overview of obtaining and maintaining SLO

5.2 Preparation – getting ready

Identifying stakeholders

Stakeholder identification and analysis are key to minimising risk and to the delivery of a project's long-term sustainability. Stakeholder mapping and engagement should not be delayed or put to one side while a project's technical and economic challenges are resolved because the absence of SLO can undermine and ultimately undo a project's prospects of being constructed and operated successfully, eroding profitability. Thus, **stakeholder engagement should be an integral part of the business plan and business risk management of any kind of extractive project**.

Stakeholder mapping is well supported by a range of tools, including those developed for extractive projects, including *the OECD Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector*, the *ICMM Stakeholder Research Toolkit* and the IFC's *A Strategic Approach to Early Stakeholder Engagement: Good Practice Handbook for Junior Companies in the Extractive Industries*.

A project should undertake studies to map and understand the social structure, issues and vision of the various individuals, groups and organisations in the community or communities it may affect. Key questions to consider include:

- Are the stakeholders all within a well-defined geographic area (close to the project site) or more spread out (along access routes to the site)?
- Do particular stakeholder types warrant greater status? If so, how will other stakeholders react to this unequal apportioning of importance?
- Which individuals, groups and organisations in the community need to accept or approve of a project before SLO is obtained? How can this be validated if other stakeholders have a negative view of a project?
- Do all the stakeholders speak the same dialect or language?

A single person can fit into several stakeholder groups and their perception, opinion and concerns may not always be the same, varying over time and according to the context. For example, permanent residents of local communities are likely to include the typical person in the street, formal or informal interest groups, and individuals who represent the community in local government institutions and people that may be employed during project development or operation. Every combined extraction project has specific stakeholders depending on its operational circumstances and the site-specific context. However, projects should consider the following groups when developing an engagement strategy.

- Immediate neighbours <0.5 km from a project's boundary.
- Local neighbours 0.5-5 km from a project's boundary.
- General community >5 km from a project's boundary[7].
- Community-based organisations, especially environmental groups.
- Resident full-time and part-time workers, unemployed and retired.
- Transient and temporary populations, including student, second homeowners, tourists and visitors.
- Landowners and organisations representing other land-users, including agriculture and tourism.
- Property owners and rental agencies.
- Shopkeeper associations.
- Disability groups.
- Hospitality.
- Work commuters.
- Platforms and outlets that may amplify the opinions of any stakeholder, including media such as local and remote, TV and radio, print and online social media platforms, including local and non-local influencers.
- Charitable organisations.
- Schools and academic institutions such as colleges, universities and related, including staff and students and related unions.
- Community hubs, such as libraries.
- NGOs.
- Faith organisations.
- Youth organisations, including sport, drop-in and social groups.
- Investors.
- Local and non-local environmental groups, whether activist, neutral or supportive.
- Local political parties.

[7] The values of <0.5 km and >5 km as the threshold for immediate neighbours and general community respectively are provided as examples: a project should establish its own thresholds according to the nature of its operations, its location and layout relative to communities and other relevant local contextual factors.

- Local authorities, such as City Council, local Member of Parliament, Parish Council and equivalents.
- Regional and central government bodies, including regulators.
- Shareholders and investors.
- Service providers and goods suppliers.
- Company employees, including current and past employees, part time and full-time employees.
- Trade unions.
- Other geothermal and mining companies.
- Associations and initiatives representing or promoting other industrial sectors.
- Customers.
- Indigenous communities.

In the context of SLO, local communities are generally the most important stakeholder group, but it is important to note that communities are not homogenous and that those members with high visibility and strong pro- and anti- opinions may not necessarily be representative of the full range of concerns and views held by local people, many of whom may be part of a silent majority. It is also important to recognise that obtaining and maintaining SLO for a combined extraction project is rarely limited to just the interaction between a project and a local community; other stakeholders at national or even international scales alongside global economic, political and social trends can influence SLO at the local level.

In some settings, access to a local community may be through an elected or unelected representative who acts as a gatekeeper: an effective enabler or preventer of engagement activities. Positioned between a project and the local community, it is important that a project identifies these gatekeepers and finds ways to collaborate with them to ensure engagement is truly inclusive.

Some stakeholders may be discounted by other stakeholders but have significant influence that needs to be considered. For example, second-home owners may be not thought of as relevant stakeholders by local people that are permanently resident. However, second-home owners may have greater financial resources and social connections that ensure their voice carries a significant weight locally.

Identifying and assessing risks and negative impacts

To engage effectively with stakeholders, a project must have a **clear understanding of the risks and negative impacts associated with its activities** throughout its lifecycle, from exploration, through project development and construction, combined extraction (operation) and eventual site closure and rehabilitation. Often this is done through legally mandated environmental and social impact assessments, complementary risk assessments and related scientific and technical studies undertaken as part of the permitting process or to meet the expectations of potential investors. However, the scope and quality of the assessments required by some regulators and investors may be limited and **comprehensively identifying and assessing risks and negative impacts may mean going beyond legal compliance** and exceeding investor expectations.

SLO for combined extraction projects may require building confidence, familiarity, and trust in environmentally friendly but unproven or unfamiliar technologies. Factors such as perceived impacts, governance, legitimacy and fairness also play a role in acceptance.

A project should consider how its activities might lead to risks and negative impacts. Depending on the lifecycle stage and the nature of a project, activities might include:

- Exploration – desktop studies, field mapping and sampling, ground-based drilling and seismic surveys and airborne surveys.
- Design, construction and commissioning – site selection, site preparation, well preparation, plant construction and equipment installation, commissioning and production ramp-up.
- Operation – combined extraction of geothermal energy and CRMs.
- Closure and rehabilitation – decommissioning, demolition, remediation, rehabilitation and restoration of affected areas.

Transport of equipment, goods, products and people to and from a project are typically required throughout the lifecycle (potentially peaking during the construction phase) and may give rise to a range of risks and negative impacts:

- Light- and heavy-duty vehicles moving to and from a project site can increase the volume of traffic on existing roads increasing associated noise, vibration and emissions, wear-and-tear on the road surface and making accidents involving vehicles and other users of the road and adjacent pedestrian areas more likely.
- Where roads are upgraded to enable adequate access to a project site, the volume of traffic and average traffic speed may both rise, with similar risks and impacts to those resulting from increased traffic on existing roads. Upgraded roads can continue to have negative impacts beyond the life of a project.
- In previously inaccessible areas, the construction of new roads to access a project site can open up a much wider area to negative impacts through land clearance and development and the establishment of new formal or informal settlements. This may be more relevant in some regions and countries outside the EU, where limitations in legal controls and enforcement capacity can lead to unmanaged development. New roads may also be used by pedestrians where separate walkways do not exist, increasing the risk of accidents and injuries resulting from collisions between vehicles and pedestrians. As for upgraded roads, new roads can change traffic flow patterns, which can have negative impacts alongside the benefits a better road network can bring beyond the life of a project.
- As well as being sources of noise, vibration and emissions, vehicles can serve to transfer invasive plant and animal species from one area to another, particularly during construction when earthmoving equipment and other heavy-duty vehicles may be transferred between distant locations and environments.

In addition, a project will generate waste throughout its lifecycle, although the volume and nature of the wastes vary considerably.

- Drilling wastes are, generally, limited in volume and largely non-hazardous or inert, unless contaminated by drilling fluids.
- Larger volumes of waste may be produced during construction, but these are often dominated by earthmoving materials (inert soils and subsoils) or inert construction materials and packaging that can be readily recycled (metals, wood, plastics).
- The volume and nature of wastes generated during commissioning and operation depend on the chemistry of the geothermal reservoir being exploited and the technologies used to recover geothermal energy and CRMs. In some cases, wastes may contain small amounts of naturally occurring heavy metals or radioactive material, which require specific management and disposal. At the other extreme, some extraction technologies may generate little or no waste that cannot be re-used or recycled, limiting the need for onsite or offsite disposal and risks and impacts associated with waste disposal facilities.

While it is not possible or useful for these Guidelines to attempt to define every possible risk and impact that might exist in every context, in broad terms, the risks and negative impacts that a combined extraction project should investigate and assess relate to:

- Reduced availability and quality of surface water and groundwater resources, including cross-contamination of aquifers through physical connection after drilling.
- Reduced air quality, including dust, gaseous emissions and odours.
- Land clearance, particularly during exploration and construction.
- Degraded land and soil quality.
- Increased road traffic and inward / outward vehicle movements.
- Increased noise and vibration.
- Loss, disturbance and fragmentation of biodiversity resources and ecosystems.
- Visual and landscape changes, including light pollution.
- Induced seismic activity (the triggering of earth tremors).
- Subsidence and uplift of land.
- Damaged buildings and cultural assets.
- Reduced human health and wellbeing.
- Restricted natural resource access and use.
- Decreased livelihood options.
- Cumulative impacts, considering other developments in surrounding area.

Many of these risks and impacts should be eliminated or minimised if standard mitigation measures are implemented in accordance with robust legal requirements and permits. Nevertheless, a project should be prepared to answer questions or to provide information about how these risks and impacts are being managed as part of its stakeholder engagement activities.

The risks and negative impacts noted above are common to many types of development, not just combined extraction projects, and are likely to be included in the list of concerns local communities and other stakeholders may have. If communities consider the combination of geothermal energy with the recovery of CRMs to be 'riskier' than geothermal energy alone, this may generate more interest in local risks and negative impacts. Therefore, a combined extraction project needs to have a detailed understanding of whether and how these risks and impacts may occur as a result of its specific activities, what the likely receptors are and how risks and impacts will be avoided or mitigated. **A project should aim to apply the mitigation hierarchy**, where prevention is preferred to mitigation, which in turn is preferred to compensation, and be able to demonstrate and communicate this is the case to local communities and other stakeholders as early as possible in the project lifecycle.

It is likely a project with more significant negative impacts will find it harder to obtain and maintain SLO. However, unlike many other types of extractive operations, the risks and actual impacts from combined extraction projects may be relatively contained. Once the plant has been built, there will be little change to the surface footprint of the operation, and it is likely that processes will take place in closed circuits that limit emissions and releases under normal operating conditions.

Once the risks and negative impacts have been defined, a project must plan and implement measures to avoid, mitigate or compensate these, so that residual risks and impacts are reduced to an acceptable level. This is often an iterative process undertaken in conjunction with inputs from regulators and other stakeholders. It is important to give advance warning to local people when specific negative impacts such as noise from drilling may occur, along with the details of mitigation measures that will be implemented to reduce the impact, such as using noise baffles to reduce the transmission of noise beyond the immediate vicinity of the drilling rig.

Being able to demonstrate that risks and negative impacts are being effectively managed is an important part of obtaining and maintaining SLO. Sometimes, a project may be able to improve further its ability to avoid risks and negative impacts, but to do so would be at a cost that undermines a project's economic viability. In such cases, a project must be able to communicate the trade-off between economic and environmental optimisation and how it will ensure risks and negative impacts that cannot be avoided will be effectively mitigated.

Uncertainty may exist in expert analysis of risks. While a community may expect two experts with similar backgrounds and knowledge to draw the same conclusions about risks and the likelihood of negative impacts, the reality is that even when looking at the same data, two experts can arrive at different answers. This is because there are always gaps in scientific data – when these gaps are large enough, they create the space for different interpretations. This is important because the extent of the gap between expert scientific opinions and community perceptions may be unclear if the expert opinion itself covers a range of scenarios.

There can be a diversity of viewpoints amongst scientists, reflecting varying levels of uncertainty. This is uncomfortable for stakeholders who would prefer certainty and a concrete scientific answer: in this context, stakeholders often just want confirmation that a risk does not exist. More realistic is that risk and impact assessments can describe the likely costs and benefits of a project or facility and define the measures that must be implemented to ensure less likely but more problematic scenarios do not occur.

Tangible impacts may occur or be considered to have occurred by stakeholders. Perception is important in how local communities and other stakeholders interpret the nature and likelihood of impacts, which may be quite different to what a project considers to be its principal risks and negative impacts. Detailed studies, ideally completed by independent experts, are necessary to help close potential gaps between the nature of perceived and actual risks and impacts.

Independent experts commissioned to undertake risk and impact-related studies, and to help the company develop management plans to avoid or reduce the risks and impacts identified, are typically paid for by the company. For many stakeholders, this naturally immediately raises the question of the experts' objectivity and legitimacy, undermining the value of these studies in terms of achieving a common understanding with local stakeholders on risks and negative impacts. In turn this creates space for trust issues and opposition to a project to grow. **One way to address this is to have a project provide funds for experts appointed by the stakeholders. Alternative approaches could include a project using an intermediary (which in some jurisdictions could be the regulator) to organise studies and review the results independently**, but ultimately the funding will normally be provided by a project, whatever the pathway chosen.

Defining benefits and opportunities

While the real or perceived negative aspects of a project are the principal challenge in obtaining and maintaining SLO, a project's benefits should not be overlooked. The effective communication and awareness building of the benefits a project can deliver to stakeholders (from local to global) may generate greater acceptance amongst local communities and balance the risks and negative impacts. However, it is important to consider the likelihood that a project is delivering a global good will carry less weight with local communities than benefits that accrue locally. A project should engage with communities (see Section 5.3) to ensure it understands what local people, businesses and organisations define as benefits and opportunities and ensure these are considered in its future commitments.

A project should be clear about how it can add value in surrounding communities and not just further along the supply chain, which can be geographically remote from the area hosting the combined extraction project.

In defining and communicating benefits, it is important to not over-commit or raise expectations beyond what a project can realistically deliver. For example, if benefits will arise for a specific period rather than the entire life of a project, this should be clearly understood by local communities and other stakeholders. If the number of direct or indirect jobs a project can generate is limited, this should be clearly communicated to local communities and other stakeholders.

Commitments made by a project must be achievable, as failure to deliver on them is likely to result in the erosion or loss of trust amongst local communities and other stakeholders.

In the early days of project planning and design, it is better to underestimate the likely benefits and opportunities that a project can deliver. These can always be expanded and described in greater detail as the nature of a project is more clearly defined – this is more easily done than having to downgrade previous forecasts of benefits.

Benefits and opportunities to consider include:

- **Local direct and indirect employment and contributions to the local economy:** this benefit may require some early investment by a project to develop general or specific training programmes for local people, potentially in collaboration with local educational institutions and other existing or planned industrial projects, to improve access to well-paid jobs at a project or local service providers and contractors.
- **Encouraging other companies into the area:** as an additional form of job creation.
- **Local sourcing of goods and services:** this is good practice and can be viewed as a compensatory measure for addressing residual adverse impacts that cannot be designed out of a project. This can help to generate indirect job creation and demonstrate a project is injecting money into the community.
- **Local and regional heat planning and provision:** this could, for example, crosscut contributions to the local economy through the development of business opportunities in a project vicinity that can benefit from the use of waste heat, such as for wine and beer production and small-scale greenhouse agriculture.
- **Supporting renewable energy and decarbonisation:** the combination of CRM and geothermal energy extraction may not only reduce the need for traditional mining and its associated environmental, social and societal impacts, but also improve the economics of geothermal projects that would previously have not been viable. Combined extraction project may also lower capital and operating costs than some other types of renewable energy, with lower land use requirements and visual impacts. In this way, combined extraction projects can be seen as contributing to increased provision of renewable energy and decarbonisation through the production of essential CRMs and increased geothermal energy production.
- **Reduced environmental, social and societal impacts relative to conventional mining:** in general terms, combined extraction projects are likely to have less impacts than conventional metal mining producing the same tonnage of metal, as the land clearance, infrastructure development, size and visibility of operational facilities, associated road traffic and waste generation will be significantly lower. It may be a useful exercise for a project to benchmark itself against conventional mines and compare its land requirement, energy consumption, carbon footprint, waste generation and so on per unit of production.

Building internal capacity for stakeholder engagement

The need to invest in activities to support SLO at an early stage typically coincides with the period of lowest project revenue and 'spare' cash, meaning a project may have limited human and financial resources to focus on SLO. To increase the resources available, a project should discuss SLO requirements with investors as part of mainstream operational costs, or as part of wider environmental, social and governance management activities.

Engagement should be planned as a continuous process throughout a project's lifecycle to ensure stakeholders have access to relevant information and are given the opportunity to participate effectively. A project's engagement activities should therefore run alongside, rather than be isolated from, evolving exploration / exploitation activities. This can be managed, ideally, by employing engagement experts at this early stage in a project's life. If this is not possible, an alternative way to increase internal capacity is to nominate and train company 'ambassadors' so they can play a role as consistent and accessible points of contact for local communities. More widely, any project department and job function that is likely to interact with stakeholders as part of its work could also be trained on stakeholder engagement, integrating good practice with day-to-day activities

It may be useful for a project to develop a 'frequently asked questions' document (FAQ), that compiles the questions expected and received from communities and other stakeholders, with a set of clear factual answers. This helps to ensure all project staff are providing consistent information to address the questions and concerns of community members and other interested stakeholders. The FAQ can be updated to reflect new questions received and when new information becomes available. To complement written answers a project may also consider a video equivalent using graphics as appropriate to respond to specific questions and concerns, which can be shared via the project website or social media.

Example questions include:

- How much energy will the project generate relative to how much it consumes?
- Would the extraction of geothermal energy be viable without the recovery of CRMs?
- What happens if there are radioactive minerals in the rock?
- Will the water pumped from underground be radioactive or contain toxic metals and chemicals?
- What will happen to the pumped water afterwards?
- Will the methods used to recover CRMs pollute groundwater?
- What is the likelihood that the project will trigger local earth tremors and how big will these be?
- What waste will be generated and where will it go?
- What will the CRMs be used for and what impacts and benefits arise from this use?
- Why is domestic production of CRMs necessary – why can't they be purchased from abroad instead?

For each question, a project should have a suitable response that either answers the question directly or explains what studies it can undertake to answer the question and manage the issue raised.

A project should ensure sufficient budget is available to deliver planned community engagement activities. It is critical that commitments made to communities in this respect are followed through and completed, to build trust.

Where the budget for community engagement is limited, a project will need to prioritise the activities that are most important from the perspective of communities and not just the project. A

project can use different categories to decide which activities are most important – for example, essential, time-bound (urgent), non-urgent, non-essential. The categories and the activities considered to fall within each should be tested with communities at community conversation events, or through questionnaires, as they may have an alternative view on priority activities.

Understanding stakeholder interests and perceptions

Beyond knowing whether someone is a local resident or other type of affected / interested stakeholder, it is also important to think about what they value in terms of local identity and culture, trust towards industry, the government and scientific experts, financial security and livelihoods, environmental protection and the role of renewable energy and CRMs in the future of a community and society as a whole. A project must not assume it knows best when working with local communities and must take its lead from what people have to say.

Addressing and resolving issues and concerns raised by stakeholders are central to establishing (and maintaining) SLO. This is underpinned by first understanding what those issues and concerns are likely to be, noting that these are not necessarily fixed and may develop and change as a project proceeds, in response to external events or as the attention of potential influencers ebbs and flows.

The nature of stakeholders affected by or with an interest in a project and the project's likely risks, negative impacts, benefits and opportunities can collectively inform an initial review of stakeholder's anticipated concerns and views. This is a first iteration of what should be an ongoing process, to continually refine and update a project's understanding of stakeholder's concerns and views. The refined and updated understanding underpins effective engagement with local communities and other stakeholders and is therefore essential to obtaining and maintaining SLO.

Preliminary canvassing can be used to understand the general attitudes towards combined extraction and geothermal and mining in their own right amongst local communities and other stakeholders.

Many community members and other stakeholders may have little or no experience of formal risk assessment or processes to identify the likelihood of negative impacts occurring. This can create a mismatch between what a project considers to be likely risks and impacts and what communities believe, particularly if misinterpretations and misinformation[8] are amplified as they spread through a community. The mismatch can be aggravated by the absence of dialogue between a project and its stakeholders, which can breed suspicion and create space for misinformation to develop and spread. Some people do not believe what they say but have reasons for saying it. Some people are open to having their minds changed. Some people are neutral. Challenges abound in terms of teasing out fact from fiction and balancing the acknowledgment of valid concerns and refuting issues where the risk is extremely low or without scientific basis, all of which must be done without appearing to overrule peoples' concerns. Stakeholders' concerns that are partly, but not wholly, credible can be difficult to resolve, as mitigating the unfounded part of the concern is unlikely to make technical or economic sense, even if it contributes to building trust. In such cases, a project should work with stakeholders to arrive at a common understanding of what are credible risks and what are not (see Section 0). In the same vein, while every stakeholder has a right to raise concerns and discuss their views, it is still important for a project to actively manage misinformation, whether spread on purpose or not. To the extent possible, a project should

[8] Misinterpretation means the right information is provided, but misunderstood; misinformation is the wrong information provided unintentionally and false information is the wrong information provided deliberately according to a specific agenda.

anticipate such misinformation and act to address it immediately – allowing a knowledge and information gap to develop leaves space for misinformation to grow and spread. To this end, a project should communicate truthful information and avoid direct or indirect attempts to manipulate the audience. A project must find a way to control the narrative (nipping incorrect information in the bud) without subverting or overruling stakeholders' genuine concerns and opinions.

However, this does not imply that a project has exclusive ownership of the truth; even if it has followed scientific procedures to define the nature and significance of risks and adverse impacts. Parts of that process can still rely on subjective judgements. It is therefore important for a project to be honest and transparent about how it reached its conclusions, by, for example, stating the assumptions that have been made and the nature of subjective judgements. This can be made more difficult if the owner, operator or management of a project has been associated with any type of controversial project in the past, as that association may taint the reputation of the current project, irrespective of whether the projects have similarities or not.

The acceptance of combined geothermal-CRM projects depends on a range of factors. The comparison of benefits, risks and negative impacts by different stakeholder groups is not a simple arithmetic exercise (do the benefits outweigh the risks and negative impacts) but is influenced by perceptions, which may be right, wrong or somewhere in-between. It is possible for a small risk to assume an overwhelming position of importance, pushing the benefits to one side in the minds of many or all stakeholders, although at a strictly scientific level, the nature of the risk does not justify the assignment of such importance. Perceptions may apply to specific aspects of a project, for example, policies and strategies, management, activities, or the project as a whole.

Many factors can influence how local communities and other stakeholders perceive a project, including:

- Local norms and values.
- The local, regional and national political agenda
- Local, regional and national media coverage.
- Ongoing and recent past local social conflicts
- Past experience with other infrastructure projects.

Perceptions can also relate to the technology a project is using or intends to use and the extent to which stakeholders trust and understand this or similar technologies. The perception of the risks associated with a specific technology, parts of the project or the overall project can be influenced by:

- How uncertain the risks are.
- Whether stakeholders are familiar or unfamiliar with the risks.
- Whether the risks are well understood by science.
- Whether the outcome of the risks can be reversed.
- How complex or difficult to understand the risks are.
- How memorable the risks are.
- Whether the risks can be easily controlled.
- Whether exposure to the risks is within or outside the control of stakeholders.
- Whether the risks are natural or caused by humans.
- Whether the risks induce a feeling of 'dread'.
- Whether the risks are considered particularly catastrophic due to the size of the area affected or duration.
- Extent to which the risks particularly affect disadvantaged groups.
- Extent to which the risks affect or have implications for future generations.

- Whether the risks are balanced by associated benefits.
- Social class of the different individuals and groups that collectively comprise the stakeholders.
- Financial or other resources different individuals and groups have available to address the risks.
- Previous experience of the same or similar risks.
- Time spent living in a potentially impacted area.
- Degree of normalisation (familiarity arising from long-term acceptance of a similar or worse risk.
- Scope and trustworthiness of information received by individual or group related to the risk.

Perceptions can also be influenced by how well a project does at stakeholder engagement and whether this meets stakeholder expectations. **It is important to recognise that what is considered significant from a regulatory perspective may be substantially different to stakeholder perceptions**.

Some stakeholders may perceive parallels between a combined extraction project and traditional mining of the same CRMs a project will produce. In such cases, a project should clearly describe the differences and similarities in what it is doing or intends to do relative to traditional mining approaches. This should extend to describing how risks and negative impacts associated with a combined extraction project compare with those of a mining project.

Perceptions of benefits may be understated relative to how risks and negative impacts are perceived. However, the absence of perceived benefits will undermine and likely prevent the establishment of SLO as a project would appear to have only have downsides, unbalanced by benefits. A project does not have to rely only on the benefits that necessarily arise from its development and operation. **A project can also create mutual benefits to foster positive attitudes towards the development amongst stakeholders with the most direct control over SLO.** This may mean moving away from a focus on the national economic value of cleaner and renewable energy and the production of CRMs that underpin the transition to a low-carbon economy, and looking in more detail at the local value creation and economic benefits a project can deliver.

Example:

How a project will communicate risks and negative impacts related to increasing the permeability, water/heat flows, and reactive surfaces down-hole, which can require pumping fluids at high pressure into boreholes to open up fractures and pumping sand or other inert solids to hold the fractures open. This method is associated with the hydrocarbon industry, where it used to increase yield, often in combination with flow-improving surfactants. For some stakeholders, the triggering of seismic activity and the use of surfactants are significant concerns which they might raise for combined extraction projects. Demonstrating that surfactants are not used is likely to be easier than proving that seismic events from drilling and pumping will not be significant, as the perceived association with problematic activities such as fracking may be difficult and time consuming to untangle. A project will need to clearly communicate how its activities differ from those of fracking and other industrial activities that stakeholders are concerned about. Stakeholders may also be concerned that accepting a combined extraction project may open the way to fracking for shale oil and gas in the local area.

Building external capacity for stakeholder engagement

There are different kinds of capacity building to consider, which in broad terms can be divided into:

- The **capacity of local communities and other stakeholders to engage meaningfully in the long-term with a project** – this is fundamental to obtaining and maintaining SLO.
- The capacity of people in local communities to be employed directly or indirectly by a project through the development of necessary skills and knowledge by, for example, investing early in training programmes to improve opportunities for local people to be employed by the project.

The focus here is on enabling local communities and other stakeholders to engage with a project effectively. However, the importance of actions taken by a project to promote employment of local people should not be underestimated, as such employment can contribute to obtaining and maintaining SLO.

Capacity building with local communities and other stakeholders may mean helping them to **transition from awareness of combined extraction projects to a deeper knowledge and understanding**. Many stakeholders may start with little existing knowledge of, or interest in, geothermal, mining and CRM related information. The most likely to engage are those with views on a project, either for or against.

For local communities, **those who are most interested in and affected by a project should be able to effectively engage with a project** throughout the entire lifecycle, from pre-exploration to closure and rehabilitation.

Informed stakeholders need to generate the appetite and time to understand and support a project. Stakeholders with the ability to provide SLO must have sufficient correct information to ask questions and engage with a project. This process may include understanding the barriers to awareness about a project, and building the capacity amongst stakeholders to understand the project and its potential risks, benefits and negative impacts. This may require **actively addressing topics where the perceptions of local communities and other stakeholders are not aligned with a project's assessment of risk and negative impacts**.

5.3 Engaging effectively and obtaining social licence to operate

The basics of effective engagement

Objectives of engagement

Ultimately, **SLO is underpinned by fairness, cultural respect, good governance, accountability and trust**. It is essential to respect every member of local communities and other stakeholders whatever their concerns and views on a project. A project must spend time engaging and analysing people's concerns and views and provide tailored responses and advice. Opinions and facts may diverge, but the approach taken needs to be open-minded and inclusive to **avoid creating or exacerbating a "them and us" situation**.

SLO is context specific, hence the process required to obtain and maintain it will vary from one project to another, but will inevitably be linked to trust, legitimacy and credibility.

When a project engages with stakeholders, the objective should be to obtain and maintain SLO. Developing robust **collaborative relationships** produce the best chance for achieving this, enabling problems that arise to be worked out immediately and informally. A two-way dialogue

can be challenging for projects focused on technical aspects, with stakeholder engagement instead becoming a way of letting people see 'experts at work'. Therefore, effective and trusted communication can be a challenge and requires stakeholder concerns to be addressed not only at a technical level, but also considering the social and cultural context. The historical context of the area, the existing vision in terms of energy solutions, the political context, and the existing knowledge of geothermal energy can all influence how engagement should be planned and implemented. SLO relies on building trust and credibility with stakeholders. This requires **continuous, effective, and timely communication activities, meaningful dialogue, and ethical and responsible environmental and social behaviour**. Certain types of stakeholder engagement may be required as part of environmental and social impact assessments and permitting processes, establishing the means for a regular formal two-way discussion between a project and its stakeholders. However, the nature and extent of such mandated engagement – if required at all – varies widely in different countries. It is therefore unlikely that only carrying out mandated engagement will be sufficient to obtain and maintain SLO.

Setting up a Stakeholder Engagement Plan

A project has stakeholder engagement responsibilities throughout its lifecycle. To manage this process, a project should consider developing and implementing an end-to-end **Stakeholder Engagement Plan (SEP)**. The SEP should describe the strategies and steps that will be implemented to plan and implement stakeholder engagement, promote active stakeholder participation and define the timelines, methods and approaches, and types of information needed during the stakeholder engagement process throughout a project's lifecycle. The SEP can help to organise and promote continual and transparent communication with local communities and other stakeholders, focused on constructive two-way dialogue on environmental, social and other issues and between a project and its stakeholders.

As part of the SEP, **a project should have a grievance mechanism**, for receiving, reviewing, documenting and resolving concerns raised by local communities and other stakeholders.

Finally, while high quality stakeholder engagement and increased social acceptance are linked, if local communities and other stakeholders believe a project is poorly designed or that risks and negative impacts are not being managed properly, no amount of engagement can deliver social acceptance.

Creating a strong foundation

While there is no single stakeholder engagement approach that is universally applicable, given the broad range of project types and contexts in which projects operate, it is important that people feel valued as stakeholders and ensure project staff are:

- Letting people **talk without interruption** so they feel heard.
- **Providing information about decisions that have already been taken** and explaining why stakeholders were not engaged or involved in the decision-making process.
- **Contactable** during most times of day, with multiple options, which could include:
    - A 'contact us' form on the project's website.
    - A telephone number to speak to designated staff about general enquiries and questions during office hours. Ideally, the designated staff should remain the same so that a long-term relationship can be built with local communities and other stakeholders.
    - or that can provide certain basic information via pre-recorded messages outside of office hours.

    - A dedicated and well publicised telephone hotline to receive complaints and urgent concerns (as part of the grievance mechanism).
    - An email account that is frequently monitored by project staff.
    - A designated contact person to deal with enquiries from the media.
- **Responsive**, reacting positively and quickly with care when a question or concern is raised, with urgent concerns dealt with during or outside of normal working hours as appropriate. A project should check whether people are happy with how the question or concern has been addressed and identify further actions, as necessary.
- **Empowered to acknowledge mistakes and apologise where appropriate**.
- **Proactive**, reaching out and engaging with people rather than relying on them contacting the project, using a mix of in-person and remote communication options appropriate to different audiences.
- **Respectful**, treating each stakeholder as an important individual or group with concerns and views that should be heard.
- **Providing simple hospitality to stakeholders** (hot and cold drinks, savoury and sweet snacks) during face-to-face meetings and events, reflecting a level of care that is respectful and appropriate.

Whatever stakeholder engagement method is used, it should ensure the stakeholder can engage and contribute to a two-way discussion and exchanges of idea, concerns and viewpoints.

Inclusive engagement

Planned and opportunistic face-to-face and remote discussions with individuals or groups from local communities and other stakeholders are inevitably a major part of any stakeholder engagement process. Initially, all the stakeholder groups identified (see Section 0) should be included in the engagement process, although some may have little or no interest in engagement or may begin but then withdraw, for example due to other demands on their time or the feeling that they have sufficient information and understanding of a project. It is important to recognise that for people to attend a pre-arranged meeting relies on them receiving information about the meeting, being available at a set time and able to travel to the venue, hence only a small number may become actively engaged. To address this constraint and encourage local communities and other stakeholders to engage, a project should take an **inclusive approach** by, for example:

- Ensuring communication materials are **accessible** to everyone that might have an interest in them.
- Presenting ideas and information using **simple non-technical language**.
- Using **translators and interpreters** when necessary to eliminate language barriers.
- **Communicating widely** – as much as possible, to as many people as possible, as soon as possible.
- Reaching out directly to **disadvantaged and marginalised groups**.
- **Contacting and following up** with stakeholders after meetings and events rather than relying on them making further contact.

There are, however, limits to inclusivity when dealing with deliberately and persistently obstructive individuals and organisations. In some cases, a project's stakeholders may include groups with a strong negative opinion of combined extraction or, more generally, activities related to geothermal energy, mining and/or CRMs. Such groups may be unwilling to engage constructively with a project and less likely to reach a common understanding with the project of the risks, negative impacts, benefits and opportunities. Some stakeholders with strong negative opinions may also seek to

remain anonymous as individuals or groups, as they may consider this reduces the risk that a project can constrain their activities. While a project should ensure it understands their concerns and views, and seek to engage with them, in some cases it may need to focus its resources elsewhere and prioritise engagement with other stakeholders. This is not to say that strong negative opinions of a project are not important, or that they do not have significant implications for how a project is perceived by local communities and other stakeholders, but rather that working with wider stakeholders to develop trust and a common understanding of the project is a more realistic approach than trying to change the opinions of those with immovable views.

Means of engagement

The means of engagement should be fine-tuned so it meets the requirements of the stakeholders, as they may wish to engage in different ways, at different times and with a different frequency. Group discussions can support direct two-way communication, with the project team providing factual updates on progress and plans, and the community and other stakeholders raising issues of concern and suggesting ways to improve communication and information sharing. For a project with limited financial and human resources focused on stakeholder engagement, group discussions may be the preferred approach and this approach does have several benefits:

- Rapid and efficient method of sharing information and obtaining feedback.
- Flexible approach that helps to uncover concerns and views that people may be less willing to voice in one-to-one meetings.
- Typically, well-received in communities where group discussion is a natural form of communication.
- Applicable to a wide range of people and groups in different settings.

Undertaking discussions in groups does, however, have some potential drawbacks:

- Less detailed discussions and analysis are possible than with individuals.
- Some participants may be more reluctant to contribute in a group setting than a one-to-one interview or may simply follow the lead of more dominant participants.
- In some focus groups, dominant and aggressive participants may significantly influence the group discussion.

Group discussions should last for no longer than around 90 minutes and involve 6–8 people, as groups with more than 8 people may become difficult to effectively moderate and facilitate. People should be drawn from the local community and ideally come from a similar social or cultural group, as group discussion can be particularly successful where the participants are able to talk to each other about the topic of interest without fear of being judged by others thought to be superior or more expert. Ideally the members present during a group discussion should not be close associates to facilitate neutral relationships during the discussion. This may, however, become impossible as time passes and people become more familiar with one another at subsequent engagement events.

When using group discussion, project staff should ensure that everyone has the opportunity to contribute. This may mean **careful management of self-appointed 'experts'** who wish to dominate the conversation and **encouraging quiet and shy members of the group**.

Stakeholder engagement discussions should be documented accurately. Comprehensive verbatim records are not required, but particularly important comments should be captured. Recording of discussions is an option, but must be agreed with stakeholders before proceeding. Recordings can then be referred to during subsequent analysis of the meetings, eliminating the risk that notes do not accurately reflect the nature of discussions. Consensus on the discussed issues is not a

necessity; rather, discussion within the group should reveal a range of responses that help define the perceptions of participants and reveal the inconsistencies and variation that exist in a particular group or community. To the extent possible, project staff should check that individuals or groups are giving their true opinions rather than answers they think are expected. When appropriate, participants should be encouraged to talk to each other instead of project staff as individuals may choose to not provide an opinion to project staff but be more willing to share it with others in the group. The role of the staff in this case is to act as a facilitator for the discussion.

Developing communication materials and methods

5.3.1.1 Ensuring communication materials can be understood

Communication materials underpin stakeholder engagement and should give stakeholders a clear view of what a project will entail through its lifecycle, the risks, potential negative impacts, benefits and opportunities and how these can be managed. It is important to remember, however, that written material is not a substitute for ongoing stakeholder engagement and does not represent a standalone means of obtaining or maintaining SLO.

Materials developed by a project have to communicate complex information in a way that non-technical specialists with a wide range of backgrounds and experience can access and understand. Communication materials should be informed by, and respond to, stakeholder interests and perceptions (as described in Section 0). To maximise the benefit of communication materials, they should comprise a balanced mix of words, diagrams and pictures and their development should consider:

- Presenting information **stripped of jargon** and unnecessary technical details.
- Reflecting the key aspects in **clear non-technical language**.
- Breaking down text to a concise **bullet format**, using a small number of key words.
- **Using analogies** to compare project activities to things the stakeholders may know or understand in the local context, for example 'the noise will be as loud as a push-along lawnmower'.
- **Avoid false equivalence** – comparing apples to oranges – when trying to draw comparisons to explain a potential negative impact. If an impact is made up of multiple elements, find a comparison for each rather than ignoring some aspects (for example, drilling may create noise and vibration, so needs a comparison for both and not just the noise component).
- In **risk communication** avoid drawing comparisons, such as saying that people have accepted similar risks in the past.
- Translating information into **local languages** if necessary.
- Providing **clear graphics** to explain project processes in a way that is fun and visually appealing and likely to engage stakeholders.
- Using **3D models**, **fly-through animations** to show what the project will look like once constructed.
- **Avoiding overloaded communication materials** with too much confusing and complex information.
- Ensure the information being presented is **clear about what it can tell a stakeholder and what it cannot**.
- **Avoiding cherry picking from available facts** to support a specific point of view favoured by the project as stakeholders are likely to see through this quickly.

Simplifying and streamlining information should not be seen as dumbing down complex and technical concepts, but rather the stripping back of information to the key aspects that provide a

full and clear picture of all relevant aspects of a project. Providing graphics can help clarify the nature of a project for local communities and other stakeholders and give them a clearer understanding of what risks and negative impacts more or less likely to occur, as their mind's-eye perception of the project may be quite different to what will actually be built and operated.

Developing materials so they can be used in schools is a useful approach to ensuring communication is clear while providing the necessary context and information for non-expert stakeholders. If the audience contains people with specialist knowledge or experience relevant to geothermal energy or mining or an interest in a particular aspect of the process to extract energy or CRMs, a project should be prepared to respond to their questions with greater technical detail within the limitations of commercially sensitive information.

5.3.1.2 Contents of communication

It is important to **explain not just the 'what'** (how a project will be constructed and operated, the related risks, impacts and mitigation measures), **but also the 'why'** (the needs met and benefits and opportunities the project can deliver). Collectively, this can be presented as the justification for a project. For example, knowledge of CRMs, their importance and the reasons for promoting domestic production may be limited amongst many stakeholders, but such information is key to obtaining SLO. Consequently, a project should be able to describe its CRM production in the wider context of promoting domestic production and managing supply chain risks more effectively at a national level.

A project should explain clearly and simply why it has to be located where it is, what benefits and opportunities it will provide and describe the forecast risks and negative impacts, noting how risks and negative impacts that cannot be avoided will be managed effectively instead.

Clear information on what a project will entail is critical. A description of the project should be shared with local communities and other stakeholders, addressing at a minimum:

- The nature and location of extraction and injection wells.
- The siting and construction of the power-plant and the plant for the extraction of the metal value.
- The location of potentially sensitive receptors, such as communities, protected areas and cultural heritage sites.
- Storage areas for reactants and products.
- Management options for extractive and processing wastes.
- Inward and outward transport routes.
- The duration of operations.
- Plans for eventual closure and rehabilitation of affected areas[9].
- The benefits the project is expected to deliver locally and nationally.
- For operational projects, renewable energy, CRM production and greenhouse gas savings per set time period (day, week, month, year) as examples of the added value of the project.
- Project phases, explaining the current status of the project, what work is imminent, exactly what will be done in each subsequent phase and the duration of those activities with the highest risk of causing public complaints due to, for example, noise or periods of increased traffic during construction.

[9] While combined extraction projects may have a long lifetime, planning for closure should begin during the project design phase. Preliminary plans for closure and site rehabilitation should already be available by the time a project begins operating. This is because closure can occur unexpectedly and with little notice.

- A non-technical summary of the above, distilling complex project information and studies using language that a layperson can readily understand.

This information should be updated as frequently as necessary. In periods with intensive activities, such as drilling, it may be necessary to provide online updates of ongoing and planned work, via the project's website, on a daily or near-daily basis. This enables local people to have access to current information and to be alerted to imminent activities.

Complementing this, measures planned or implemented to avoid or mitigate risks and negative impacts and the monitoring methods to track the outcome of mitigation should be communicated to local communities and other stakeholders. The mitigation measures and monitoring may be simple and similar to those applied at many different types of industrial project, or specific to the nature and context of a combined extraction project.

Engaged stakeholders want to know about the licencing and permitting processes a project will be subject to. In some regions and countries, such as the EU, there are many laws and regulations that potentially limit the adverse impacts of geothermal energy and metal extraction, individually and as combined extraction projects. Generally, project development includes the permitting application procedures, as these are iterative with more detailed planning. At this point, the final environmental and social impact assessment is developed together with mitigation measures for any risks and negative impacts. The environmental and sustainability aspects are also informed by the impact assessment that is typically required as part of the permitting process. These, together with the site-specific risks, shape the narratives to address any SLO issues as part of addressing the societal and governance aspects.

It is therefore **important to summarise and communicate the licensing and permitting requirements** (including timing) to local communities and other stakeholder, as legal licences and permits represent a way of demonstrating checks and balances on a project. In many countries, licensing and permitting processes give stakeholders the opportunity to formally submit concerns and views to the project and regulators. However, the value of permits and licences in the view of some stakeholder groups may be limited if they consider geothermal and CRM related projects are being 'fast-tracked' through a streamlined regulatory process, driven by the need to reduce reliance on fossil fuels or import of energy and CRMs. In such cases, a project should **highlight how it will meet and – if necessary, exceed – legal requirements to effectively manage risks and negative impacts**.

Once communication materials have been developed, a substantial outreach effort will benefit engagement with local communities and other stakeholders. Awareness of a project can be improved through posters, leaflets, email invitations, social media posts, a dedicated project website, word-of-mouth and networking, particularly through existing local social and environmental organisations and local government, who may already have extensive stakeholder contacts.

5.3.1.3 Information outlets and dissemination

It is important to understand where local communities and stakeholders get project-related information. A **project's website** is an obvious starting point. Any **communication materials aimed at local communities and stakeholders should be easily accessible**, which generally means the information can be reached without requiring an excessive number of mouse clicks and is stored in a logical location. Clear web-based information is particularly useful for people that are unable to visit the project site or attend meetings in person. Although clear and concise information should be readily accessible on a project's website, there is also the opportunity to

provide more comprehensive reports and data for those that want to dig deeper into the details of the project.

However, even if a project's website contains accessible and clear information with options to dig deeper into the detail, it may be used by – or known to – only a small number of people from local communities. If that is the case, the website should not be relied on as a primary focus for communication efforts. Instead, a project must develop its understanding of where local people – by default or choice – obtain project-related information, which can include a wide range of alternative sources:

- Online and printed news.
- Local and national television and radio.
- Social media, including periodic blog posts.
- Friends and family.
- Work colleagues.
- Regulatory and other government sources.
- Non-project websites.

For some of these sources, there is only limited potential for a project to influence how it is portrayed. A project should discuss with local communities and other stakeholders **what media information would be most useful and relevant**, what are the preferred platforms and whether these are more trusted than 'formal' sources. Stakeholder engagement can be used to assess whether and how a project's social media accounts and other information outlets are having a positive or negative impact on the flow of information and perception of the combined extraction concept.

To complement the above outlets, a project can provide certain basic information via a dedicated phone number. For example, this could take the form of a regularly updated pre-recorded message with information about upcoming events such as meetings and presentations. The number used should be distinct from the hotline number provided as part of the grievance mechanism.

5.3.1.4 Site visits

Stakeholder engagement can include inviting the local community and other stakeholders to the project for discussions and site tours, familiarising them with current and planned activities and visiting local events to interact with attendees. Site visits can range from formal public events such as site visits and field trips for larger groups, through to more informal public 'drop-in' sessions for smaller groups or the invitation of specifically targeted audiences such as charities, environmental organisations, professional societies and social organisations. Large public events such as open days typically require the development of lots of visually engaging information such as posters and videos, while hosting a fieldtrip can be resource intensive. Smaller gatherings with targeted audiences are easier to arrange and can use presentations specific to the nature of the visiting group, which can range from general interest to a more technical focus on geological or engineering aspects.

Irrespective of the type or size of visit, including a question-and-answer session will normally be useful and improve the two-way communication between a project and its stakeholders. People attending public events and drop-in sessions are likely to disseminate newly learned information to friends, relatives and contacts, helping to spread factual information about a project.

5.3.1.5 Printed communication materials

To further expand the options for communications and increase the likelihood of intersecting directly with local communities and other stakeholders, a project should **consider a wider range of outreach opportunities**, including providing:

- **Fact sheets** – easy to design and keep up to date and can be used to provide facts and figures about the project in a compact form that can be delivered to homes and businesses and made available online.
- **Newsletters** – similar to fact sheets, but these should be provided to local communities and other stakeholders at set times as an ongoing series that shows how the project is making progress and how activities are changing from one phase to another. Newsletters should be issued even during quieter project periods when limited activities are taking place, as the absence of an update can give rise to speculation and increases the risk that misinformation will spread.
- **Fixed and mobile displays** – fixed visual displays with maps, diagrams and photographs can be set up in existing community hubs such as community centres, libraries and noticeboards, where there is likely to be significant footfall. Mobile equivalents can be used at venues where a permanent display may not be possible such as shopfronts, supermarket entrances and bars and at one-off or intermittent events where large numbers of local people are likely to attend, such as monthly or seasonal markets and fairs.

To the extent possible, text and graphics to be provided to local communities and other stakeholders should be tested for general comprehension before being distributed.

If a project has an office in the local community this can provide an easily accessible location for people to obtain fact sheets and newsletters, view a display about the project and ask questions or raise concerns directly with project staff.

Starting early

A project must manage the expectations of local communities and other stakeholders from the outset and throughout its lifecycle. Community expectations can relate to both the negative impacts of a project (where they may fear the worst) and the benefits a project may bring (where they may hope for the best). In both cases, it is important that expectations align with the reality. It is hard to realign stakeholder expectations once they have become unrealistic.

For projects that are at an early stage of the lifecycle, it is important to communicate to local communities and other stakeholders the risk that the project will not proceed, will take years to develop or that what ends up being built and operated may be quite different to the project as originally envisioned. Failure to meet overly optimistic expectations about employment and contributions to the local economy can disillusion those that are hoping a project will generate those benefits. Equally, those who are relying on a project failing to go beyond the design phase to address their concerns are likely to become more vocal and polarised opponents if the project does proceed to construction and operation.

The process of obtaining SLO should start before construction and operation of a project commences. Ideally, a project should engage proactively with communities and other stakeholders to **understand concerns early in the project design phase** as it is easier to earn their trust by being inclusive, engaged and open from the outset, not after key aspects of a project are already ‘carved in stone’. This requires the nature, scale and timing of risks and adverse impacts to be communicated in an open and accessible fashion. In this way, gaps between how a project and communities perceive risks and adverse impacts can be defined at an early stage and addressed through the provision of communication materials and ongoing stakeholder engagement to

ultimately arrive at a common understanding. This can be aided by setting up a community liaison group at an early stage in a project's life, with members including the project team, people from local communities and other stakeholders, which may include representatives from local government if this is likely to strengthen discussions.

The community should feel it can influence development of a project in a meaningful and tangible way that can help to address and resolve concerns and issues. This is more difficult to accomplish if a project is already well advanced. This does not, however, mean that an operating project should not seek SLO – it is never too late to obtain SLO – but integrating the process from the outset is more efficient and straightforward.

The exploration phase is often the first moment a potential project comes into contact with the local population. At this point, the technical details of a project are unknown. Even the likelihood of a project happening is uncertain at this early stage. Nevertheless, meaningful and truthful engagement is essential to manage the expectations of local communities and other stakeholders and laying a solid foundation for obtaining and then maintaining SLO. The exploration crew, therefore, needs to be trained to interact openly and meaningfully with stakeholders, despite the lack of concrete project-related information, to prepare the ground for a relationship built on trust. Alternatively, field staff (including contractors) can be given business cards with details of the project engagement team, which can be handed out to people enquiring about the project. This can help field staff avoid being drawn into detailed conversations which may include questions they are unable to answer.

Interactions with local communities and other stakeholders should continue from the exploration phase, as stakeholder concerns may influence the design and mode of operation of the project.

Prioritising engagement

Given that a project generally has limited human and financial resources it can call on, particularly at an early stage such as exploration, **engagement with stakeholders needs to be prioritised**. This should not mean that some stakeholder groups are not engaged because they are considered unimportant, but it may mean that engagement with some groups is done at a later stage or with a lighter touch than groups that have a high degree of influence over SLO and that are in the immediate vicinity of a project. The outcome of prioritisation should be reflected in the Stakeholder Engagement Plan (see Section 0).

There are different ways of assigning a priority to different stakeholder groups. Not every stakeholder holds the same sway over whether and how a company obtains and maintains SLO. Some stakeholders, such as local authorities and regional and central government bodies, are more focused on legal aspects, although they may still have formal and informal expectations on how stakeholders are identified and engaged as part of planning and permitting processes. **SLO can be directly and indirectly influenced by stakeholders at a wider scale, including more distant communities and authorities through to international funding bodies and other investors**. At a higher level, these stakeholders affect SLO by influencing the local stakeholders that most directly provide SLO. For example, an international investor with a track-record of investing in responsible industrial projects that agrees to or declines an investment opportunity in a combined extraction project, sends a signal to local stakeholders that will support or undermine SLO.

Stakeholder mapping creates a visual representation of stakeholders most closely linked to SLO.

Figure 5 provides an example stakeholder map on which different stakeholders can be placed. In this example, the priority assigned is based on **influence over SLO** and **geographical proximity**. This model emphasises local stakeholders with direct influence. The priority then influences the nature of the engagement. In the example shown, this ranges from **collaboration with nearby stakeholders with the greatest influence (highest priority)** through to **providing information to remote stakeholders with only indirect influence over SLO (lowest priority)**:

- **Collaborate** – partner with local communities in a way that incorporates community feedback into project-related decisions.
- **Consult** – obtain feedback on a project from local communities.
- **Involve** – working with local communities to integrate community issues with the approach taken by a project.
- **Inform** – provide stakeholders with information that allows them to understand a project and its context.

A project should map stakeholders and define what this means for the nature of engagement according to specific nature of its operations and the context in which it is operating. An alternative, but related, factor to use instead of geographic proximity is the **level of interest a stakeholder** has in a project. This may result in more remote stakeholders being assigned a higher priority when they have a significant interest in the project.

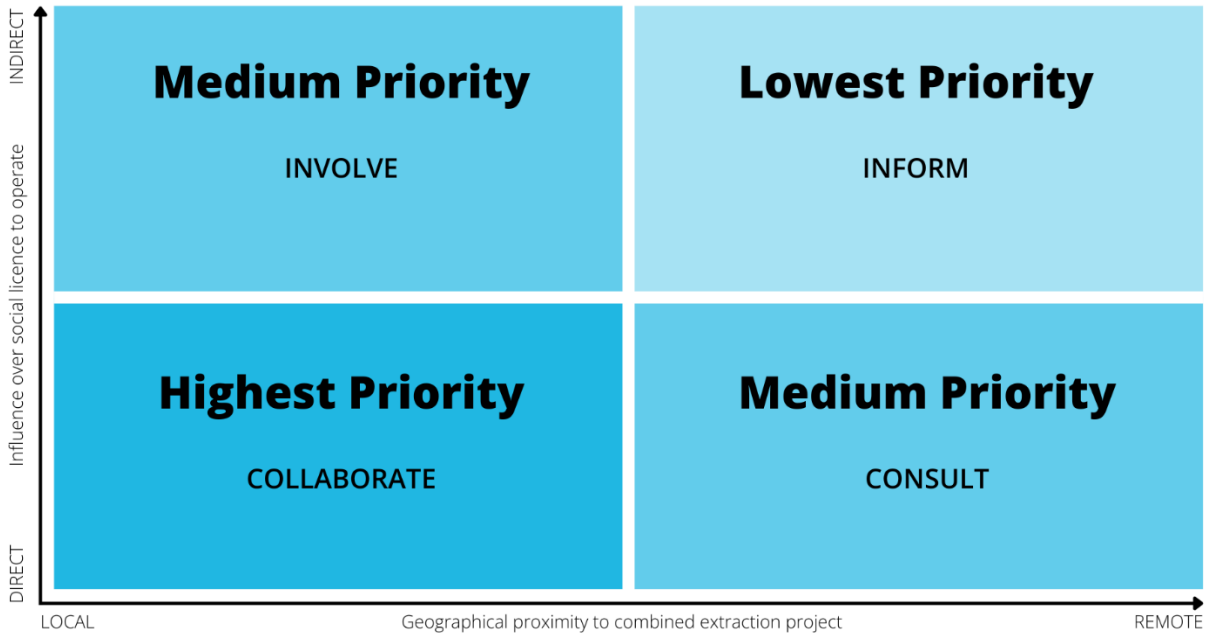


Figure 5 Stakeholder mapping, considering influence versus geographical proximity and potential interactions

When mapping and prioritising stakeholders, a project should consider that communities – even small ones – are not homogenous and the **relative importance of a vocal or well-organised minority versus the larger proportion with undisclosed or fragmented views (the 'silent majority')**. A project needs to analyse the sub-groups that exist and understand how well the most vocal and active sub-groups represent the full community spectrum (whether with positive, negative or neutral views of the project).

The loudest groups, commonly against a project, are less likely to represent the full range of opinions in a community or necessarily reflect all the issues, concerns, risks and potential benefits community members are thinking about and discussing amongst themselves. However, **claiming**

that vocal groups opposing a project are not representative of the wider community is unlikely to be helpful, as it can appear the project is attempting to undermine opposition without addressing the root causes of that opposition. A better approach is to **enable the silent majority to make their views known**, in turn empowering and supporting a broader discussion and defining a more representative cross-section of views. This inclusive approach encourages everyone to have their say, but does not necessarily mean a project will like what it hears but it is easier to work with communities to address concerns, perceptions and opinion once these are out in the open.

A project should, therefore, seek to understand why the silent majority is not sharing its views and what can be done to increase its contribution to the engagement process. Reasons for parts of a community not sharing their views may reflect one or more of the following:

- **Limited knowledge** of geothermal energy and mining / metals extraction or the project.
- **Lack of capacity, time or interest** to become actively engaged.
- Aware of the project but consider it of **limited relevance** to aspects of life they consider important.
- **Feeling intimidated** by the vocal objectors and preferring to remain quiet.

Other stakeholders with no knowledge of a project or with a neutral view may only engage and react as the project progresses from 'possibility' to 'certainty', changing from silent to vocal. Opportunities to engage along a project's timeline may be declined or ignored until 'push comes to shove' and the potential for a project to give rise to positive or negative impacts becomes a more pressing concern for the stakeholder.

Each of these issues can be managed and potentially resolved by a project through, for example:

- Improving awareness of, and access to, **communication materials**.
- Ensuring meetings and events are **scheduled for a mix of times and days** to increase the chance people are available to attend if interested.
- Ensuring the **links between the project and local or societal benefits** are clearly communicated.
- **Reaching out directly to individuals and groups** that may be hesitant to voice their opinions when in meetings and events with vocal opponents.
- Seek to **identify and engage with individuals and groups that may become more vocal** as the certainty of the project increases.

Although some stakeholders may be lower priority in terms of influence over SLO, they can still be of the utmost significance in determining if a project is successful if constructed and operated. A good example is schoolchildren, who have little direct influence, but who can make a difference in how their parents and carers receive combined extraction projects. Engagement with schools and colleges employs a trickle-down approach to information dissemination, with students returning home with information and sharing it with their families and carers. Targeting activities with schools can help to develop a better understanding of geothermal energy and metal extraction methods, risks, potential impacts and benefits in future generations and enable children to act as conduits for information to their parents who may be less engaged directly. Targeting activities with schools also represents a 'long-game' approach, through developing better understanding in the next generation of renewable energy, CRMs and the role combined extraction projects can play.

Working with 'ambassadors' and 'trusted messengers'

A project should consider if there is a potential role for internal 'ambassadors' trained as part of building internal capacity for stakeholder engagement (see Section 0) and external 'trusted messengers' drawn from local communities or groups in obtaining and maintaining SLO. Both these may be considered more trustworthy than general project staff by local communities and other stakeholders. **Trusted messengers can distribute factual information and messages to communities and other stakeholders**, such as communication materials, information of forthcoming events, the minutes of meetings with stakeholders and the reports on stakeholder engagement activities. Trusted messengers typically include people who are not industry-based, are trusted within the local community, with a solid understanding of issues relevant to a project and local context, and independent with no real or perceived reason for having a bias in favour of the project. As an alternative to working with individuals as trusted messengers, special interest groups working on local sustainability and renewable energy issues may also have strong relationships with their communities that can facilitate the distribution of factual information and messages. If a project can develop a strong relationship with special interest groups, these can be useful allies and public supporters that can help build trust between the project and the local community.

There is a risk the trusted messenger concept can have a negative impact on obtaining and maintaining SLO if a messenger has or develops a negative view of part or all of a project. This risk can be managed in part by working to ensure local communities and stakeholders in general hold a positive view of a project: if this begins to slip, it is likely that the opinion of the trusted messenger may also shift, further reinforcing negative opinions in the wider community.

Tracking progress towards obtaining social licence to operate

Defining when SLO has been obtained is open to interpretation, particularly given that the concerns and view of local communities and other stakeholder are not fixed and there is a question of how many people need to at least accept (or, ideally, approve of) a project before SLO is obtained. Is a simple majority or broad-based consensus sufficient or is there a higher expectation? If the outcomes of project activities and the stakeholder engagement process itself are not contested, it might be reasonable to assume SLO has been obtained. But if some members of the local communities and other stakeholders are not happy with a project or the engagement process, the project will need to judge what else it needs to do to improve the situation and define a critical mass of people necessary to provide SLO.

Certain aspects of stakeholder engagement can be documented. This can include, for example, a database of identified stakeholders, records of information disclosed to stakeholders, records of stakeholder engagement events, and records of inputs from stakeholders and responses to these. These should be updated as necessary, and the database of identified stakeholders should be reviewed on regular basis and updated as needed as there may be additional stakeholders who need to be engaged as a project proceeds.

A project should also document **how and when it attempted to engage with stakeholders that declined to respond, attend events or otherwise become involved**. This can become important at a later stage if the same stakeholders complain that they have been ignored and have not been adequately consulted. This phenomenon is sometimes seen as a project proceeds from design to planning to construction, with the reality of a project's likely development triggering a sudden increase in interest amongst previously disengaged stakeholders.

It may be useful **to compile a project's responses to comments and concerns raised by local communities and other stakeholders**, including those received through the grievance

mechanism. This does not mean agreeing with everything or always taking action, but it may help the engagement process to show that comments and concerns have been considered, what actions these triggered or why an action was not required or appropriate. It is important to communicate effectively about what may be causing concerns, and whether it is related to a project or not. This process can help when reviewing FAQs: if the same topic has been raised several times but not addressed in the FAQ, it can be added.

The documentation noted above can be used to develop **indicators to measure SLO.** These may include tracking the number and nature of social engagement activities to enhance public knowledge by communicating technically complex information to non-technical stakeholders. Others may be based on legitimacy and trust.

The status of SLO should be measured at the earliest stage possible of a project, to establish a baseline and then measured periodically as the project develops. SLO can ebb and flow in line with wider changes in the project context over which a project may have only limited influence or control.

Indicators could be co-created with local communities and other stakeholders so that everyone is using the same information to track progress. These could include monthly, quarterly or annual trends related to:

- Number of individuals and groups engaged, including those that are disadvantaged and marginalised.
- Number of questions received during and outside of meetings.
- Number of complaints, including those that have been resolved, are being discussed or that are unresolved.
- Spread of complaints, considering whether they are received from different people or are repeated complaints from the same people.
- Time taken to resolve grievances.
- Number of positive / negative comments related to project-related feeds and news on social media.
- Direct feedback from people and organisations attending meetings and events organised by the project.
- Number of job applications received from local communities for positions within the project.
- Budget dedicated to the maintenance of SLO.

To supplement these, it may be possible to pick performance indicators that go beyond legal obligations and report progress towards providing community, environmental and other benefits against pre-defined metrics (measurable over time). If this analysis highlights areas where things have got worse or targets have been missed, a project can then highlight corrective actions it plans to implement to get back on track.

To assist with tracking, a project should consider preparing internal monthly or quarterly reports that summarise:

- Stakeholder engagement activities conducted during the preceding period.
- Minutes of meetings held with stakeholders.
- Concerns and issues received via the grievance mechanism.
- Issues and comments on stakeholder interactions.
- Newly identified stakeholder groups (if relevant).
- Engagement plans for the next period.

To complement this, a project can publish an annual public report which summarises stakeholder engagement activities and their outcome and stakeholder perceptions of the project. This could include detailed or aggregated feedback on how stakeholder views have been addressed (or not).

An internal evaluation could be conducted annually to survey stakeholders and assess the engagement process. This could be done by using a simple questionnaire to assess the knowledge of and attitude towards project activities and the stakeholder engagement process. The following type of questions could inform the survey:

- Are stakeholders satisfied with the stakeholder engagement process?
- Are the communication channels used with the various stakeholders effective?
- Does the grievance mechanism function effectively?
- Have issues raised by stakeholders been addressed to their satisfaction (including grievances)?
- Is there positive support for the project amongst the local community?
- How are community attitudes to the project changing over time?

5.4 Maintaining social licence to operate

Ideally, a project will obtain SLO during the design and pre-construction phases and then maintain this throughout a project's subsequent lifecycle. To this end, dialogue between a project and its stakeholders should be maintained throughout the project lifecycle, even when SLO is at its highest and full trust has been achieved.

Maintaining SLO once it has been obtained can be as simple as continuing to conform with the underlying principles and implementing the same stakeholder engagement processes and activities, recognising that some aspects may need to be adapted and updated as the project evolves:

- **Continue to build internal expertise and human resources** to support stakeholder engagement through training and expansion of the team.
- **Routinely update the analysis of risks and negative impacts**, including those that may be affected by external changes in the area hosting the project.
- **Maintain consistency in answering questions by updating and expanding the FAQ** to reflect any changes to risks and impacts and considering questions and feedback from local communities and other stakeholder.
- **Scan the range of stakeholders** interested in or affected by the project and update the stakeholder map as necessary, engaging with new stakeholders according to the prioritisation assigned.
- **Keep communication materials up to date** and aligned with the current status of the project.

If problems with SLO arise as the project proceeds, remedial action is necessary to resolve issues. The path to solving problems may be complex, but generally relies on the ability of a project to understand the importance of positive relationships with local communities and other stakeholders and the need to deliver on its commitments (whether those relate to avoiding a negative impact or providing a benefit or positive opportunity).

When issues arise, to prevent the erosion or loss of SLO and a transition to resistance or conflict, ongoing engagement is essential. This can be facilitated by a project and its stakeholders having some confidence in their collective ability to discuss and resolve problems as they arise (in other words, some reasonable level of mutual trust exists).

Examples of issues and potential approaches to their resolution include:

- **Negative comments from a potentially wide range of external sources**. Counterintuitively, these may include those representing or promoting other renewable and non-renewable energy sources and 'normal' mining, all of which could potentially view combined geothermal-CRM extraction projects as 'competition' in the context of – for example – a finite number of investors and capital for project construction and limited government grants and other financial support for pilot studies and project development. Consequently, 'bad press' on the economics, risks and impacts of a combined extraction project may originate in the comments and studies of competing projects, with the bad press going on to influence the perceptions of the local communities and other stakeholders. This type of issue can be addressed by **maintaining a watching brief on external sources of opinion on the project** and **ensuring factual and up-to-date information on the project is available** to correct misinformation. In meetings when misinformation is discussed, simple accurate statements should be used as counterpoints, and it can be useful to state the facts first and last (a 'truth sandwich') as this helps the repeated information to be retained by the people receiving it.
- **The development of resistance in response to a specific concern** such as the risk that house prices will be negatively impacted by project development ('property blight'). This type of issue can be addressed by developing a bespoke response to the specific concern, for example, project engagement staff can speak to estate agents and prospective property buyers to answer questions and disseminate factual information to reduce concerns about property blight.
- **The development of resistance in response to more general concerns** such as the protection of the local environment from change or preservation of local lifestyles. Ideally a project's company executives and senior staff live locally and participate in local activities, demonstrating a commitment to protecting the local environmental and lifestyles and creating trust, as these people and their families will be exposed to the same risks as others in the local community. A project may also want to consider how local people can be involved in environmental monitoring to build trust in the methods applied to eliminate or reduce risks and negative impacts.
- It is also possible that during construction or operation, **unforeseen negative impacts will be identified**. In this case, a project will need to address these in ongoing stakeholder engagement activities and prepare and communicate a plan to define the cause of such impacts and how they can be avoided or mitigated effectively.

Missteps and mistakes by a project can see strong SLO eroded and lost if due to obvious negligence or misconduct. If there is a strong SLO and a company acknowledges and addresses its errors, this may not undermine SLO. Therefore, maintenance of SLO is just as important as obtaining SLO and requires ongoing attention throughout a project's life to maintain a buffer if and when mistakes happen. It is important to own up to mistakes immediately and provide details of mitigating actions if taken and measures put in place to prevent such mistakes happening in the future.

Mediation can help when SLO has been eroded or lost. Mediation can take many forms, ranging from working with conflict resolution experts through to using trusted messengers as a bridge between the company and local communities. As part of this process, skilled facilitators can help translate technical information and reduce the differences in power and knowledge between stakeholders and the project. **The most appropriate and effective form of mediation depends on the reason that SLO has been eroded or lost** and the players that communities consider to be trustworthy and those that they do not. For example, if the loss of SLO relates to expert reports that communities consider biased or inaccurate, the same experts are unlikely to be able to play a positive role as a mediator even though their involvement in the mediation process would be essential to understand the gap between the perceptions of the experts and communities).

6 Annotated bibliography

The following annotated bibliography provides a brief summary of reports, research papers and other documents in the specific context of their relevance to SLO and related activities.

Abesser, C. and Walker, A. 2022. *Geothermal energy*. UK Parliament, POSTbrief 46. Available at https://post.parliament.uk/research-briefings/post-pb-0046/. Accessed 18 March 2025.
Provides a review of geothermal resources and technologies and the potential role of geothermal energy in the UK, environmental considerations, development of a UK market for geothermal energy considering opportunities and barriers and the policy and regulatory frameworks applicable to geothermal energy resources.

Afandi, Purba, D., Apriani, D.N.I., Fadhillah, F.R. and Mustika, A.I. 2024. Social Safeguard Measures in Geothermal Exploration: Fulfilling Requirements for the Geothermal Resource Risk Mitigation Program. *Proceedings, 49th Workshop on Geothermal Reservoir Engineering*, Stanford University, Stanford, California, February 12-14, 2024. SGP-TR-227. Available at https://pangea.stanford.edu/ERE/db/GeoConf/papers/SGW/2024/Afandi.pdf. Accessed 19 March 2025.
The Geothermal Resource Risk Mitigation Program (GREM), a geothermal exploration funding programme by The World Bank and Indonesian Ministry of Finance, aims to accelerate and support geothermal exploration projects in Indonesia. The programme highlights the significance of effective communication and stakeholder engagement in managing social impacts. This paper draws on case studies and best practice to present a comprehensive approach to social safeguarding during geothermal exploration. The activities considered would each contribute to obtaining and maintaining SLO and include social impact assessments, stakeholder engagement plans, resettlement and livelihood restoration measures, indigenous peoples' rights protection, health and safety protocols, local employment opportunities, and sustainable community development initiatives.

Allen, W., Grant, A., Stronge, D. and Wegner, S. 2019. *Building engagement and social licence: Unpacking Social Licence to Operate and partnerships – developing rubrics for guidance and assessment*. Biosecurity New Zealand Technical Paper No: 2019/17. MPI 18607 Project Report. Available at https://www.myrtlerust.org.nz/assets/Uploads/Building-engagement-and-social-licence-Unpacking-Social-Licence-to-Opera..-.pdf. Accessed 21 March 2025.
This report describes provides a set of instructions for planning, implementing and evaluating initiatives in SLO and engagement building. These are based on the experience of the research team and a review of international and national literature. The instructions are introduced as a way of defining and improving tasks and behaviours to ensure good practice and enable successful partnerships and SLO. The instructions provided can be adapted to reflect different contexts.

Anggreta, D.K., Somantri, G.R. and Purwanto, S.A. 2022. Social Acceptance: Mapping the Perspectives of Stakeholder in the Development of Geothermal Power Plants in West Sumatra, Indonesia. *International Journal of Sustainable Development & Planning*, *17*(4). Available at https://www.iieta.org/journals/ijsdp/paper/10.18280/ijsdp.170402. Accessed 17 March 2025.
The Indonesian government is seeking to increase development of geothermal power plants, including in the province of West Sumatra. Social acceptance as a factor in the success of project development is compared for two sites in the province, with public acceptance at one benefiting from the company considering the surrounding community as partners, while public resistance is evident at the other. A key conclusion in the context of Indonesia is that for a project to achieve social acceptance (equivalent to social licence to operate), the support of regional government is required.

ARENA (Australian Renewable Energy Agency). 2015. *Establishing the social licence to operate large scale solar facilities in Australia: insights from social research for industry*. Available at

https://arena.gov.au/assets/2020/11/establishing-the-social-licence-to-operate-large-scale-solar-facilities-in-australia.pdf. Accessed 19 March 2025.
Surveys, group discussions and in-depth interviews were used to identify the factors that influence SLO for utility-scale solar installations in Australia, based on understanding general attitudes towards solar energy and large-scale solar energy facilities. Surveys noted that providing images and information about large scale solar facilities led to people having more positive attitudes towards different aspects of solar energy, including land use, efficiency, reliability, visual impacts, economic impacts, environmental impacts, health impacts and the cost of electricity (relative to people that had not been provided such images and information).

Asnar, Y. and Zannone, N. 2008. Perceived Risk Assessment. *Proceedings of the 4th ACM Workshop on Quality of Protection*, pp. 59-64, ACM New York, NY, USA. Available at https://dl.acm.org/doi/10.1145/1456362.1456375. Accessed 17 March 2025.
In the context of the growing role of information technology in critical activities such as the management of air traffic control and nuclear power plants, the importance of how different actors perceive risk is analysed and differences between perceived risk and actual risk are discussed. The concepts necessary to capture and analyse perceived risk are also investigated.

Barich, A., Stokłosa, A.W., Hildebrand, J., Elíasson, O., Medgyes, T., Quinonez, G., Casillas, A.C. and Fernandez, I. 2022. Social License to Operate in Geothermal Energy. *Energies* 2022, 15, 139. https://doi.org/10.3390/en15010139. Available at https://www.mdpi.com/1996-1073/15/1/139. Accessed 18 March 2025.
Provides a conceptual model of SLO in the geothermal energy sector based on existing general conceptual models of SLO and experiences from other sectors and case studies, working group discussions and surveys conducted as part of the H2020 funded CROWDTHERMAL project, which aims to empower EU citizens for direct participation in geothermal projects through crowdfunding. The paper examines the practices and challenges that influence obtaining and maintaining SLO in geothermal energy projects and initiatives.

Baumber, A., Scerri, M. and Schweinsberg, S. 2019. A social licence for the sharing economy. *Technological Forecasting and Social Change*. Volume 146, September 2019, Pages 12-23. Available at https://ideas.repec.org/a/eee/tefoso/v146y2019icp12-23.html. Accessed 17 March 2025.
Uses SLO as a means of analysing community acceptance of the sharing economy concept (in which the creation, production, distribution, trade and consumption of goods and services is done for free or on a non-profit basis). The paper investigates the complex relationships between social acceptance and regulatory requirements, identifying and measuring key variables that determine SLO, and developing strategies for obtaining and maintaining SLO for sharing economy practices.

Beecher, N., Harrison, E., Goldstein, N., McDaniel, M., Field, P. and Susskind, L. 2005. Risk Perception, Risk Communication, and Stakeholder Involvement for Biosolids Management and Research. *J. Environ. Qual.* Vol. 34, pp. 122–128. Available at https://pubmed.ncbi.nlm.nih.gov/15647541/. Accessed 17 March 2025.
Examines the factors that affect perceptions of risk, such as uncertainty, degree of control, distribution of the risk amongst different stakeholder groups and the differences that exist in how technical experts and the public define and assess risk. Options to address this gap are noted as (i) two-way dialogue, (ii) acknowledgement of the useful knowledge and concerns held by the public, (iii) ensuring the purveyor of information is credible and respected and considered trustworthy and fair and (iv) consensus-building and joint fact-finding.

Berrizbeitia, L.D. 2014. Environmental impacts of geothermal energy generation and utilization. *Volcanos of the Eastern Sierra Nevada–G190. Hamburger, Rupp and Taranovic*. Available at https://geocom.geonardo.com/assets/elearning/8.21.Berrizbeitia.pdf. Accessed 17 March 2025.

This paper assesses the negative environmental impacts of geothermal energy, noting these are limited relative to other types of energy production and particularly when compared with fossil fuel powered plants. The paper also provides an overview of geothermal energy globally, and issues and status of projects in the USA.

Bice, S. and Moffat, K. 2014. Social licence to operate and impact assessment, *Impact Assessment and Project Appraisal*, 32:4, 257-262. Available at https://www.researchgate.net/publication/265340630_Social_licence_to_operate_and_impact_assessment. Accessed 17 March 2025.
This article reviews developments in the understanding and employment of SLO, particularly as it relates to impact assessment. It explores the implications of SLO for the impact assessment process (tensions and synergies), exploring how the two concepts overlap or can be integrated and using a series of questions to help impact assessment practitioners address concerns raised by projects and communities about SLO.

Billing, S-L., Rostan, J. and Tett, P. Undated. Handbook on Social License to Operate for Seaweed Cultivation. GenialG H2020 Project. Scottish Association for Marine Science. Available at https://www.sams-enterprise.com/t4-media/sams/pdf/Handbook-on-Social-License-to-Operate-for-Seaweed-Cultivationv4(2).pdf. Accessed 21 March 2025.
In the context of seaweed cultivation, this paper identifies several ways to improve industry-community relationships and build trust, including understanding the local social context, providing communities with sufficient information and enabling their participation in fair and transparent decision-making, early and on-going engagement and building relationships between individuals in the community and the company. More broadly, a company should understand that economic, environmental and social sustainability are important concerns for communities, who will also want to learn about the local benefits of a project.

Blennerhassett, L., Schuitema, G. and McAuliffe, F. 2025. GreenDealz: a hands-on shopping activity for public engagement with critical raw materials, EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-2292, https://doi.org/10.5194/egusphere-egu25-2292. Accessed 28 April 2025.
Developing innovative public engagement measures are central to addressing many of the key geoscience related challenges within the EU, including achieving a sustainable and secure supply of CRMs. While informal education spaces such as festivals provide unique environments for science communication, science exhibits at such events need to capture attention and stimulate the audience in a short period of time and also address historically negative public attitudes towards mining. This paper presents the design, testing and validation of a hands-on, challenge-based public engagement activity/tool ('GreenDealz') for use in the fast-paced science and arts festival environment, where contact time is limited and interaction is key. The purpose of the tool is to engage participants on CRMs and their importance for renewable energy technologies in a relatable and task-based way.

Boutilier, R.G. and Thomson, I. 2011. Modelling and measuring the social license to operate: fruits of a dialogue between theory and practice. *Social Licence*. Available at https://socialicense.com/publications/Modelling%20and%20Measuring%20the%20SLO.pdf. Accessed 17 March 2025.
This paper traces the development of a conceptual model of SLO, stemming from a study of the levels of acceptance of a mine in Bolivia across a 15-year period. This informed attempts to measure SLO quantitatively in a survey of the stakeholders of the same mine, using a 5-point scale to assess how strongly representatives of stakeholder groups agreed or disagreed with an initial pool of two dozen statements. Subsequently, the pool of statements was refined in studies of stakeholder networks in Australia, Bolivia, and Mexico. The latest version consists of 15 statements, which were used at the original mine in Bolivia to develop a modified model of SLO, which the paper notes can be used by mine management to increase the focus on a neglected aspect of stakeholder relations, namely, the role of a company in fostering more equitable social contracts at local and regional levels in both developed and developing countries.

Brewer, N.T., Weinstein, N.D., Cuite, C.L. and Herrington, J.E. 2004. Risk Perceptions and Their Relation to Risk Behavior. *Annals of Behavioral Medicine*, Volume 27, Number 2, 2004, pp 125-130. Available at https://pubmed.ncbi.nlm.nih.gov/15026296/. Accessed 17 March 2025.
Using the release of the Lyme disease vaccine in the USA as a case study, this paper considers whether perceptions of personal risk cause people to take protective action, whether when people take actions thought to be effective, they lower their risk perceptions and whether risk perceptions accurately reflect risk behaviour. Lyme disease vaccination behaviour and risk perception were assessed and it was found that participants with higher initial risk perceptions were much more likely than those with lower risk perceptions to get vaccinated against Lyme disease. Being vaccinated led to a reduction in risk perceptions and people vaccinated correctly believed that their risk of future infection was lower than that of people not vaccinated.

Bruce-Iri, P. and Shelley, R. 2010. Assessing stakeholder engagement. *Communication Journal of New Zealand*, *11*(2), 30-48. Available at https://www.researchgate.net/profile/Peter-Bruce-Iri/publication/285151789_Assessing_stakeholder_engagement/links/6333eee65f6370520d015d5f/Assessing-stakeholder-engagement.pdf. Accessed 17 March 2025.
Stakeholder engagement is the two-way interaction between an organisation and the individuals and groups impacted by, or that influence, the organisation. Engagement is underpinned by dialogue to enhance shared meaning with internal and external stakeholders. As organisations introduce and evolve formal stakeholder engagement processes, there is a need to measure and evaluate engagement efficacy, in part to link engagement practices to enhanced outcomes. Tools such as AccountAbility's AA1000 Stakeholder Engagement Standard (AA1000SES) mostly describe stakeholder engagement in the context of large organisations. This paper evaluates the relevance of AA1000SES to small and medium enterprises (SMEs), using three companies in Northland, New Zealand. Research indicated that each company demonstrated enthusiasm for stakeholder engagement, with constructive relationships with stakeholders. However, while the companies supported the intent of AA1000SES, as SMEs they did not consider they had the resources necessary to formalise their stakeholder engagement processes. Therefore, the paper notes that while AA1000SES remains a useful tool, a 'light' version for SMEs would be useful.

Buhmann, K. 2015. Public Regulators and CSR: The 'Social Licence to Operate' in Recent United Nations Instruments on Business and Human Rights and the Juridification of CSR. *Journal of Business Ethics*, volume 136, pages 699–714.Available at https://ideas.repec.org/a/kap/jbuset/v136y2016i4d10.1007_s10551-015-2869-9.html. Accessed 17 March 2025.
The United National (UN) Guiding Principles on Business and Human Rights and the UN 'Protect, Respect and Remedy' Framework both refer to SLO in the context of responsible business conduct, connecting to social expectations and bridging to public regulation. This UN guidance has influenced how regulators seek to influence business conduct. This article explores and explains the efforts by public regulators to reach beyond jurisdictional and territorial limitations of conventional public law to address adverse effects of transnational economic activity, analysing the expansion of law into the normative framing of what constitutes responsible business conduct. The paper demonstrates the increased legal framing of social expectations of companies, the intersection of law with business ethics and an increased regulation by law of social actors or processes.

Buhmann, K., Fonseca, A., Andrews, N. and Amatulli, G. (Eds.). 2024. *The Routledge Handbook on Meaningful Stakeholder Engagement* (1st ed.). Routledge. https://doi.org/10.4324/9781003388227. Accessed 20 March 2025.
Cutting across multiple disciplines including stakeholder theory, natural resource management, impact assessment, project management, ESG, responsible business, and global value chains, this handbook introduces key elements of stakeholder engagement and the causes for the current surge in expectations. Synthesising knowledge, academic literature, and practical experience, the handbook provides four thematic sections exploring the theory and practice of meaningful stakeholder engagement. Each section includes short practice notes based on real-life experiences or dilemmas of practitioners and affected

people. A concluding chapter provides key insights and proposes a pathway for the future integration of values, norms and practice for stakeholder engagement.

Business Council for British Columbia. 2015. Rethinking Social Licence to Operate – A Concept in Search of Definition and Boundaries. Environment and Energy Bulletin. Volume 7, Issue 2, May 2015. Available at https://www.bcbc.com/insight/2015/05/28/rethinking-social-licence-to-operate-a-concept-in-search-of-definition-and-boundaries. Accessed 20 March 2025.
This article examines the evolution of SLO in the approval of resource development projects and its recent rise in popular use. It then considers how the concept relates to political governance and law. Finally, it assesses the implications of how SLO is being applied – for good and for bad, but most often without a proper context.

Business for Social Responsibility. 2003. The Social License to Operate. Available at https://static1.squarespace.com/static/5bb24d3c9b8fe8421e87bbb6/t/5c3bd87340ec9ab9b9f3fdf9/1547425908683/file_BSR_Social_License_to_Operate.pdf. Accessed 20 March 2025.
This guide examines the business case for constructive engagement with stakeholders and the importance of SLO. Cases studies are provided to illustrate the consequences of failing to build SLO with surrounding communities and other stakeholders, including significant delays or project cancellation. A second set of case studies examines how initially difficult situations and issues related to indigenous peoples, small-scale miners, and sustainable community development were resolved to obtain SLO and deliver benefits to all parties.

Callaghan, C.T., Winnebald, C., Smith, B., Mason, B.M and López-Hoffman, L. 2025. Citizen science as a valuable tool for environmental review. *Frontiers in Ecology and the Environment*. https://doi.org/10.1002/fee.2808. Accessed 19 March 2025.
Under the US National Environmental Policy Act, environmental impact statements (EISs) are mandated for development projects that may have major environmental impacts. Citizen science may serve as a valuable resource for monitoring biodiversity and EISs are increasingly incorporating citizen science data in lieu of or as a means of complementing expensive and time-consuming biodiversity surveys. From a sample of more than 1,300 EISs, 40% of EISs in 2022 used, mentioned or suggested using of such information, as compared with just 3% in 2012. Although citizen science data have potential for informing decisions, the paper notes their use in EISs must be scientifically sound and statistically rigorous, in accordance with general ecological and conservation science practices.

Carr-Cornish, S. and Romanach, L. 2012. Exploring community views toward geothermal energy technology in Australia. CSIRO, Pullenvale, Australia. Available at https://doi.org/10.4225/08/584af4356be3f. Accessed 17 March 2025.
This paper reports research on the factors linked with the extent of societal acceptance (or not) of geothermal energy technology in Australia and the factors that impact on geothermal projects having SLO (or not) in Australia. The research also evaluated how perceptions change with exposure to science-based information and group discussion about geothermal energy technology. Results indicate that most participants were receptive to geothermal technologies and projects being developed in Australia, and providing participants with science-based information and group discussion had a positive effect on participants support for the technology. The paper notes that most participants had questions concerning the engineering of geothermal systems and the potential for negative impacts. A range of specific issues and questions arising from the research require further examination, including whether individuals living in communities with existing geothermal projects can distinguish between different geothermal energy technologies and their implications, how the perceived benefits of geothermal energy compare with the actual benefits that are likely to be delivered and what assurances, particularly safety-related, are required and how these should be communicated to local communities.

Carr-Cornish, S. and Romanach, L. 2014. Differences in public perceptions of geothermal energy technology in Australia. *Energies* 7(3), 1555–1575. Available at https://www.mdpi.com/1996-1073/7/3/1555 Accessed 17 March 2025.
Research in Australia used online focus groups to identify the extent of agreement with geothermal technology before and after information, including media reports focusing on a range of the technology's attributes and how the characteristics of individuals with different levels of agreement vary. After information was provided, fewer participants reported being unsure and a minority disagreed and a majority agreed with geothermal technology. Research indicated that the overall preference was for projects to be located away from communities. Participants that disagreed or were unsure, were more likely to report lower subjective knowledge of the technology and to perceive lower benefits and higher risks. They were also less likely to believe people in their community would have the opportunity to participate in consultation. The paper notes that the location of projects will be an important consideration and that the conditions of acceptance are likely to vary amongst community members.

Cataldi, R. 2000. Social Acceptance: a Must to foster Geothermal Development in Next Decades. Proceedings International Seminar on "The Role of Geothermal Energy in Sustainable Development of Mazowsze and Lodz Regions, Poland"; Osuchòw, 4-6 Oct.2000. Polish Academy of Sciences / Mineral and Energy Economy Research Institute (PAS/MEERI) Krakow. Available at https://www.readkong.com/page/social-acceptance-of-geothermal-projects-problems-and-6937092. Accessed 17 March 2025.
This paper considers the social acceptance (a type of SLO) of geothermal resources and how this can be achieved by preventing adverse effects on people's health, minimising environmental impacts and creating direct benefits for the local communities. The paper notes that additional costs related to these actions can be more than repaid through the creation of a favourable context for project implementation.

Charman, J., Law, R., Beynon, S. and Farndale, H. 2022. Effective Community Engagement: The United Downs Geothermal Power Project, Cornwall, UK. European Geothermal Congress 2022, Berlin, Germany, 17-21 October 2022. www.europeangeothermalcongress.eu.
The United Downs deep geothermal project is the first geothermal power project in the United Kingdom. It is being developed and operated by Geothermal Engineering Ltd (GEL) which has received financial support from the European Regional Development Fund, Cornwall Council and Thrive Renewables plc. As part of an ongoing extensive public engagement exercise, a locally-based Community Engagement Manager (CEM) was recruited five months before drilling commenced to bring local knowledge and experience of working with communities in areas close to the drilling site. This approach reduced the research necessary to identify who the "community" were and where to find them. Community engagement was undertaken through visits to the drilling site for talks and tours and visiting existing community functions and events to interact with attendees, swapping to social media when the Covid-19 pandemic prevented all face-to-face contact. Engaging with education establishments gave an opportunity for a pyramid style dissemination of information, where students take information home and share it with their families. The community engagement programme has ensured the project has progressed without demonstrations or mass complaints.

Chen, X. Q. and Musango, J. K. 2022. A Conceptual Approach to the Stakeholder Mapping of Energy Lab in Poor Urban Settings. *Sustainability*, *14*(10), 6233. Available at https://www.mdpi.com/2071-1050/14/10/6233. Accessed 17 March 2025.
This paper takes a dynamic multi-level system view of stakeholder mapping, to tackle the lack of security of energy services in poor urban settings, assessing theoretical models available for stakeholders and outcome mapping. The paper also focuses on the preliminary identification of stakeholders and their primary interests at all levels, using case studies from Africa. Findings indicate that all stakeholders should support the government in the development of policies and strategies. Findings also suggested that key players should proactively agree and negotiate with the local government on energy outcome measures. It was also found that multi-stakeholder involvement improved transparency and accountability for decision making.

Conrad J. 2018. The Social License to Operate and Social Contract Theory: Themes and Relations of Two Concepts – A Literature Analysis. Masters Thesis. University of Iceland. Available at https://skemman.is/bitstream/1946/31718/1/Thesis.pdf. Accessed 17 March 2025.
SLO is broadly defined as the ongoing public acceptance of a business's impact on the local community or society at large. This thesis examines the links between SLO and social contract theory (the idea that society is based on a set of moral and political rules of behaviour that are implicitly agreed by the members of that society). This thesis reviews current attempts to apply social contract theory to the business domain. Research identified three themes central to both SLO and social contract theory: legitimacy, consent and trust and defined a 'business covenant' as the normative basis for standards of good business practice and SLO as the empirical validation of such standards.

Cook, D., Karlsdóttir, I. and Minelgaite, I. 2022. Enjoying the heat? Co-creation of stakeholder benefits and sustainable energy development within projects in the geothermal sector. *Energies*, *15*(3), 1029. Available at https://www.mdpi.com/1996-1073/15/3/1029. Accessed 17 March 2025.
To supplement existing high-level analysis of the sustainability implications of the geothermal industry, this paper considers the way that projects in the Icelandic geothermal energy sector can create co-benefits with stakeholders. It focuses on identification of stakeholders, the nature of co-created sustainability benefits and the point in a project's lifecycle that these occur. Using semi-structured interviews with project managers in Iceland's geothermal industry, the study identifies a range of sector stakeholders including national and municipal governments, public sector institutions, businesses, the public, employees and landowners. While sustainability benefits are apparent, trade-offs are reported between pursuing an economically efficient energy system, nature conservation and other environmental externalities associated with power production and consumption.

Cooper, B., Donner, E., Crase, L., Robertson, H., Carter, D., Short, M., Drigo, B., Leder, K., Roiko, A. and Fielding, K. 2022. Maintaining a social license to operate for wastewater-based monitoring: The case of managing infectious disease and the COVID-19 pandemic. J Environ Manage. 2022 Oct 15;320:115819. doi: 10.1016/j.jenvman.2022.115819. Epub 2022 Jul 22. PMID: 35930884; PMCID: PMC9304157. Accessed 20 March 2025.
Wastewater monitoring as a public health tool is well-established and the COVID-19 pandemic saw its widespread uptake. This paper explains the information, actions and public engagement necessary to establish and maintain SLO for wastewater monitoring, considering the influence of relationships between different stakeholder groups.

Crowdthermal. 2020. Guidelines for public engagement. Deliverable 1.4. Project information available at https://www.crowdthermalproject.eu/. Accessed 18 March 2025.
The report on guidelines for public engagement deals with the topics of why public engagement is important in geothermal energy projects, why a comprehensive planning of participation measures is crucial, and in this regard how a constructive communication strategy can serve risk and conflict prevention. The report provides suggestions on how to analyse the contextual preconditions of a project area and elaborates on the different phases and formats of public engagement. The recommendations are illustrated by examples stemming predominantly from case studies of the CROWDTHERMAL Project.

Crowdthermal. 2021. Social Licence to Operate for Geothermal Energy. Deliverable 1.5. Project information available at https://www.crowdthermalproject.eu/. Accessed 18 March 2025.
The mission of Crowdthermal is to empower the European public to directly participate in the development of geothermal projects with the help of alternative financing schemes (crowdfunding) and social engagement tools. Building on earlier stakeholder analysis and work on social acceptance, the need to define a framework to manage the dynamics between stakeholders (including the public) and geothermal projects operators was identified. This report aims to deliver a conceptual framework for SLO in geothermal energy to increase transparency and reduce investment risks and the risk of public criticism and social conflicts, providing a universally accepted social acceptance framework for different types of geothermal investment projects.

Dawson, S., Manderson, L. and Tallo, V.L. 1993. *A Manual for the Use of Focus Groups*. WHO Social and Economic Research, UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. INFDC, Boston, USA. Available at https://iris.who.int/handle/10665/41795. Accessed 18 March 2025.
This manual introduces qualitative research methods such as interviewing, observations and focus groups for assessing social and cultural issues, ideas and beliefs and practices and behaviours. Although presented in the context of disease control and treatment, the methods are more broadly applicable and are aimed at use by non-specialists with no formal training in social science. The methods discussed can be used in different ways, including the gathering of information for design and implementation activities, for ongoing assessment and for the evaluation of outcomes.

EBRD. 2019. Performance Requirements and Guidance. Available at https://www.ebrd.com/who-we-are/our-values/environmental-and-socialpolicy/performance-requirements.html. Accessed 18 March 2025.
To help its clients design and operate their projects in compliance with good international practices relating to sustainable development, the European Bank for Reconstruction and Development (EBRD) has defined ten performance requirements covering the key areas of environmental and social issues and impacts. New facilities or business activities financed by EBRD must meet the requirements from the outset and existing facilities that are financed must adopt and implement a satisfactory Environmental and Social Action Plan (ESAP) to address any shortfall in performance. The performance requirements note that where possible, projects should avoid adverse impacts on workers, communities, and the environment and if avoidance is not possible, negative impacts should be reduced, mitigated or compensated for.

Edelman. 2020. Edelman Trust Barometer 2020. Available at https://www.edelman.com/trustbarometer. Accessed 18 March 2025.
Edelman has studied trust for more than 25 years. Its Trust Barometer uses comprehensive data and research to analyse the extent to which four societal institutions – government, business, NGOs and media – are trusted. In 2020, the Barometer indicated that despite a strong global economy and near full employment, none of the four were trusted, with people concerned about the future and their role in it.

Edwards P., Fleming A., Lacey J., Lester L., Pinkard E., Ruckstuhl K., Bezuidenhout C., Payn T., Bayne K. and Willimans T. 2019. Trust, engagement, information and social licence—insights from New Zealand. *Environmental Research Letters*, volume 14, 024010. Available at https://research.monash.edu/en/publications/trust-engagement-information-and-social-licence-insights-from-new. Accessed 18 March 2025.
This research examines trust at the nexus of government, industry and community, how this is influenced by the media, and its effect on SLO. The research considered trust in New Zealand's natural resource sectors by examining ways of building, maintaining and assessing public trust. Honesty was highlighted as the top influencer of trustworthiness and trust, and dishonesty as the top influencer of distrust, with actors cited in the media distrusted more than the media outlet itself.

Elias, B, O'Neil, J.D. and Yassi, A. 1997. *Wollaston Lake: The Uranium Mining Industry and the Perceptions of Health Risks*. Department of Community Health Sciences, University of Manitoba. Available at https://epub.sub.uni-hamburg.de/epub/volltexte/2010/5159/pdf/WOLLASTON_LAKE.pdf. Accessed 18 March 2025.
This report analyses health risk perceptions, using a community case study of the Lac la Hache First Nation in Canada that relates to uranium mining. Using questionnaires and open-ended interviews, the study profiled the community and considered diverse and inter-related environmental health issues and risks, including those related to land use activities, everyday living activities, medical treatments, global environmental impacts and uranium mining dangers. Research indicates that the Lac la Hache First Nation has distinct perceptions regarding traditional land use activities and community health risks that suggest its people have long practiced cultural risk assessment, management and communication activities.

Endo, A., Yamada, M., Baba, K., Miyashita, Y., Sugimoto, R., Ishii, A., Nishijima, J., Fujii, M., Kato, T., Hamamoto, H., Kimura, M., Kumazawa, T., Masuhara, N. and Honda, H. 2021. Methodology for Nexus Approach Toward Sustainable Use of Geothermal Hot Spring Resources. Front. Water 3:713000. doi: 0.3389/frwa.2021.713000. Accessed 19 March 2025.
This study integrates interdisciplinary and transdisciplinary concepts as the nexus approach, using a case study in Beppu, Japan to explore how interconnected issues (in this case, heat, steam, nutrients, and drainage between land and coastal systems) can be analysed holistically to improve decision- and policy-making in the context of sustainable use of geothermal hot spring resources. The nexus approach facilitated the integration of methods and data from different disciplines and can be used to support enhanced stakeholder engagement.

Energy Sector Management Assistance Program. 2022. Direct Utilization of Geothermal Resources. Technical Report 21/22. Washington, DC: World Bank. Available at https://www.esmap.org/Direct_Use_of_Geothermal_Resources. Accessed 20 March 2025.
This report introduces the concept of Geothermal Direct Use (GDU), which is the use of geothermal resources to create valuable commodities from heat, minerals and gases (beyond the sole use for electricity generation at geothermal power plants). It examines why countries should explore the potential of GDU and how its development can deliver economic and social benefits to different sectors of the population.

Engineers Without Borders Canada. (2017). Mining Shared Value, Mining Local Procurement Reporting Mechanism. Available at http://miningsharedvalue.org/mininglprm. Accessed 18 March 2025.
The Mining Local Procurement Reporting Mechanism (LPRM) seeks to standardise how the global mining industry and host countries measure and talk about local procurement of goods and services (often the single largest in-country payment type made by a mine site). The LPRM helps mine sites define and report on local procurement to create more benefits for host countries, empowers suppliers, host governments, and other stakeholders to collaborate with mine sites and increases the transparency of procurement process to deter issues such as corruption. Improved local procurement is linked to stronger SLO.

Equator Principles Association. 2020. Equator Principles. Available at https://equator-principles.com/. Accessed 18 March 2025.
The Equator Principles (EPs) are intended to serve as a global standard and risk management framework for financial institutions to identify, assess and manage environmental and social risks when financing projects.

European Commission. 2020. Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability. Available at https://ec.europa.eu/docsroom/documents/42849. Accessed 18 March 2025.
This Communication from the European Union presents the EU 2020 list of critical raw materials, the challenges for a diversified, secure and sustainable supply of CRMs (avoiding the risk of replacing a reliance on fossil fuels with a reliance on raw materials from abroad that are also being targeted by non-EU purchasers) and the actions necessary to increase EU resilience and autonomy.

Fadhillah, F.R., Al Asyari, M.R., Bagaskara, A., Vanda, D.V.V., Adityatama, D.W., Purba, D., Katmoyo, R., Djandam, A. and Gurning, L. 2023. Challenges in Getting Public Acceptance on Geothermal Project in Indonesia. Proceedings, 48th Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, February 6-8, 2023, SGP-TR-224. Available at https://www.researchgate.net/publication/369201771_Challenges_in_Getting_Public_Acceptance_on_Geothermal_Project_in_Indonesia. Accessed 19 March 2025.
Support from local communities for geothermal projects in Indonesia is often difficult to obtain, which in turn creates delays in project execution. This paper maps various rejections of geothermal projects by local

communities in Indonesia, using a literature review to define community concerns related to project impacts. Based on the analysis of different reasons for rejection, the paper notes the importance of local communities understanding the proposed implementation of the project and the project gaining public trust during both the exploration and development phases. The paper also provides preliminary options for engaging local communities in the geothermal project area.

Falck, W.E. and Spangenberg, J.H. 2014. Selection of Social Demand-Based Indicators: EO-based Indicators for Mining. Journal of Cleaner Production, **84**: 193-203. Available at http://www.sciencedirect.com/science/article/pii/ S0959652614001656. Accessed 18 March 2025.
Achieving SLO is key to a successful mining project, which requires trust between the different actors, and trust requires knowledge. This paper describes the development of a practical process to identify and test indicator that can be used to frame and communicate knowledge on complex scientific, technical and socio-economic issues related to mining. The process was driven by stakeholder-need, rather than expert-judgement. The process was developed and tested in the framework of the European Commission EO-MINERS project (designed to test if Earth observation tools, particularly satellite imaging, can help bridge the information gap between stakeholders) and deployed at three demonstration sites in the Czech Republic, Kyrgyzstan and South Africa.

Falck, W.E. 2016. Social Licensing in Mining - Between Ethical Dilemmas and Economic Risk Management. Mineral Economics, **29**(2): 97-104. DOI: 10.1007/s13563-016-0089-0.
Mining comes at the price of environmental and social impacts. While minimising environmental impacts with a view to comply with regulatory requirements today is a standard procedure in mine business management, this is not necessarily the case for social impacts. On the other hand, many societies today express their desire to participate in the decision-finding on the development of their physical and economic environment. A sustained and sustainable mine development requires the collaboration with the host communities concerned, which means that it has to be developed in a process commonly termed social licencing. This paper examines the evolution of SLO in the context of several ethical dilemmas and divergent norm and value systems of the different actors, such as host communities, mining companies and society as a whole. It notes that SLO is not granted once or forever, but evolves as the affected communities and their needs evolve.

Franks, D.M. 2011. Management of the Social Impacts of Mining. In SME, SME Mining engineering handbook (pp. 1817-1825). SME. Available at https://www.csrm.uq.edu.au/publications/management-of-the-social-impacts-of-mining. Accessed 18 March 2025.
Effective coordination of activities in responding to social impacts and social risks requires an understanding of social issues, which can be gained through ongoing assessment. This chapter outlines techniques and processes that assist first in identifying and responding to social issues during planning and then in guiding and monitoring projects during operation through to post-closure. Through both assessment and management, the design and implementation of mining activities can be shaped to enhance environmental and community outcomes.

Franks D.M. and Cohen T. 2012. Social licence in design: constructive technology assessment within a mineral research and development institution. *Technol. Forecast. Soc. Change*, 79 (7), pp. 1229-1240. Available at https://www.researchgate.net/publication/256859552_Social_Licence_in_Design_Constructive_technology_assessment_within_a_mineral_research_and_development_institution. Accessed 18 March 2025.
This paper reports on the development of a process called Social Licence in Design to address future social challenges and opportunities of innovative mining-related technologies. Social Licence in Design utilises social research techniques to account for the perspectives and values of decision makers and likely stakeholders. Interviews with senior technologists and social scientists within the Minerals Down Under

National Research Flagship (MDU, part of the Australian Commonwealth Scientific and Industrial Research Organisation) were used to identify key factors that may inhibit or enhance uptake of Social Licence in Design.

Gehman J., Lefsrud, L. and Fast S. 2017. Social License to Operate: Legitimacy by Another Name? *Canadian Public Administration*, volume 60, Issue 2, pages 293-317. Available at https://www.researchgate.net/publication/316467963_Social_License_to_Operate_Legitimacy_by_Another_Name. Accessed 18 March 2025.
This article reviews academic, popular, and industry literature to identify and synthesise three models of SLO. Building on this review, the linkages between SLO and legitimacy are investigated, considering how the two concepts differ and overlap. The various methods used to measure SLO are also reviewed and the paper concludes with a discussion of the implications for stakeholder engagement and evolving models of regulation.

Gehman, J., Thompson, D., Alessi, D., Allen, D. and Goss, G. 2016. Comparative analysis of hydraulic fracturing wastewater practices in unconventional shale development: newspaper coverage of stakeholder concerns and social license to operate. *Sustainability* 8, 912. Available at https://www.mdpi.com/2071-1050/8/9/912. Accessed 18 March 2025.
This paper review prior literature regarding the concept of SLO licence to operate and related concepts, including corporate social responsibility, sustainable development, stakeholder management and cumulative effects. Using these concepts, a review was undertaken of newspaper articles published in North American provinces and states where unconventional oil and gas shales are located. Based on this review, coverage of stakeholder concerns related to hydraulic fracturing and wastewater practices and the extent to which these concerns vary over place and time was analysed. Results indicated that obtaining SLO is not a 'one size fits all' process and that by understanding which stakeholder concerns are most salient in particular places and times, oil and gas operators and regulators can tailor their strategies and policies to address local concerns.

Ginsberg, M. (2014). Beyond compliance – Advancing energy sector risk management. Available at https://www.linkedin.com/pulse/beyond-compliance-michael-ginsberg%2C-leed-ap/. Accessed 18 March 2025.
Energy firms have a range of approaches to risk mitigation and associated preparedness, with differences informed by corporate culture and approach. This forms a spectrum of corporate cultures that are reactive to proactive, and approaches that are compliant to strategic. For proactive companies, there has been a shift from considering environmental management and protection as burdensome regulation to viewing instead as an economic opportunity. Reactive companies continue to view environmental, social, and corporate governance (ESG) risks as a matter of compliance.

Gobel, M., Benet-Martinez, Mesquita, B. and Uskul, A. 2018. Europe's Culture(s): Negotiating Cultural Meanings, Values, and Identities in the European Context. Journal of Cross-Cultural Psychology, 49(6), pp. 858-867. Available at https://www.researchgate.net/publication/325853782_Europe's_Cultures_Negotiating_Cultural_Meanings_Values_and_Identities_in_the_European_Context. Accessed 18 March 2025.
Across seven research articles, this Special Issue explores what European cultures and European identity entail, how acculturation within the European cultural contexts takes place and under what conditions a multicultural Europe might be possible. It also discusses gaps in the current research agenda.

Gunningham N, Kagan R.A. and Thornton D. 2004. Social license and environmental protection: why businesses go beyond compliance. *Law Social Inquiry*. 29:307–341. Available at https://eprints.lse.ac.uk/35990/1/Disspaper8.pdf. Accessed 18 March 2025.
Research in this paper demonstrates that corporate environmental behaviour is not explained by just the obligation to comply with the law. In an increasing range of circumstances, the paper notes that companies consider going beyond compliance based on the perceived terms of their SLO, subject to the limitations

and realities of economic constraints. Going beyond compliance is considered more common in those companies operating in reputation sensitive industries.

Hall, N., Ashworth, P. and Devine-Wright, P. 2013. Societal acceptance of wind farms: analysis of four common themes across Australian case studies. *Energy Policy*, 58, pp. 200-208. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301421513001638. Accessed 18 March 2025.
High levels of societal resistance to wind farms, combined with new regulatory policies, indicate Australia's renewable energy target may not be dominated by wind power as anticipated. This paper considers seven case studies of wind farm deployment. Using qualitative interviews, analysis identified strong community support for wind farms but four common themes emerged that influence societal acceptance of wind farms in Australia: trust, distributional justice, procedural justice and place attachment. It is noted that unless these factors are addressed through integration into policy development and engagement approaches, wind energy is unlikely to provide the early and majority of new renewable energy.

Hall, N., Lacey, J., Carr-Cornish, S. and Dowd, A.-M. 2015. Social licence to operate: understanding how a concept has been translated into practice in energy industries. *J. Clean. Prod*. 86, 301–310. Available at https://www.sciencedirect.com/science/article/abs/pii/S0959652614008427. Accessed 18 March 2025.
The emergence of the SLO concept reflects increasing awareness by industries of the need to negotiate with communities and other stakeholders regarding the costs and benefits associated with industrial development. It has been assumed that all industries understand and apply SLO in a similar way, as previous research has tended to adopt a single-industry focus. This article is a cross-industry examination of SLO, comparing the use of this concept in four Australian energy industry contexts: mining, wind, carbon dioxide capture and storage, and geothermal. Semi-structured interviews with industry representatives were conducted to provide a comparison of views on the understanding and application of SLO in these industries. The findings identified shared expectations of increasing stakeholder engagement in energy project development, and a view that SLO could guide this engagement. However, there is evidence that the understanding, meaning and application of SLO are influenced by the duration of use and the maturity of the industry.

Horn, D., Gross, M., Pfeiffer, M. and Sonnberger, M. 2022. How Far Is Far Enough? The Social Constitution of Geothermal Energy through Spacing Regulations. Sustainability **2022**, 14, 496. https://doi.org/10.3390/su14010496. Accessed 20 March 2025.
This paper argues that near-surface geothermal energy is temporarily depletable and therefore the minimisation of unavoidable side effects such as cold plumes is crucial. Using Germany as a case study, the paper discusses how cold plumes and the impact of neighbouring ground source heat pumps constitute challenges for the existing regulatory framework, requiring negotiations drawing on expertise in planning law, geology, cultural habits and engineering to ensure the extraction of geothermal energy is carried out sustainably.

IAIA. 2015. Social Impact Assessment-Guidance for assessing and managing the social impacts of projects. Fargo: IAIA. Available at https://www.researchgate.net/publication/274254726_Social_Impact_Assessment_Guidance_for_Assessing_and_Managing_the_Social_Impacts_of_Projects. Accessed 18 March 2025.
This document builds on the IAIA's 2003 International Principles for Social Impact Assessment and provides advice to stakeholders about good practice in social impact assessment (SIA) and social impact management processes, especially in relation to project development such as dams, mines, oil and gas drilling, factories, ports, airports, pipelines, electricity transmission corridors, roads, railway lines and other infrastructure including large-scale agriculture, forestry and aquaculture projects. Users who will benefit from the god practice guidance include SIA practitioners / consultants, project developers / proponents, regulatory agencies, social specialists in international development organisations, staff with social-related

roles in financial institutions, development cooperation agencies, government planning agencies, communities and local peoples and civil society organisations.

IBLF and IFC. 2010. Guide to Human Rights Impact Assessment and Management. Available at http://www.ifc.org/hriam. Accessed 18 March 2025.
This interactive online tool provides companies with guidance on assessing and managing human rights risks and impacts of their business activities.

ICMM. 2024. Indigenous Peoples: Position Statement. Available at https://www.icmm.com/en-gb/our-principles/position-statements/indigenous-peoples. Accessed 18 March 2025.
This position statement from ICMM describes the various stakeholders with roles in protecting the rights of Indigenous Peoples (IPs). It notes that states have a fundamental role, including the decision on whether a project can proceed and a duty to consult IPs to obtain their free, and informed consent prior to the approval of projects that affect them (in accordance with the UN's Declaration on the Rights of Indigenous Peoples). Mining companies must respect the rights of IPs through meaningful consultation and engagement and seeking the consent of affected IPs for anticipated impacts on their rights. The position statement notes that ICMM members are committed to respecting the rights of IPs and to obtaining their freely given agreement to activities that may impact them, to create beneficial and equitable outcomes for all parties throughout a project's lifecycle.

ICMM. 2015. Stakeholder Research Toolkit. Retrieved from ICMM Stakeholder Research Toolkit. Available at https://www.icmm.com/en-gb/guidance/social-performance/2015/stakeholder-research-toolkit. Accessed 18 March 2025.
This toolkit from ICMM provides a methodology for companies seeking to work collaboratively with stakeholders to understand the key drivers of reputation. The methodology includes developing and applying meaningful survey methods and a set of metrics for measuring and monitoring reputation over time at local, national and global scales. Measuring and managing company and industry reputation enables the understanding and tracking of issues that matter to company and industry stakeholders (allowing issues of concern to be identified before they escalate) and helps to build trust by supporting the development of strategies, initiatives and programmes that are aligned with stakeholder needs or expectations. The toolkit is useful for community engagement, social performance, communications and external relations professionals and others within mining companies with roles related to the relationships between the company and external stakeholders.

ICMM. 2025. Integrated mine closure. Available at https://www.icmm.com/integrated-mine-closure. Accessed 18 March 2025.
Integrated mine closure is a dynamic and iterative process that considers environmental, social and economic factors from an early stage of mine development and throughout the life of an asset. Fundamental to this process is the need to consider closure as an integral part of the mine operations' core business. This document is intended to promote a disciplined approach to integrated closure planning and increase the uniformity of good practice across the mining sector, with concepts that apply equally to large and small mining companies. The structure of the guide reflects this process, providing good practice guidance to key elements of mine closure planning and implementation. It uses a risk and opportunity-based process to guide the practitioner through the iterative process of planning for final and progressive closure in a considered manner, as well as tactics for considering sudden or temporary closure. Originally, launched in February 2019, the guidance was updated in February 2025 to reflect the latest industry knowledge and guide companies to strengthen the governance and long-term stability of tailings storage facilities, as it relates to closure.

IFC. 2007. Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets. Available at https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-

ifc/publications/publications_handbook_stakeholderengagement__wci__1319577185063. Accessed 18 March 2025.
This handbook provides a comprehensive overview of good practice in stakeholder engagement, focusing on stakeholder groups that are "external" to the core operation of a business, such as affected communities, local government authorities, non-governmental and other civil society organisations, local institutions and other interested or affected parties. The handbook introduces the key concepts and principles of stakeholder engagement, providing practices that are known to work and the tools to support the delivery of effective engagement. It also explores how these principles, practices and tools can be used during different phases of the project cycle, from initial concept, through construction and operations, to divestment (sale) or closure and decommissioning.

IFC. 2012. Performance Standards. Available at https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards. Accessed 18 March 2025.
Part of IFC's Sustainability Framework, the Performance Standards are directed towards private sector clients, providing guidance on identifying risks and impacts. The Performance Standards are intended to promote sustainability by helping businesses avoid, mitigate and manage risks and impacts. They include requirements related to stakeholder engagement and disclosure by the company of project-level activities.

IFC. 2014. A Strategic Approach to Early Stakeholder Engagement. Available at https://commdev.org/publications/a-strategic-approach-to-early-stakeholder-engagement/. Accessed 18 March 2025.
The handbook provides a step-by-step guide to building trust and gaining and maintaining SLO across a range of project contexts and cultural settings, considering good practice approaches and tools such as addressing human rights and gender issues, participatory rural appraisal techniques, stakeholder mapping and analysis, communications and sustainability, strategic community engagement, grievance mechanisms and tips on conflict resolution. Although guidance is provided for each lifecycle stage for mining project, the emphasis is on exploration and early project planning, times when the financial and human resources to address stakeholder engagement issues may be most limited. Stakeholder relationships established at these early stages can influence ongoing relationships throughout a project's life: the handbook notes that early investment in relationship building with local communities and stakeholders can pay significant dividends throughout the lifecycle of a project, and especially during times of conflict or crisis.

International Energy Agency. 2024. Recycling of Critical Minerals. Strategies to scale up recycling and urban mining. A World Energy Outlook Special Report. Available at https://iea.blob.core.windows.net/assets/3af7fda6-8fd9-46b7-bede-395f7f8f9943/RecyclingofCriticalMinerals.pdf. Accessed 4 April 2025.
The shift to clean energy systems will drive increased demand for a range of critical minerals and metals such as copper, lithium, nickel, cobalt, rare earths elements and graphite. Meeting this demand is likely to require substantial investment in new mines and refining capacity in many different countries and regions. Reliance on primary materials from new mines and refineries can be reduced by recycling and at the same time recycling can improve security of supply for countries that have to import critical minerals or metals (if they are able to domestically recycle these). Recycling can also reduce the environmental and social impacts associated with mining and refining and reduces the volume of manufacturing and post-consumer waste containing valuable minerals and metals from being disposed in landfills. This report evaluates the current status of recycling of minerals critical to the energy transition, analyses the prospects for secondary supply under different scenarios, and outlines targeted policy recommendations to accelerate the uptake of recycling that can pave the way for more sustainable and secure future mineral supply chains.

Jartti, T., Litmanen T., Lacey J. and Moffat K. 2020. National level paths to the mining industry's Social Licence to Operate (SLO) in Northern Europe: the case of Finland. *Extract. Ind. Soc.*, 7 (2020), pp. 97-109. Available at

https://www.sciencedirect.com/science/article/abs/pii/S2214790X19303326. Accessed 18 March 2025.
Research on SLO is frequently focused on local communities directly affected by mining operations and there has been a lack of systematic research exploring attitudes to mining among the wider public. This paper uses a national survey to examine attitudes towards mining in Finland in 2016 and the factors affecting SLO at national level in diverse social, economic and political settings. Amongst the Finnish public, the factors with the greatest influence on SLO for mining are the balance between benefits and negative impacts, governance capacity, procedural fairness, equal distribution of benefits, resource nationalism and trust in the mining industry. The paper notes that building trust in the mining industry at a national level requires the combined efforts of industry and governments, rather than efforts by either in isolation.

Jijelava D. and Vanclay F. 2017. Legitimacy, credibility and trust as the key components of a social licence to operate: an analysis of BP's projects in Georgia. *J. Cleaner Prod*., 140 (part 3) (2017), pp. 1077-1086. Available at https://www.sciencedirect.com/science/article/abs/pii/S0959652616316808. Accessed 18 March 2025.
This paper considers how SLO can be applied in practice using BP's activities in Georgia as an example, with a particular focus on major oil pipeline and gas pipeline projects. The analysis focuses on three concepts that underlie SLO: legitimacy, credibility and trust. The paper assesses whether these concepts can be used to provide practical and useful results in assessing the SLO of a project proponent. The level of SLO achieved by BP for its projects in Georgia is then assessed and the paper draws lessons from BP's experience that can be used elsewhere.

Kagan R.A., Gunningham, N. and Thornton, D. 2003. Explaining Corporate Environmental Performance: How Does Regulation Matter? *Law and Society Review*. Volume37, Issue1, Pages 51-90. Available at https://www.researchgate.net/publication/227652994_Explaining_Corporate_Environmental_Performance_How_Does_Regulation_Matter. Accessed 18 March 2025.
This article considers how and to what extent regulations shape corporate behaviour through a study of environmental performance in 14 pulp and paper manufacturing mills in Australia, New Zealand, British Columbia (Canada) and the states of Washington and Georgia (USA). The importance of regulations compared to other incentives and the variation in corporate responses to law and other external pressures are also analysed. Analysis revealed tightening regulatory requirements and intensifying political pressure are in the main responsible for driving improved and converging environmental performance amongst leading and lagging pulp manufacturers, most of which have gone "beyond compliance" in several ways. However, pressure to obtain SLO from local communities and environmental activists explains the better performance seen at some facilities. Overall, environmental progress is dependent on regulation first and foremost, but influenced by market pressures and local and national environmental activists.

Komnitsas, K. 2020. Social License to Operate in Mining: Present Views and Future Trends. *Resources* **2020**, *9*, 79. https://doi.org/10.3390/resources9060079. Accessed 19 March 2025.
This paper discusses the current situation and the future prospects of granting SLO, mainly at the European Union (EU) level, considering the mine of the future (including deep sea and landfill mining) and the need for CRMs in high tech products and emerging and green technologies. It analyses the factors that may affect the views of involved stakeholders and the main technological, social, political and legal issues which are relevant to the process of obtaining SLO. The paper notes that SLO may be an important tool in future mining to safeguard the supply of raw materials, minimise the environmental footprint and improve the quality of life in affected regions. A conceptual flowsheet of the main steps to obtain SLO is proposed.

Lacey, J., Parsons R. and Moffat K. 2012. Exploring the Concept of a Social Licence to Operate in the Australian Minerals Industry. CSIRO, Brisbane. Available at https://www.researchgate.net/publication/265967712_Exploring_the_concept_of_a_Social_Licen

ce to Operate in the Australian minerals industry Results from interviews with industry representatives. Accessed 18 March 2025.
This report summarises the results of 16 interviews with representatives from the Australian minerals industry and its representative bodies about their understanding of SLO and its relation to existing sustainable development and corporate social responsibility (CSR) activities. There was little consensus on how SLO related to sustainable development and CSR, despite the understanding of SLO aligning with the extant literature. In general, interviewees found it easier to define when a project did not have SLO than when SLO had been obtained.

Lacey J. and Lamont, J. 2014. Using social contract to inform social licence to operate: an application in the Australian coal seam gas industry. *J. Clean. Prod*., 84 (2014), pp. 831-839. Available at https://www.sciencedirect.com/science/article/abs/pii/S0959652613008111. Accessed 18 March 2025.
This paper examines the status of SLO for the coal seam gas (CSG) industry in Australia. CSG has been the subject of significant social opposition from coordinated citizen action groups raising environmental, social, economic and technological concerns. SLO is presented as a consent-based and justice-based social contract between companies and communities, which provides an ethical framework for interactions between CSG companies and communities.

Lesser, P., Gugerell, K., Poelzer, G., Hitch, M. and Tost, M. 2021. European mining and the social licence to operate. The Extractive Industries and Society, Volume 8, Issue 2, June 2021, 100787. Available at https://www.sciencedirect.com/science/article/pii/S2214790X20302240. Accessed 18 March 2025.
This paper considers that the concept of SLO in Europe in relation to mining is still maturing due to the greater degree of trust in governance bodies and the role they play in prioritising the best interests of the citizens they serve. The community and societal drivers of SLO (and its loss) are investigated and proposes a 'Scalar SLO Model' that integrates community-level and societal-level SLO, noting that in Europe, good legislation and an active government are necessary for SLO.

Lesser, P., Poelzer, G. and Tost, M. 2020. MIREU Survey Results: Perceptions of Mining in Europe Summary Report. Available at https://mireu.eu/system/files/2020-09/MIREU%20Survey%20results%3A%20Perceptions%20of%20Mining%20in%20Europe_2020-09-21_2727.pdf. Accessed 18 March 2025.
An online survey entitled *The Perceptions of Mining in Europe* was conducted seven languages in the autumn of 2019 to clarify the relationship between individual attitudes toward mining (including metallurgy) and the most important conditions for the acceptance of mining (or if mining can be accepted at all). The survey was distributed via email to a wide range of individuals: academics, public officials, representatives from NGOs, industry representatives, students and members of communities near mines, with the intention of gathering data from different perspectives via snowball distribution. Although the respondents are not necessarily representative of any community, region, country or the EU itself, the survey served as a first test of whether there is something unique about Europe with respect to SLO and mining. Aspects and questions considered in the survey and analysed in the report include attitudes toward mining activity, the roles of various stakeholders, preferred approaches to SLO, the correlation between the socio demographic information and attitudes toward mining, the correlation between socio-demographic information and preferred approaches to SLO, and if the preferred approaches to SLO can be grouped together and help inform companies and authorities what else they need to consider when thinking about different stakeholder groups and their concerns.

Levine, A., Smith, L.E.P., Robins, J., Witter, E., Smith, C. and Haffner, C. 2022. *Non-Technical Barriers to Geothermal Development in California and Nevada*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-83133. Available at https://www.nrel.gov/docs/fy23osti/83133.pdf. Accessed 19 March 2025.

This paper analyses the non-technical barriers to geothermal development, such as federal, state, and local permitting and regulatory processes that constrain deployment of geothermal electricity in the USA.

Llaque, L. 2021. Strategies to Gain a Social License to Operate in the Mining Industry. Doctoral study submitted in partial fulfilment of the requirements for the degree of doctor of business administration. Walden University. Available at https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=11785&context=dissertations. Accessed 20 March 2025.
This paper uses qualitative case studies based on semi-structured interviews and document reviews to explore strategies used by mining project managers at five mining companies in Peru to obtain SLO. Three themes emerged: linking shared value to socioeconomic development, effective stakeholder management practices, and effective project leadership. The relationship between local community stakeholders and a mining project can be improved by promoting benefits associated with social wellness, environmental protection, and improving the local economy by increasing employment.

Luning S. 2012. Corporate Social Responsibility (CSR) for exploration: consultants, companies and communities in processes of engagement. *Resour. Policy*, 37, pp. 205-211. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301420711000110. Accessed 18 March 2025.
The article assesses the value of Corporate Social Responsibility (CSR) practices (a pre-cursor to the concept of SLO) in the context of company–community relations from early exploration to post-mining planning. It considers the gaps between guidance developed by large-scale mining companies and development agencies and the processes as implemented in the field, noting that the impact of social group heterogeneity in communities on social processes is underestimated.

Mathur, V.N., Price, A.D. and Austin, S. 2008. Conceptualizing stakeholder engagement in the context of sustainability and its assessment. *Construction management and economics*, *26*(6), 601-609. Available at https://www.tandfonline.com/doi/abs/10.1080/01446190802061233. Accessed 18 March 2025.
Stakeholder engagement is conceptualised from a strategic management perspective (capturing knowledge, increasing ownership of the project by users, reducing conflict, encouraging innovation and facilitating spin-off partnerships), ethical perspective (enhancing inclusive decision making, promoting equity, enhancing local decision-making and building social capital) and social learning perspective (in which diverse stakeholders use a common forum to learn about each other's values and create a shared vision and objectives). Although all three perspectives are important for sustainability, a management perspective is considered most common and its combination with an ethical perspective much less so, while a social learning perspective is rare. A dialogue-oriented approach is noted as a means of integrating the three perspectives.

McClean, A. and Pedersen, O.W. 2022. The role of regulation in geothermal energy in the UK. Energy Policy 173 (2023) 113378. Available at https://www.sciencedirect.com/science/article/pii/S0301421522005973. Accessed 18 March 2025.
Provides an in-depth analysis of the United Kingdom's regulatory regime as it applies to geothermal energy, considering specifically the regulation of environmental and financial risks of both shallow and deep geothermal energy. The paper notes that the piecemeal regulation of environmental impacts could be addressed through reform of the environmental permitting regime, including the protection of geothermal energy resources from over abstraction and the use of financial incentives to encourage growth of both shallow and deep geothermal energy industries. This would help to promote private investment, increasing the share of geothermal in the renewable energy mix in the UK.

Meesters, M., Wostyn, P., van Leeuwen, J., Behagel, J.H. and Turnhout, E. 2021. The Social Licence to Operate and the legitimacy of resource extraction, Current Opinion in Environmental

Sustainability, Volume 49, 2021, Pages 7-11, ISSN 1877-3435, https://doi.org/10.1016/j.cosust.2020.11.002. (https://www.sciencedirect.com/science/article/pii/S1877343520301123). Accessed 20 March 2025.
This article examines recent SLO literature to discuss how the SLO is conceptualised and enacted, focusing on who are considered to be relevant stakeholders, the ways in which stakeholders are engaged and how social and environmental impacts of extractive operations are considered. Analysis indicates there is a tendency to focus on the approval of local stakeholders without giving sufficient consideration to the diverse values, needs and interests of other stakeholders and potential role of these in underpinning the legitimacy of the SLO.

Melé, D. and Armengou, J. 2016. Moral legitimacy in controversial projects and its relationship with social license to operate: A case study. *Journal of business ethics*, *136*, 729-742. Available at https://link.springer.com/article/10.1007/s10551-015-2866-z. Accessed 18 March 2025.
This paper explores the role of moral legitimacy in providing ethical support for SLO and convincing a company's stakeholders and the general public of the ethical acceptability of its activities or projects. The paper proposes four criteria to evaluate moral legitimacy: (1) contribution of the project or activity to the common good in a better way than alternatives, (2) morality of the means and procedures employed, (3) ethical evaluation of the situation including stakeholder concerns and needs and (4) ethical evaluation of reasonably foreseeable consequences and how to minimise possible damage or risks, and balance foreseeable negative consequences and benefits. These criteria are examined using the construction of a rail tunnel for a high-speed train near the foundations of the Sagrada Familia (a famous church in Barcelona, Spain) as a case study.

Mercer-Mapstone, L., Rifkin, W., Louis, W. and Moffat, K. 2019. Power, participation, and exclusion through dialogue in the extractive industries: Who gets a seat at the table? *Resources Policy*, *61*, 190-199. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301420717305809. Accessed 18 March 2025.
Through processes falling under the banner of stakeholder engagement, SLO supports the greater provision of power to certain stakeholders by promoting their voices in the decision-making and approval processes of resource developments. This paper studies dialogue as a form of participatory engagement, examining the perceptions of stakeholder engagement practitioners involved in extractive industries regarding which community stakeholders tend to be included in dialogue and how the decisions to include (or not) are made. Other factors that facilitate or inhibit engagement in dialogue are described. Existing 'top-down' frameworks for stakeholder engagement were noted as driving exclusion, particularly of minority groups. A 'bottom-up' approach is proposed instead, to promote inclusivity, with more meaningful engagement supported by the development of capacity to understand information, communicate effectively and to deal with conflict amongst both company personnel and community members.

Mercer-Mapstone, L., Rifkin, W., Moffat, K. and Louis, W. 2017. Conceptualising the role of dialogue in social licence to operate. *Resources Policy* 54, 137–146. Available at https://ideas.repec.org/a/eee/jrpoli/v54y2017icp137-146.html. Accessed 18 March 2025.
SLO requires engagement and relationship-building efforts, which are increasingly expected to include 'meaningful dialogue'. There has been limited research on how such dialogue translates into practice in the context of SLO. This paper presents a conceptual framework to examine the role of dialogue in SLO strategies. Two dialogue models are considered: a learning model and a strategic model. The paper analyses how these models arise in five engagement frameworks drawn from academic literature, considering how the frameworks situate, conceptualise and seek to operationalise dialogue. This analysis indicates that dialogue in SLO is predominantly portrayed as a goal-oriented, strategic process rather than a learning and relationship-building process. However, the analysis is made less clear by multiple definitions of dialogue, which can sometimes refer to a process, sometimes to an outcome and sometimes to an aspiration.

Moeremans, B. and Dooms, M. 2021. An Exploration of Social License to Operate (SLTO) Measurement in the Port Industry: The Case of North America. Sustainability **2021**, 13, 2543. https://doi.org/10.3390/su13052543. Accessed 20 March 2025.
In this paper, exploratory research is undertaken to improve understanding of how the port industry measures the perceptions of local communities and public engagement. A survey was distributed to North American port managing bodies and terminal operators. The results show differences in how SLO is measured and in public engagement practices between port managing bodies and terminal operators. Follow-up interviews with port managing bodies were used to capture the value addition and barriers to engagement with local communities.

Moffat, K. and Zhang, A. 2014. The paths to social licence to operate: an integrative model explaining community acceptance of mining. *Resources Policy* 39, 61–70. Available at https://www.sciencedirect.com/science/article/pii/S0301420713001141. Accessed 18 March 2025.
This paper considers how SLO in mining is granted and maintained, considering the processes mining companies use to engage with local communities. Research measured and modelled the critical elements of SLO by conducting a longitudinal study in an Australian mining region, which showed that building trust with local communities was crucial for mining companies to obtain and maintain SLO. The mining operation's negative impacts on social infrastructure, community members' perceived contact quality and procedural fairness in dealing with company personnel significantly affected the community's acceptance of the mining operation through inferred trustworthiness of the company. The occurrence of worse than expected impacts reduced trust and acceptance among stakeholders. The results highlight the importance of fair treatment and high-quality engagement of mining companies with communities, alongside mitigation of operational impacts, in securing and holding SLO.

Moffat, K., Lacey, J., Zhang, A. and Leipold, S. 2016. The social licence to operate: a critical review, *Forestry: An International Journal of Forest Research*, Volume 89, Issue 5, 15 September 2016, Pages 477–488, https://doi.org/10.1093/forestry/cpv044. Accessed 20 March 2025.
SLO has been described as the combination of increasing pressures on industry performance (including demands by communities for greater involvement in decision-making) and the associated societal acceptance of such operations and reflects the evolving nature of the relationships between industries and their communities and other stakeholders. This article presents a critical review of the emergence of the SLO concept in industry practice over the last two decades. Recent applied research to measure and model SLO is examined to demonstrate how the roles of trust, fairness and governance may underpin the development of more sustainable, trust-based relationships between industry and society.

Morrison, J. 2014. *The Social Licence: How to Keep your Organization Legitimate*. Palgrave Macmillan, Basingstoke. Available at https://link.springer.com/book/10.1057/9781137370723. Accessed 18 March 2025.
This book explains the concept of SLO, with a particular focus on the underpinning importance of establishing legitimacy. The book provides an expert, experience-based analysis, using first-hand case studies to help readers understand and measure legitimacy.

Moser C., Rösch A. and Stauffacher M. 2015. Exploring societal preferences for energy sufficiency measures in Switzerland. *Front. Energy Res*., volume 3, pages 40. Available at https://www.frontiersin.org/journals/energy-research/articles/10.3389/fenrg.2015.00040/full. Accessed 18 March 2025.
Many countries are facing a challenging transition toward more sustainable energy systems, based on higher production from renewable sources and consumption of less energy. This paper surveyed and analysed societal preferences for different energy-related behaviours in Switzerland, considering mobility heating and food and the technical potentials for energy demand reduction in each of these domains. Participants in the survey were asked to consider trade-off situations in the form of different fictional lifestyles and to identify their preferred lifestyle. Survey results revealed that a vegetarian diet was

considered the aspect that participants were most unwilling to trade off, followed by distance to workplace and means of transportation. The highest willingness to trade off was found for adjustments in room temperature, holiday travel behaviours and living space. Participants' preferences for the most energy-sufficient lifestyles were rather, but lifestyles with substantive energy-saving potentials were well accepted. Overall, the study suggests that the success of energy-sufficiency interventions might be greater for well-balanced lifestyles, rather than extremely energy-sufficient lifestyles.

Murray-Webster, R. and Simon, P. 2006. Making sense of stakeholder mapping. *PM World today*, *8*(11), 1-5. Available at https://skat.ihmc.us/rid=1JGD4CJZ4-F9CF0Y-1KM6/SEMINAL%20stakeholder%20mapping%20in%203d.pdf. Accessed 18 March 2025.
This paper provides information on how to consider and understand stakeholders using different types of stakeholder mapping techniques. Grids or maps showing stakeholders (individuals or groups) mapped against their area of interest in the project or programme are compared with techniques that use two axes (labelled with features of stakeholder status or behaviour) to plot the relative position of each stakeholder with respect to those labels.

NSW Department of Planning and Environment (DPE). 2023. Social Impact Assessment Guideline. Available at https://www.planningportal.nsw.gov.au/sites/default/files/documents/2023/GD1944%20SIA%20Guideline_NEW%20VI_14_02_23.pdf. Accessed 18 March 2025.
Change associated with significant new projects can affect individuals, households, groups, communities, or organisations both positively and negatively. Identifying, understanding and evaluating social impacts through a Social Impact Assessment (SIA) helps to inform responses to avoid, mitigate or reduce potential negative impacts and enhance potential positive impacts. The SIA should be targeted and proportionate to the likely project impacts, and to the project's context.

Ngetich, G. and Gakuu, C. 2019. Influence of stakeholder management plan on project performance: A case of Olkaria geothermal power project, Nakuru County. *International Academic Journal of Information Sciences and Project Management*, *3*(5), 218-237. Available at https://www.iajournals.org/articles/iajispm_v3_i5_218_237.pdf. Accessed 18 March 2025.
This paper examines the influence of stakeholder engagement, analysis and mapping on performance at Olkaria Geothermal power project in Kenya, considering that stakeholders have significant influence on both the success and performance of projects. The study noted that stakeholder analysis and stakeholder mapping were highly correlated with performance while stakeholder engagement was the least correlated with performance. The study therefore recommended that the detailed assessment and analysis of both internal and external stakeholders should be recognised as a key factor by project managers, with stakeholder needs and expectations considered before project inception. The paper notes that stakeholder involvement in project decision making can be aided implementing good communication channels that ensure all stakeholders are engaged regarding project activities.

Oduor, J. 2010. Environmental and social considerations in geothermal development. Environment and energy: Policy and practice. FIG Congress 2010. Facing the Challenges – Building the Capacity. Sydney, Australia, 11-16 April 2010. Available at https://www.fig.net/resources/proceedings/fig_proceedings/fig2010/papers/ts01e/ts01e_oduor_3857.pdf. Accessed 18 March 205.
This paper discusses environmental and social considerations in geothermal development in Kenya, which mainly occurs along the Kenyan Rift. Land is mainly used for geothermal activities, wildlife conservation and ranches, with spontaneous settlements by the Maasai, a pastoral community, who are the indigenous inhabitants of the land and private landowners whose interest is mainly ranching and conservancy.

OECD. 2017. OECD Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector. Paris: OECD. Available at https://www.oecd.org/en/publications/2017/02/oecd-

due-diligence-guidance-for-meaningful-stakeholder-engagement-in-the-extractive-sector_g1g65995.html. Accessed 18 March 2025.
The OECD has prepared a Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector intended to provide practical guidance to mining, oil and gas enterprises in addressing challenges related to stakeholder engagement. Companies can contribute to positive social and economic development when they involve stakeholders, such as local communities, in their planning and decision making. This is particularly true in the extractive sector, which is associated with extensive social, economic and environmental impacts.

Onstad, C. and van der Flier-Keller, E. 2025. Preliminary Insights into Science Communication Strategies in Canadian Mining Messaging: A Mixed-Methods Perspective, EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-2911, https://doi.org/10.5194/egusphere-egu25-2911. Accessed 28 April 2025.
This study investigates how Canadian mining organisations employ science communication tactics, specifically framing, warmth, honesty, and relatability when engaging with the public and how these tactics influence engagement among audiences with pro-, anti-, and neutral attitudes toward mining. Systematic analysis was undertaken of survey responses, advertisements, corporate websites and corporate responsibility documents from various mining organisations. Public perceptions, knowledge and behaviours toward mining were compared before and after engagement with mining related messaging to inform best practices for transparent, relatable, and effective communication in the mining industry.

Owen J.R. and Kemp D. 2013. Social licence and mining: a critical perspective. *Resour. Policy*, 38 (1) (2013), pp. 29-35. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301420712000529. Accessed 18 March 2025.
This article discusses how best to frame the mining industry's social and environmental obligations and how these obligations can be met by the sector. While SLO is noted as contributing to raising the profile of social issues, it has not helped to articulate a collaborative developmental agenda for the sector or a path to restoring the lost confidence of impacted communities, stakeholders, and pressure groups. The article argues that the industry needs to reconcile its internal risk-orientation with external expectations, which will require a less defensive and more constructive approach to stakeholder engagement.

Ozcelik, M. 2021. Environmental and social impacts of the increasing number of geothermal power plants (Büyük Menderes Graben—Turkey). *Environ Sci Pollut Res* **29**, 15526–15538 (2022). https://doi.org/10.1007/s11356-021-16941-5
Geothermal power plants use a range of technologies to convert the source to electricity (dual, single flash, double flash, back pressure, and dry steam) and for cooling (water-cooled and air-cooled). Environmental risks and adverse / positive impacts vary depending on the conversion and cooling technology used and may include those related to land use and visual impacts, microclimatic impacts, impacts on flora-fauna and biodiversity, air emissions, water quality, soil pollution, noise, micro-earthquakes, induced seismicity, and subsidence, along with social and economic aspects. Before beginning geothermal energy activity, the positive and negative aspects of the project should be considered.

Parsons, R. and Lacey, J. 2012. Maintaining discursive legitimacy of a contested practice: How the Australian minerals industry understands its SLO. In: *Proceedings of the 5th Australasian Caucus of the Standing Conference on Organisational Symbolism*, Melbourne, Australia.
The concept of SLO suggests that stakeholders may threaten a company's legitimacy and ability to operate through boycotts, picketing or legal challenges. However, this does not mean that stakeholders have the same capacity as regulators to grant or withhold an operation's right to exist. This paper presents the findings of interviews with 16 managers in the minerals industry in Australia to assess how they conceptualise SLO in relation to notions such as legitimacy, approval and consent, how they interpret SLO processes in practice, and how they differentiate it from concepts such as corporate social responsibility. Findings suggest that, while social licence potentially represents a shift in power relations between the

company and its stakeholders, this shift is constrained by pressure to legitimise mining operations, to restrict social licence issues to the local level, to minimise regulatory impositions, to marginalise dissent and to manage reputation.

PDAC. 2024. Driving Responsible Exploration. Available at https://pdac.ca/driving-responsible-exploration. Accessed 18 March 2025.
The purpose of the original Environmental Excellence in Exploration programme developed by the Prospectors & Developers Association of Canada (PDAC) was to provide a series of free, detailed, practical, comprehensive and internationally accepted best practices for enhancing performance in mineral exploration. The programme has recently been rebranded as Driving Responsible Exploration (DRE) and the toolkits updated to better reflect the scope and application of these resources for PDAC members, stakeholders and industry partners.

Pedro, A., Ayuk, E. T., Bodouroglou, C., Milligan, B., Ekins, P. and Oberle, B. 2017. Towards a sustainable development licence to operate for the extractive sector. *Mineral Economics*, *30*, 153-165. Available at https://link.springer.com/article/10.1007/s13563-017-0108-9. Accessed 18 March 2025.
Managing extractive resources has always presented a major challenge for many countries worldwide, but especially in the developing world. This paper documents the shortcomings of existing governance of the extractive sector. It builds on SLO and proposes a new framework called the 'sustainable development licence to operate', which is intended to enhance the contribution of the mining sector to sustainable development. The underlying principles, policy options and best practices that form the basis of the proposed framework are outlined, recognising that this is a starting point and further work is required to develop the specific content and standards of the framework.

Prno, J. and Slocombe, D. 2014. A systems-based conceptual framework for assessing the determinants of a social license to operate in the mining industry. *Environ. Manag*. 53, 672–689. Available at https://pubmed.ncbi.nlm.nih.gov/24375075/. Accessed 18 March 2025.
SLO implies the need of project developers to acquire the widespread approval of local community members to avoid exposure to potentially costly conflict and business risks. This paper proposes a conceptual framework for assessing SLO and outcomes in the mining industry. The framework was developed based on a multi-year research project which involved international mining case study investigations, a comprehensive literature review, and interviews conducted with mining stakeholders and observers. The merits and challenges of the framework are discussed relative to a case study in Alaska (USA).

Roelfsema, A., Patrahau, I. and Rademaker, M. 2022. Cobalt mining in the EU Securing supplies and ensuring energy justice. September 2022. The Hague Centre for Strategic Studies. Available at https://hcss.nl/report/cobalt-mining-in-the-eu-securing-supplies-and-ensuring-energy-justice/. Accessed 19 March 2025.
Implementing a low-carbon energy system will drive demand for minerals required for green technologies, posing geopolitical, economic and environmental challenges to the European Union and its members. Cobalt is a relevant example: this element is essential in manufacturing lithium-ion batteries for electric cars and stationary applications, both central to the energy transition. At present 70% of global cobalt supply is mined in the Democratic Republic of Congo and 70% of global cobalt refining capacity is in China, but current domestic production in Europe is limited. The paper analyses the obstacles and possibilities for developing EU cobalt mines, noting that domestic mine development could become more attractive if communication is improved with local communities about the need for mining activities while acknowledging that mining will always impact the local environment.

Sale, H.A. 2019. The Corporate Purpose of Social License. Georgetown Law Faculty Publications and Other Works. 2171. Available at https://scholarship.law.georgetown.edu/facpub/2171. Accessed 20 March 2025.

SLO derives not from legally granted permission, but from the development of legitimacy, credibility, and trust within the relevant communities and other stakeholders. Using Wells Fargo and Uber as case studies, this article explores how the failure to account for the public nature of corporate actions can result in the loss of SLO regardless of whether a legal licence exists. The article notes that SLO can prevent demonstrations, boycotts, shutdowns, negative publicity and increases in regulation, but must be earned with consistent trustworthy behaviour. Discussing and developing SLO is suggested as a board-level activity, making it a part of strategic, proactive cost-benefit decision-making.

Santiago, A.L., Demajorovic, J., Rossetto, D.E. and Luke, H. 2021. Understanding the fundamentals of the Social Licence to Operate: Its evolution, current state of development and future avenues for research. *Resources Policy*, 70. 101941. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301420720309715. Accessed 18 March 2025.
This paper uses an extensive literature review to organise, map and analyse the evolution of SLO in the period 1996-2019, considering the theories that support the concept and the most influential studies that have guided its development. Results show that SLO evolution can be organised into five broadly representative stages, categorised as Historical Bases (1996–2002), SLO Recognition (2003–2006), First Management Models (2007–2011), Evolution of SLO Models and Initial Critical Studies (2012–2016) and Critical Studies and Increasing Complexity (2017–2019). Ultimately SLO has emerged as a self-sufficient field of knowledge, no-longer needing to borrow knowledge from other fields for its development.

Sjöberg, L., Moen, B. and Rundmo, T. 2004. *Explaining Risk Perception. An Evaluation of the Psychometric Paradigm in Risk Perception Research*. Rotunde publikasjoner, Rotunde no. 84, 2004. Norwegian University of Science and Technology, Department of Psychology, 7491 Trondheim, Norway. Available at https://www.studocu.com/row/document/university-of-ghana/psychology/psychometric-paradigm/5039800. Accessed 18 March 2025.
This report evaluates the relevance of the psychometric paradigm in risk perception research (the assumption that risk is subjective) and whether it can be used to predict perceived risk. The report concludes that most results reached in the paradigm are not sufficiently based on empirical data and appropriate analyses. Results show that demand for risk mitigation are related most strongly to seriousness of consequences of a hazard rather than the risk of an accident or the riskiness of an activity.

Smith, D.C. and Richards, J.M. 2015. Social License to Operate: Hydraulic Fracturing-Related Challenges Facing the Oil & Gas Industry, 1 Oil & Gas, Nat. Resources & Energy J. 81 (2015), https://digitalcommons.law.ou.edu/onej/vol1/iss2/2. Accessed 20 March 2025.
The overlap of urban development and oil and gas development can result in contentious community issues, with hydraulic fracturing a good example. Consequently, industry must address community issues, earning trust and SLO. This paper provides the background to SLO in the context of the oil and gas industry, particularly with respect to shale gas development. It discusses the current status of SLO for 'unconventional' oil and gas production (production that does not rely on traditional extraction methods), analyses current efforts by shale gas developers to establish SLO and identifies potential new methods of obtaining SLO.

Smits C.C.A., Justinussen J.C.S. and Bertelsen R.G. 2016. Human capital development and a Social License to Operate: Examples from Arctic energy development in the Faroe Islands, Iceland and Greenland. *Energy Research & Social Science*. Volume 16, June 2016, Pages 122-131. Available at https://www.researchgate.net/publication/301235835_Human_capital_development_and_a_Social_License_to_Operate_Examples_from_Arctic_energy_development_in_the_Faroe_Islands_Iceland_and_Greenland. Accessed 18 March 2025.
The Arctic region is opening up as sea ice and snow cover decline due to climate change, facilitating increased commercial fishing, shipping, oil and gas, mining and tourism. Obtaining and maintaining the support of local stakeholders in the Arctic is critical if governments and companies want these activities TO continue and contribute meaningfully to the resilience of Arctic societies. In particular, increased oil and

gas exploration and production have been the subject of public debate and attract a lot of national and international attention. This paper explores the role human capital development (the enhancement of people's skills, knowledge and abilities) in obtaining and maintaining SLO in Iceland, the Faroe Islands and Greenland, focusing on trust and legitimacy as two fundamental principles. Using three case studies, the paper explores how human capital development can contribute to the legitimacy of Arctic energy development and trust building between various stakeholders.

Soltani M., Kashkooli F.M., Souri M., Rafiei B., Jabarifar M., Gharali K. and Nathwani J. 2021. Environmental, economic, and social impacts of geothermal energy systems. *Renewable and Sustainable Energy Reviews* 140 - 110750. Available at https://www.sciencedirect.com/science/article/abs/pii/S1364032121000459. Accessed 18 March 2025.

This paper provides a detailed review of the factors influencing the development and future of geothermal energy, including barriers to wide deployment of geothermal resources. Key barriers are noted as including high capital costs, location and quality of resource at different depths and opposition by local communities based on environmental and social concerns. It identifies solutions and options for enhancing geothermal capacity and energy production considering the scale required to meet global 'net-zero' carbon emission targets.

Spijkerboer, R.C., Turhan, E., Roos, A., Billi, M., Vargas-Payera, S., Opazo, J. and Armiero, M. 2022. Out of steam? A social science and humanities research agenda for geothermal energy, Energy Research & Social Science, Volume 92, 2022, 102801, ISSN 2214-6296, Available at https://doi.org/10.1016/j.erss.2022.102801. Accessed 19 March 2025.

The potential of geothermal energy for energy transition is increasingly recognised by governments around the world. Whether geothermal energy is a sustainable source of heat and/or electricity depends on how it is deployed in specific contexts. Based on a review of existing literature, there is limited attention to geothermal energy from a social science and humanities perspective, with the focus instead on technological or geological aspects. This article considers social science research as an important way of exploring the benefits and drawbacks of geothermal energy, but notes that current social science and humanities studies tend to be limited to descriptive analyses. Three complementary theoretical approaches used to observe and address other forms of energy and energy transition are suggested as more rigorous approaches: socio-technical assemblage (a dynamic network comprising social elements such as people, institutions, norms and technical components such as technology and infrastructure), systems (involving the interaction of technical systems and humans) and imaginaries (the visions, symbols and associated feelings that people have about something).

Stauffacher M. 2015. Risk governance for induced seismicity: a view from the social sciences. AGIS Workshop on Induced Seismicity, 10 - 13 March, 2015, Davos Schatzalp. Available at http://www.seismo.ethz.ch/en/static/schatzalp/2015/Stauffacher.pdf. Accessed 18 March 2025.

This presentation presents a review of risk governance of induced seismicity, introducing the International Risk Governance Council's core documents and Risk Governance Framework, noting that communication is key throughout the process. It analyses the importance of risk perception and of socio-political context. The presentation explores how induced seismicity has been reported in the media and how external events can affect such reporting. Social science and the analysis of local/national socio-political-cultural context can contribute to improved understanding of geothermal energy and its risks and public acceptance, but requires integration with technical and environmental aspects (rather than being considered as an 'add-on') to positively influence stakeholder engagement.

Stronge, D. C., Kannemeyer, R. L. and Edwards, P. 2024. Building social licence to operate: A framework for gaining and maintaining meaningful, trustworthy relationships. *Resources Policy*, *89*, 104586. Available at https://www.sciencedirect.com/science/article/pii/S0301420723012977. Accessed 18 March 2025.

This paper notes that despite its increasing use, the meaning and application of SLO are still poorly understood and that in the absence of a clear understanding, organisations may mistakenly believe their approach will obtain and maintain SLO, only to find the outcomes are not as expected. Drawing on SLO literature, interviews with SLO researchers and workshops with social researchers experienced with stakeholder engagement, the paper provides a framework to guide organisations in gaining and maintaining SLO by building and maintaining trustworthiness through meaningful relationships. The paper notes there is no single solution to building and maintaining relationships (an essential prerequisite to SLO); focusing on the process rather than prescriptive methods provides the flexibility to adjust to a specific context.

Suopajärvi, L., Eerola, T., Poelzer, G.A., Panttila, H., de Ketelaere, D., Spiteri, A. and Lindahl, K.B. 2019. Mapping key factors influencing effectiveness of social license during the exploration phase. Horizon 2020 Project: NEXT (New Exploration Technologies). Available at https://new-exploration.tech/media/pages/media-news-events/deliverables/downloads/d5-1-key-factors-for-slo-during-exploration-phase/975c6f3386-1657031352/d5.1_mapping-key-factors-influencing-effectiveness-of-social-license-during-the-exploration-phase.pdf. Accessed 20 March 2025.

This is a report from the NEXT (New Exploration Technologies) Project financed by the European Commission H2020 Program, examining the role of new technologies in establishing SLO for mineral exploration projects. Limited academic investigation of SLO has been done in the context of mineral exploration and the institutional, contextual, communicative and technological factors that affect SLO at the exploration stage remain largely unknown. However, relevant practices can be drawn from more general SLO related literature. The report provides a review of relevant literature, supported by a survey of public-facing websites of mineral exploration companies. The major challenges of establishing SLO during exploration are noted as the dispersive and transitory nature of exploration activities, along with the uncertainty and ambiguity of outcomes. The limited funding available for an activity that more often than not will not lead to a successful project is identified as an obstacle to companies proactively engaging stakeholders. Research indicates that companies are not communicating technological innovations on their websites, limiting the ability to analyse how technological innovation can influence SLO.

Sustainability First. 2020. *Developing and Embedding a Sustainable Licence to Operate and a Purposeful Business Approach. A 'How-To' Guide for Public Utilities*. Fair for the Future Project. September 2020. Available at https://sustainabilityfirst.org.uk/publications/project-research-reports/developing-and-embedding-a-sustainable-licence-to-operate-and-a-purposeful-business-approach-a-how-to-guide-for-public-utilities/. Accessed 20 March 2025.

This 'how-to' Guide aims to assist UK regulated public utility providers (energy, water and telecommunications) with adopting a 'public purpose' approach in their business, which places the needs of people and planet before short-term profit and embeds economic, environmental and social sustainability in the business' core functions. This has been referred to as a 'Sustainable Licence to Operate' and is aligned with the concept of being a responsible business. A comprehensive and practical framework is provided for companies and includes a set of key checklists for senior leaders to use when considering how to implement a 'public purpose' approach. The Guide also provides a set of case studies as examples to illustrate where businesses have gone beyond legal requirements to deliver positive social and environmental outcomes for consumers, citizens and communities.

Sustainable Business Council. 2014. Social Licence to Operate Paper. Available at https://www.securityhumanrightshub.org/media/pdf/resources/Social-Licence-to-Operate-Paper.pdf. Accessed 19 March 2025.

This paper covers the concept of SLO, a review of what the New Zealand public sees as risks to New Zealand businesses' licence to operate, tools being used by leaders in the field and options for the Sustainable Business Council and BusinessNZ to contribute to the improvement of SLO for New Zealand businesses.

Szanyi, J., Rybach, L. and Abdulhaq, H.A. 2023. Geothermal Energy and Its Potential for Critical Metal Extraction—A Review. Energies 2023, 16, 7168. https://doi.org/10.3390/en16207168. Available at https://www.mdpi.com/1996-1073/16/20/7168. Accessed 18 March 2025.
The integration of geothermal energy with critical metal extraction is a paradigm and synergistic shift in sustainable resource utilisation. This paper reviews existing geothermal technologies and extraction methods to define a coherent framework that merges energy production with environmental stewardship. It assesses current metal extraction techniques and evaluates their compatibility with geothermal brine characteristics, proposing optimised pathways for maximum yield. Using detailed case studies and empirical data, the paper examines the economic and environmental advantages of this approach, from reduced carbon footprint to enhanced energy efficiency and resource recovery. This combined approach can also open new, unexplored and previously untapped resources.

Talis Consultants. 2022. Social Licence to Operate in the Waste and Resource Recovery Sector. Prepared for Waste Management and Resource Recovery Association of Australia. 27 June 2022. Available at https://www.wmrr.asn.au/common/Uploaded%20files/Reports/Social%20Licence%20to%20Operate%20in%20the%20Waste%20and%20RR%20Industry%20Toolkit%201.7.pdf. Accessed 21 March 2025.
This report defines guiding principles for the concept of SLO and how it is established and maintained in the specific context of the waste and resource recovery industry. The report notes that industries or activities that may impact the environment (through their size, nature of operations or emissions) have the greatest need for good SLO maintenance to ensure an ongoing positive relationship with affected communities and with society at large. Advice and guidance are provided with respect to building trust and engaging with communities and society.

Taylor, D.F.P. and Mahlangu, S. 2017. Earning the Social Licence to Operate – A case study about culture, 5th International Conference on Management, Leadership and Governance, 16-17 March 2017, Wits Business School, Johannesburg, South Africa. Available at https://www.researchgate.net/publication/315282855_Earning_the_Social_Licence_to_Operate_-_A_case_study_about_culture. Accessed 18 March 2025.
This paper defines SLO as the implied consent by affected stakeholders for businesses to operate, independent from legal or statutory requirements. SLO has been used by the mining industry as a measure of the quality of relationships with affected communities. It is assumed that communities will grant SLO to a company that establishes its legitimacy, is consistently credible and ultimately demonstrates its trustworthiness through the development of a long-term relationship with the communities. Based on the literature a tentative is proposed and then tested. Using a case study of the processes followed to resettle the residents of Dingleton in the Northern Cape to allow the Sishen Mine to further expand its operations, the paper proposes a model of trust development to earn SLO. The most important issues related to appreciating the culture and value systems of the community – this 'culture gap' and its implications for obtaining and maintaining SLO, are of significance for the entire extractive industry as it can prevent the full development of trust between communities and a project.

The Geological Society. 2022. Decarbonising heat with geothermal energy. A policy and technology explainer from the Geological Society. Available at https://www.geolsoc.org.uk/~/media/shared/documents/policy/briefing%20notes/Geothermal%20Briefing%20Note%20Typeset%20FINAL%20Mar%202022%20(2).pdf?la=en. Accessed 18 March 2025.
Describes the sources of geothermal energy, the UK's net zero strategy, policy challenges and opportunities and the role of geoscientists in increasing the use of geothermal energy resources.

Thomson, I. and Joyce, S. 2008. The Social Licence to Operate: What it is and why does it seem so difficult to obtain? In PDAC Convention. Available at https://oncommonground.ca/wp-content/downloads/PDAC_2008_Social_Licence.pdf. Accessed 18 March 2025.

This paper highlights some of the problems that mining exploration teams can face in the early stages of a mining project. These include the confusion of acceptance for approval, co-operation for trust and technical credibility for social credibility. At the same time, exploration teams may have limited understanding of the local community and its dynamics and internal relationships, and may delay stakeholder engagement or fail to spend sufficient time on building relationships or listening to communities.

Thomson, I. and Boutilier, R. 2011. The social license to operate. In: Darling, P. (Ed.), SME Mining Engineering Handbook, 3rd ed. Society for Mining, Metallurgy, and Exploration, Englewood, Colorado, pp. 1779–1796. Available at https://www.researchgate.net/publication/285474394_The_social_licence_to_operate. Accessed 18 March 2025.
Provides an overview of the development of the SLO concept in the context of mining and the benefits of obtaining and maintaining SLO. Considers several activities that strengthen relationships and the values that underpin SLO, including respect and inclusivity, transparency and honesty, willingness to listen and empathy, prompt responses and keeping promises, goodwill and care (protecting each other's interests) and clear rules and principle-based actions. While these values cannot be quantified in the same way as engineering or accounting aspects of a project, they are nevertheless key to creating good and stable relationships.

Tost, M., Lesser, P., Poelzer, G., Akhouri, U. and Gugerell, K. 2021. Social Licence to Operate (SLO) Guidelines for Europe. MIREU (Mining and Metallurgy Regions EU) Deliverable 4.3. Available at https://mireu.eu/sites/default/files/2021-05/D%204.3.pdf. Accessed 18 March 2025.
These SLO Guidelines are intended to support all stakeholders in building relationships based on trust with one another. In tangible terms this means that companies and governments should be open and straightforward about potential risks, listen to stakeholder input and design the project or activity accordingly. Companies should be responsive and adaptive, respect customs and political and authority structures, and, where appropriate, gain FPIC (free, prior and informed consent). While these are now widely considered to be global good practices, the Guidelines approach SLO from the European perspective. Section 2 includes a description of SLO in the European context and SLO principles. As SLO can often be used for addressing everything from environmental concerns, to worries about jobs and the economy, to community identity and human rights issues, a model of SLO tailored to Europe is presented in order to organise, and therefore be able to discuss, the key components of SLO. The model consists of both the local perspective of community acceptance of a mining project and adds a dimension emphasising the role of broader society. It also describes the different levels of SLO as well as the loss of SLO. The higher the level of SLO, the lower the risk that a project will have significant opposition. Overall, risk is reduced by aiming for higher levels of SLO.

Trutnevyte, E. and Ejderyan, O. 2018. Managing geoenergy-induced seismicity with society. *Journal of Risk Research*, 21(10), 1287–1294. Available at https://www.researchgate.net/publication/313057977_Managing_geoenergy-induced_seismicity_with_society. Accessed 18 March 2025.
Onshore oil and gas extraction, associated wastewater injection, deep geothermal systems, and carbon capture and storage can induce seismicity, which is a potentially controversial issue. Most research to date has been limited to technical aspects of seismic hazard and risk, but this paper argues for the need for social insights to inform risk communication when discussing geoenergy-induced seismicity with society, in particular the communication of uncertainties, expert confidence and general and very low probabilities. It is noted that addressing warning signs of public concern in a timely and constructive manner can reduce the risk of greater resistance at a later stage.

Uffman-Kirsch, L.B., Richardson, B.J. and van Putten, E.I. 2020. A New Paradigm for Social License as a Path to Marine Sustainability. *Front. Mar. Sci*. 7:571373. doi: 10.3389/fmars.2020.571373. Available at https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2020.571373/full. Accessed 20 March 2025.

This paper examines the positive contributions that engaged communities can make to marine governance and relates it to SLO, defined here as both an extra-legal approval that communities give and a legally sanctioned power to deliberate. This paper builds on theories from law, social, and political science to suggest that robust public deliberation provides marine use actors methods to earn and sustain their SLO. Informed and empowered public engagement helps governments to make socially legitimate and environmentally acceptable decisions, with governmental legitimacy bolstered by ensuring public engagement opportunities are provided, with the engagement outcomes acted on.

Union of Concerned Scientists. 2013. Environmental impacts of geothermal energy. Available at https://www.ucsusa.org/resources/environmental-impacts-geothermal-energy. Accessed 18 March 2025.
Describes the potential environmental impacts associated with different types of geothermal power plants and associated electricity generation (such as direct steam, flash or binary) and the type of cooling technology used (water-cooled and air-cooled). Geothermal resources covered include those that use hot water from geologic "hot spots" (where molten rock is close to the surface) and hot dry rocks (where water is heated by pumping into hot rocks at depth).

Van Duin, D. 2023. PUSH-IT. Webinar: Understanding the Social Aspects of Geothermal Energy. Available at https://www.push-it-thermalstorage.eu/wp-content/uploads/2024/03/Webinar_Understanding_the_social_aspects_of_geothermalenergy_PC.pdf. Accessed 18 March 2025.
Although geothermal energy is not new and has been used for centuries, it is still a niche energy source due in part to limited knowledge about the technologies used amongst communities and resistance by local people living close to proposed sites. This webinar notes that, in turn, the limited experience with geothermal energy has resulted in relatively little research into the social aspects compared to other renewable sources.

Vanclay, F. and Hanna, P. 2019. Conceptualizing company response to community protest: principles to achieve a social license to operate. *Land*, *8*(6), 101. Available at https://www.mdpi.com/2073-445X/8/6/101. Accessed 18 March 2025.
The paper notes that to gain SLO, companies should treat communities with respect and be mindful of local culture and have effective community engagement activities, social impact assessment processes, environmental and social impact management procedures, and human rights-compatible grievance redress mechanisms in place. Collectively, these support early identification of negative environmental and social impacts, avoiding the escalation of social risk, while their absence means there will be no SLO. Community protests are viewed as warning signs and opportunities for companies to improve through meaningful dialogue with protesters. The paper identifies around 175 actions companies might take in relation to community protest and discusses how these actions variously have the potential to escalate or de-escalate conflict, depending on whether the company engages in appropriate and genuine interaction with protesters or if repressive measures are used instead. Early action to address community concerns is noted as a way of enhancing SLO.

Vargas-Payera S., Martinez-Reyes A. and Ejderyan O. 2020. Factors and dynamics of the social perception of geothermal energy: Case study of the Tolhuaca exploration project in Chile. *Geothermics* 88, 101907. Available at https://www.sciencedirect.com/science/article/abs/pii/S0375650520301991. Accessed 18 March 2025.
This paper analyses local stakeholders' perceptions of the Tolhuaca geothermal exploration project in Chile from 2009 until its cancellation in 2016 for financial reasons. Focus group discussions and interviews were used to reconstruct changes in the perceptions of local stakeholders throughout the project's life. The results indicate that stakeholders' perceptions were not only influenced by the company's engagement activities, but also by the exploration project activities and contextual elements, leading to the conclusion that understanding the

interplay between these factors is crucial when planning the stakeholder engagement process of geothermal projects.

Voyer and van Leeuwen. 2019. "Social license to operate' in the Blue Economy". *Resources Policy*, 62, 102-113. Available at https://www.sciencedirect.com/science/article/pii/S0301420718303878. Accessed 18 March 2025.
This paper explores the role that SLO is currently playing in ocean industries and the applicability of SLO at a cross-sectoral scale rather than for individual companies, examining how the concept may inform debates over appropriate private use of public ocean resources. A case study was used to explore perceptions of who grants SLO, what kind of concerns impact SLO and how sectors work to obtain or maintain SLO. The study highlighted that many current SLO challenges experienced by ocean industries relate to conflicting social and political values and that attempts to address these challenges to date focus mainly on technical or technological adaptations rather than broader societal and political engagement on the appropriate use and management of private sector activities in the ocean.

Were, J., Chepkwony, G., Oduor, J. and Smith, C. 2021. Sharing Value Based Practices of Community Engagement for Geothermal Development: Kenya and New Zealand Partnership. Proceedings World Geothermal Congress 2020+1, Reykjavik, Iceland, April - October 2021.
This paper examines community engagement challenges, failures and successes in the context of geothermal development, drawing on the experiences of Māori (New Zealand) and Maasai (Kenya) communities. Using joint open discussions, situation analysis, separate breakout sessions involving the two indigenous communities and respective geothermal producing companies, site visits and general observations, strategic actions and vision were proposed that engender mutual benefits and shared values. These are intended ensure a sustainable partnership between communities and companies, safeguarding companies against risks, legal suits, project delays and civil disturbances and supporting the interests of the host communities.

Widya Yudha, S. and Tjahjono, B. 2019. Stakeholder mapping and analysis of the renewable energy industry in Indonesia. *Energies*, *12*(4), 602. Available at https://www.mdpi.com/1996-1073/12/4/602. Accessed 18 March 2025.
The development of renewable energy in Indonesia is new but forecast to increase under strategic programmes prepared by the government. This paper provides a stakeholder analysis of relevant and major actors in the renewable and sustainable energy sector in Indonesia, using a Political, Economic, Social, Technological, Legal and Environmental (PESTLE) analysis methodology. Results indicate that existing policies can be improved to reduce the technological and economic risks for those involved in developing renewable energy by, for example, promoting conditions to increase investment.

Wilburn, K. and Wilburn, R. 2011. Achieving social license to operate using stakeholder theory. *J Bus Ethics*. 4:3–16. Available at https://www.researchgate.net/publication/284663470_Achieving_social_license_to_operate_using_stakeholder_theory. Accessed 18 March 2025.
Some companies are adopting SLO, as part of their corporate social responsibility (CSR) strategy. This paper provides background on CSR and SLO, using examples to support the business case for implementing these strategies. Using stakeholder theory to identify and classify stakeholders, stakeholders can be divided into two groups: vested and non-vested. The former are noted as having a 'vote' in awarding SLO, while the latter have only 'a voice'. Alignment of the norms and values of the company with those of stakeholder groups allows SLO to be negotiated successfully in different countries and cultures.

Wilburn, R. and Wilburn, K. 2014. Social License to Operate as a Business Strategy. *Organizational Cultures: An International Journal* 13 (3): 21-32. Available at https://www.researchgate.net/publication/307038851_Social_License_to_Operate_as_a_Business_Strategy. Accessed 18 March 2025.

This paper considers stakeholder theory to determine the stakeholders that should be involved in granting SLO. It describes examples of SLO in different countries by different companies, noting that meeting corporate requirements and governmental regulations does not guarantee a business will be successful when operating in a new area, but the processes required to obtain SLO can create trust and help to build partnerships between a company and its stakeholders.

Wüstenhagen, R., Wolsink, M. and Bürer, M.J. 2007. Social acceptance of renewable energy innovation: an introduction to the concept. *Energy Policy* 35, 2683–2691. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301421506004824. Accessed 18 March 2025.

Social acceptance may be a constraining factor in achieving renewable energy targets as the potential negative impacts of some technologies (such as the visual impact of wind energy) become the subject of debates in several countries. This paper considers social acceptance in the form of socio-political, community and market acceptance and notes that factors influencing socio-political and community acceptance can be used to explain the apparent contradictions between general public (societal) support for renewable energy innovation and the successful construction and operation of specific projects.

Zanini, M. T. F., Migueles, C. P., Gambirage, C. and Silva, J. 2023. Barriers to local community participation in mining projects: The eroding role of power imbalance and information asymmetry. *Resources Policy*, *86*, 104283. Available at https://www.sciencedirect.com/science/article/abs/pii/S0301420723009947#:~:text=Our%20results%20suggest%20that%20power,affect%20their%20safety%20and%20wellbeing. Accessed 18 March 2025.

Mining activities produce environmental, economic, and social impacts that may affect the quality of people's lives in surrounding communities. Community participation in decisions that can affect their safety and wellbeing is essential for reducing the risks and vulnerabilities of the local population. This paper examines aspects that negatively affect community participation in mining projects and how these aspects impact trust in company-community relations and the implications for obtaining and maintaining SLO. The paper provides a Brazilian case study on community participation in two areas that suffered the consequences of major tailings storage failures (Brumadinho 2019; Mariana 2015). Analysis suggest that power imbalance and information asymmetry are critical obstacles to community participation, suggesting that in some cases communities have no power to participate in the decisions that affect their safety and wellbeing.

Zhang, A., Moffat, K., Lacey, J., Wang, J., González, R., Uribe, K., Cui, L. and Dai, Y. 2015. Understanding the social licence to operate of mining at the national scale: a comparative study of Australia, China and Chile. *J. Clean. Prod.* 108 (Part A), 1063–1072. Available at https://www.researchgate.net/publication/280609619_Understanding_the_social_licence_to_operate_of_mining_at_the_national_scale_A_comparative_study_of_Australia_China_and_Chile. Accessed 18 March 2025.

This study examines how the distribution of benefits of mining, fairness in the interactions between the mining industry and society, and confidence in governance of the industry are perceived and the implications of these perceptions for trust between the public and the mining industry. Large-scale national surveys in Australia, China and Chile confirmed that distributional fairness, interaction fairness, and confidence in governance affected the acceptance of mining and influenced the level of public trust in the mining industry to varying degrees across the three countries, highlighting that acceptance of mining is highly context dependent.

Annex: Example summary of the Guidelines for distribution to external project stakeholders

The importance of critical raw materials

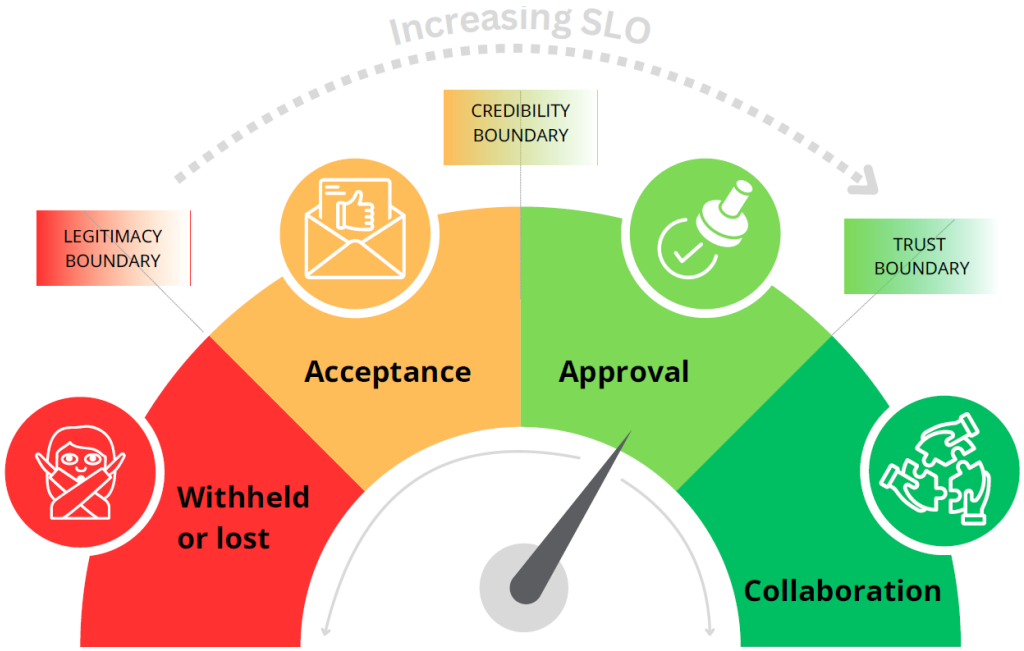
Many minerals and metals are required to support the current shift away from fossil fuels and towards the implementation of low-carbon technologies, electrification and improved energy storage. The minerals and metals that are the most important economically and have a high supply chain risk are often collectively called critical raw materials (CRMs). Demand for CRMs is rising rapidly and increased production will be necessary to meet this demand.

Combined geothermal – metal extraction projects

Although CRMs have historically been produced by 'traditional' mining, extracting them from geothermal waters represents a new way of supplementing or replacing materials produced by traditional mining. These combined geothermal – metal extraction projects offer the prospect of reducing the environmental, social and societal risks and negative impacts associated with mineral and metal production.

Social licence to operate

In simple terms, social licence to operate (SLO) reflects the degree to which a company and its activities meet the expectations of local communities and other stakeholders throughout the life of a project. It is a means of encouraging companies to set and achieve high standards. SLO is not something that a combined extraction project either has or not – it instead exists on a sliding scale, which is reflected in the relationships a local community and other stakeholders have with the project.



Projects that have no SLO, or that have lost their SLO, are less likely to be considered legitimate, while increasing SLO will help to establish a project's credibility, where stakeholders believe project information. At the next level, SLO is reflected in trust in a project, where stakeholders believe the project is 'trying to do the right thing' and develop a more collaborative relationship.

Ambitions of the project

The performance of a project can be measured against a range of ambitions, including:

- **Ensuring legal compliance** – although complying with laws and regulations is not the same as SLO, the latter is not possible without the former.
- **Doing no harm** – in effect, the implementation of appropriate measures by the project to protect health, safety, the environment and internationally recognised human rights.
- **Employing engagement experts early** – ensuring activities to obtain and maintain SLO are integrated with project activities from the earliest possible point in the project lifecycle.
- **Understanding the project's context** – the specific cultural, historical, political, economic, environmental and social context that can influence the concerns and view of local communities and other stakeholders.
- **Identifying and engaging stakeholders** – these are the individuals, groups or institutions that have a direct or indirect interest in, and can impact or be affected by, the project.
- **Communicating honestly and transparently** – SLO is closely linked to, trust, legitimacy and credibility communities and therefore stakeholders expect a project to be honest and transparent about what it is doing and why, the likely risks, negative impacts and benefits, making information and data available and accessible on a consistent, ongoing and frequent basis.
- **Understanding stakeholder concerns and views** – acknowledge the fact that stakeholder concerns and views may be quite different from a project's own analysis of risks, negative impacts, opportunities and benefits.

If a project fails to consider or apply these principles, it is likely to find obtaining and maintaining SLO more complicated, time-consuming and expensive.

Stakeholders

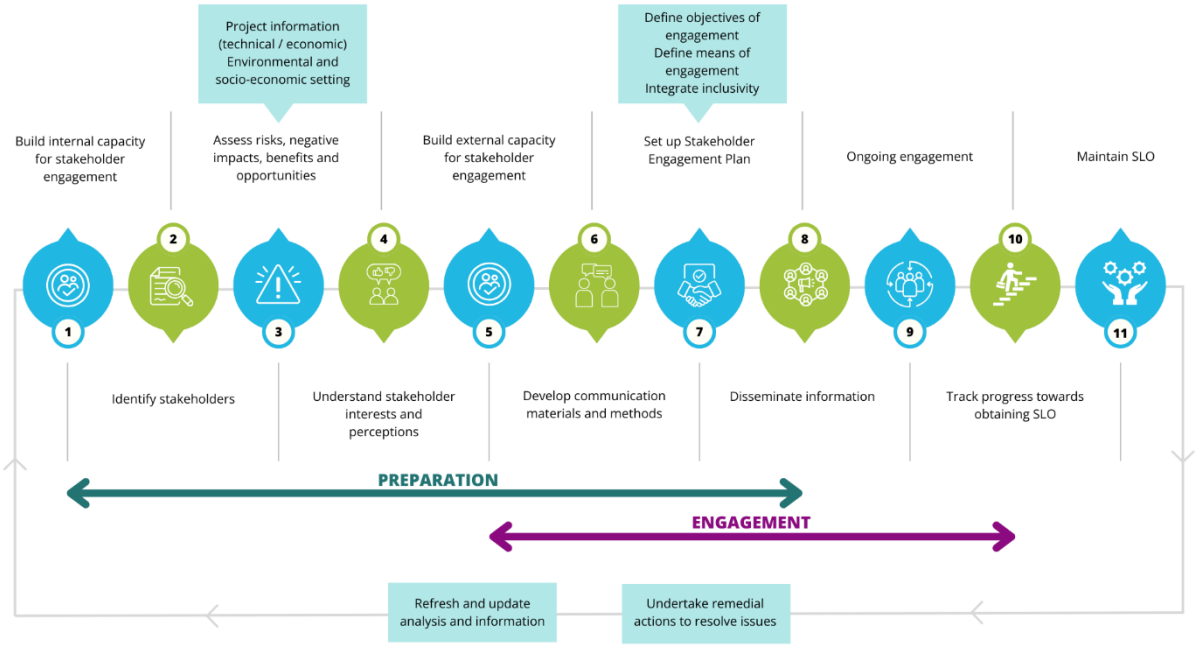
The nature and mix of stakeholders will vary from one area to another and from one project to another. In broad terms, stakeholders are the individuals, groups or institutions that are geographically close to a combined extraction project, and those that are more remote but with some interest in how a project is planned and operated.

Steps to obtain and maintain SLO

In broad terms, the steps a project is likely to follow to obtain and maintain SLO include:

- **Preparation** – getting ready by identifying stakeholders, identifying and assessing risks and negative impacts and how these differ from stakeholder perceptions, and defining the benefits and opportunities a project is expected to deliver. This stage may also include building internal and external capacity for stakeholder engagement, ensuring all parties are able to engage meaningfully.
- **Engaging effectively and obtaining SLO** – developing clear communication materials and effective methods of engagement, tracking progress and ensuring available resources are used as efficiently as possible.
- **Maintaining social licence to operate** – continuing to conform with the underlying principles and implement stakeholder engagement processes and activities, recognising that

some aspects may need to be adapted as the project evolves or remedial actions developed when issues arise.



Although shown as a sequential process, a project may begin multiple activities at the same time and undertake these in parallel rather than sequentially.