DATA IN ACTION

Natural Resources Disclosure for People and Progress

DISCUSSION PAPER | JANUARY 2020

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About the From Disclosure to Development Program

This discussion paper is a product of the From Disclosure to Development (D2D) program, led by the Sustainable Infrastructure Advisory team of the International Finance Corporation (IFC). The program, launched in 2017, is funded by the BHP Foundation and implemented in collaboration with the World Bank. It builds on more than a decade of IFC and World Bank experience in natural resources transparency and open data. For the past 13 years, IFC transparency projects in Latin America have aimed to help local governments and communities become more transparent and effective in the use of mining revenues. The World Bank provided investment and advice to more than 50 countries on the design and implementation of national and subnational open data and data innovation programs.

The program's goal is to enhance benefit sharing with communities from investment in natural resources through effective disclosure and data-use practices. D2D develops and tests new approaches, partnerships, and platforms aimed at improving the ways in which companies and governments disclose data, so that communities and other stakeholders can use it to inform their decisions and actions.

Open data is a critical ingredient of transparency in the 21st century. Without transparency, there cannot be accountability or effective sector governance. Without transparency—both actual and perceived—it is easy for companies to lose the trust of communities, which can lead to a loss of their social license to operate and put investment projects at risk.

To bridge the information asymmetry in the sector and give voice to communities, D2D works to improve the disclosure and use of open data with capacity building, multi-stakeholder dialogues, and data-driven innovation activities with youth, infomediaries, and digital entrepreneurs. In its first phase (2017–19), the program piloted the following activities in Colombia, Ghana, Mongolia, and Peru:

- research on natural resources data challenges and opportunities;
- engagement of stakeholders around innovative uses of open data;
- capacity building on data literacy; and
- multi-stakeholder dialogues for improving access to and the use of natural resource data.

The D2D program uses lessons learned from these in-country activities to contribute to global efforts to improve transparency in the natural resources sector through more effective disclosure and use of data. It works with partners such as the Transparency and Accountability Initiative (TAI), the Extractive Industries Transparency Initiative (EITI), Global Integrity, and others.

In the coming years, D2D plans to expand to other countries and infrastructure sectors and to add a gender data component. For more information about the D2D program, please contact Alla Morrison, Program Manager, at amorrison@ifc.org.

Foreword

NAMRATA THAPAR
GLOBAL HEAD, MINING
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IFC firmly believes that transparency is critical for good governance, accountability, and development effectiveness.

IFC firmly believes that transparency is critical for good governance, accountability, and development effectiveness. As an investor, IFC requires its clients to engage with communities affected by its projects, including through disclosure of information. IFC's Policy and Performance Standards on Environmental and Social Sustainability require that client companies disclose and disseminate "relevant, transparent, objective, meaningful, and easily accessible information in a culturally appropriate local language(or languages), in a format that is understandable to communities. IFC believes that clients' commitment to transparency and accountability, helps promote sustainable development and the long-term profitability of their investments.

As stakeholders' information expectations evolve, and new technologies become available, disclosure practices in the natural resources sector—including the sharing and communication of digital data to broader audiences—need to become more timely, accurate, and actionable. A growing number of government and industry actors are sharing open data,—data that is available for anyone to freely use, reuse, and distribute for any purpose, without restrictions. This practice not only helps ensure the effective dissemination of information, it also catalyzes the development of innovative data-driven products and services. Open data helps improve public service delivery, fuels innovation, and contributes to job creation. Governments and companies can also use it as a new tool for community engagement to demonstrate openness in operations and strengthen relationships to build trust. Communities and civil society can use open data to better understand sector challenges, incubate solutions, drive entrepreneurship, and demand accountability.

The World Bank has supported open data initiatives in more than 50 countries since 2012. IFC joined global open data efforts in 2017 with the launching of the From Disclosure to Development (D2D) program, which helps natural resources clients improve their information disclosure practices. In the last decade there has been significant progress in disclosure and use of open data in the natural resources sector thanks to global initiatives working with private and public sector champions such as the Extractive Industry Transparency Initiative (EITI), and Open Government Partnership (OGP). Local organizations have also invested time and effort trying to access, understand and use this new information. However, many challenges still remain.

This discussion paper consolidates the findings of D2D's natural resources data assessments conducted in: Colombia, Ghana, Mongolia, and Peru. It describes key challenges and makes recommendations to industry, governments, and civil society that help bridge the existing data gaps and unlock data-enabled opportunities in the natural resources sector. The insights in this report help better understand 1) the most pressing information needs of communities, 2) which available datasets can help address their concerns, and 3) what are the concrete entry points for multi-stakeholder collaboration that can facilitate disclosure for development impact.

I would like to highlight this document's Recommendations section for anybody working on improving transparency and accountability in the natural resources sector. Sharing information is not enough. We must go the extra mile to make information useful to ensure that benefits from natural resources investments reach all stakeholders and create long-term value for everyone.

Executive Summary

Open data—data that anyone can freely use, re-use and redistribute, for any purpose, without restrictions—can create opportunities for meeting the growing demand for transparency and the accountability in the natural resources sector. Governments and companies that efficiently disclose, share, and use data can improve service delivery across sectors, catalyze innovation and support creation of jobs in natural resource investments.

Revenue from oil, gas, minerals, metals, agricultural land, and forests accounts for 47 percent of the wealth in low-income countries (The Changing Wealth of Nations, 2018). But unequitable benefit sharing often exacerbates disparities and leads to social and economic conflict. Open data on license allocations, contracting, beneficial ownership, royalties, and environmental and social impacts, in conjunction with inclusive government, legal, and industry practices, have the potential to reduce disparities and build trust. Equipping stakeholders with the information they need to make fact-based decisions about investments will improve accountability, curb corruption, and realize equitable benefit sharing.

Data on natural resources is becoming increasingly open and publicly available, but many data sources remain underutilized. The International Finance Corporation's (IFC) "From Disclosure to Development" program was established to facilitate the disclosure and use of information and open data in order to support broader benefit sharing from investments in natural resources.

D2D works with companies, governments, and civil society to enable access to and the use of relevant, timely, and accurate information on natural resources investments. As data becomes digitized and connectivity continues to expand, companies and governments face a paradigm shift in the cycle of natural resources information. The dramatic change of pace and tools used to drive and push information forward means that companies and governments must adapt to fulfill information demands of investment projects while ensuring that this new change is inclusive of civil society and communities.

To better understand the natural resources data landscape, D2D developed a sector-specific data assessment approach, tested in four pilot countries: Colombia Ghana, Mongolia, and Peru. This document consolidates findings of the four countries for companies, governments, and civil society on natural resources data availability and demand. It discusses the gaps, challenges, and potential opportunities for greater access and use of data across four key stages of the mining information cycle: 1) data production and reporting, 2) data use and adaptation, 3) information dissemination, and 4) knowledge and value creation. It also highlights existing open and publicly available datasets that can help address the evolving demand for information on natural resources investments.

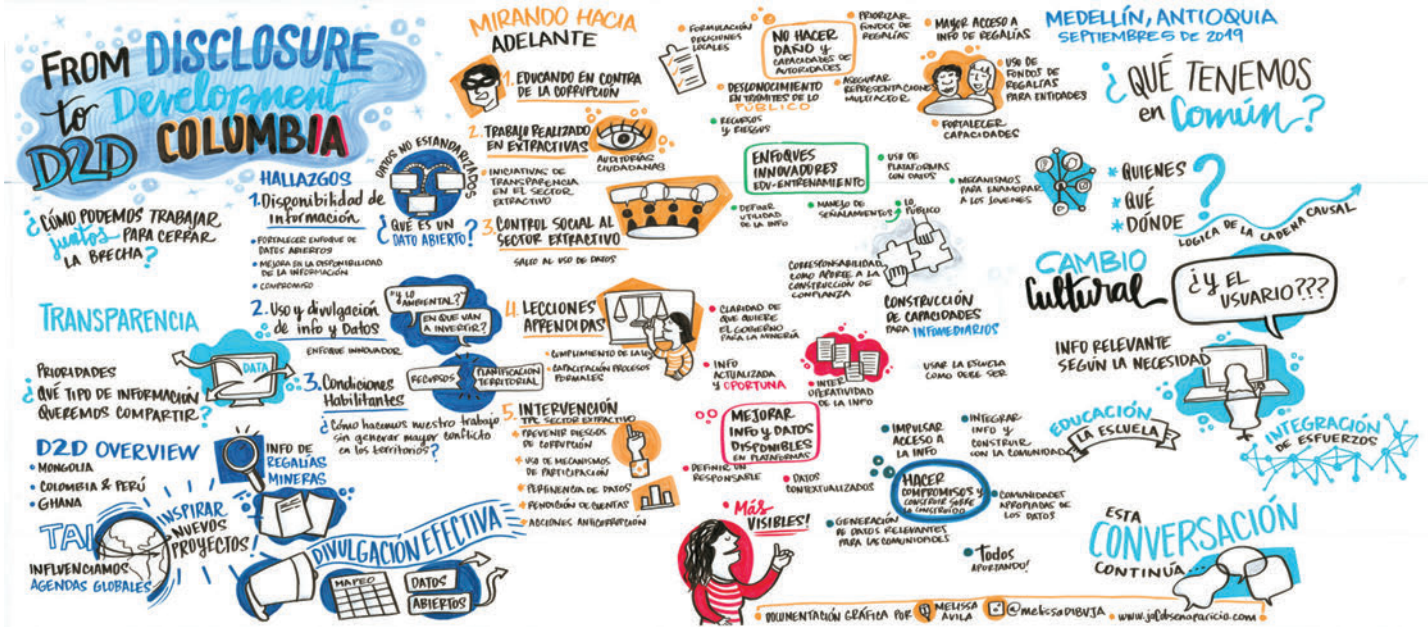
The report identifies the following challenges:

1. **Overlooked end-user data and information needs.** The types of data and information being supplied often fail to match end-users' needs. End-users can be communities, civil society, media, companies, investors, among others.

2. **Poor data quality.** Disclosed data tends to lack uniformity and has a complex structure. Best practices for natural resources data collection are nascent for financial data and nonexistent for contextual data.

3. **Limited access to data.** Datasets that are difficult to access or are in hard-to-use, non-machine-readable formats limit the ability of "infomediaries" (information providers that gather and organize large volumes of data from multiple sources and present them to a target audience) to transform data and constrain the consumption of information by targeted audiences.

4. **Limited capacity of data users.** Infomediaries lack the skills needed to conduct meaningful analysis, and users that do have the technical skills to draw insights do not have effective dissemination strategies for reaching broader target audiences.



5. **Mistrust of private sector data from communities.** Excluding communities from participating in the collection, analysis, and use of company data breeds mistrust and frequently creates the perception of information and power asymmetry, adversely affecting social license (the ongoing acceptance of a company or industry's standard business practices and operating procedures by stakeholders). Data disclosure is viewed as merely supporting company interests and government compliance requirements, not prioritizing the needs of local communities.

This report recommends actions for companies, governments and civil society that can help address these challenges. The actions are meant to improve accountability and transparency and therefore facilitate equitable benefit sharing of investments in natural resources.

Recommended actions include (but are not limited to) the following:

1. Companies and governments should deliberately assess community information needs to inform data collection strategies and disclosure. The most useful disclosures will be those that have been designed with the end-user in mind. Understanding the underlying concerns of communities (which may not always be related to mining operations) equips governments and companies with the necessary information to better engage with communities and design interventions that speak to the challenges they are facing.

2. Prioritize disaggregated and project-level data for disclosure. Communities are most interested in specific insights about their municipality, district, or mining project site. Companies and governments can provide more granular data on: local development investments, social and environmental impacts, job creation, and local procurement opportunities that help address communities' primary concerns.

3. Feedback mechanisms are needed (via an open data portal or companies' data dashboards) where users can request datasets and information of interest to them. These platforms can also be used for participatory data collection and verification, where citizens can provide missing data points, particularly for execution of public investment projects in their communities.

4. Governments can mandate to fund the design and implementation of open data initiatives, under the umbrella of national open data policies, specifically for the natural resources sector. Initiatives can include institutional mechanisms to guide data collection and disclosure standards for agencies and industry, determine the types of data that must be collected, level of disaggregation,

and provide templates and requirements for frequency of reporting.

5. **Establish cooperation between governments, companies and civil society to push the agenda for natural resources data disclosure standards.** Agreements can establish clear guidelines for data collection, outline reporting frequency and format to ensure consistency of application of the standards.

6. **Design simple platforms with end-users in mind.** Government and industry have invested significant resources on public data platforms; the return on these investments has not yet been realized. Characteristics like search functionality, one-click download buttons, and feedback mechanisms are low-hanging fruits that can change the user experience and make these datasets accessible.

7. **Engage digital entrepreneurs to transform company data and reports into interactive apps that share data in a readily consumable way.** Adaptable and reusable community dashboards (digital or paper-based, depending on the context) can be developed to make information accessible to communities and allow end-users to engage with information that is most relevant to them.

8. **Mining companies can partner with the technology sector to provide capacity building.** Governments and companies can partner with tech companies to provide trainings and skills transfer through established networks, academies, and other certification programs.

9. **Design participatory data collection and validation initiatives.** Companies and governments can use data to engage with local communities in new ways and improve accountability of investments, and build trust. Co-creation of data can: open communication channels to bridge disclosure to development, provide communities with ownership of the data/information, and empower citizen participation in decision making.

Data for Transparency and Accountability

Data is now one of the world's most valuable resources. Companies and governments are undergoing a digital transformation, characterized by the generation of unprecedented volumes of data, from a variety of sources, at increased velocity (often close to real-time). In the natural resources sector, companies are beginning to use new technologies, including machine learning, satellite data and imagery, sensors, sophisticated augmented reality tools and becoming more automated. Governments are disclosing more and more digitized data on the natural resources sector. They are starting to streamline open data standards for disclosures and build improved digital infrastructures.

These efforts are laudable. But the public is demanding more relevant, timely, and accurate information about investments in natural resources.

The Importance of Open Data

When data is made available to be used, modified, and shared by anyone for any purpose, it becomes open data. Widely accessible and useful open data creates opportunities for companies, governments, and citizens to improve the transparency of natural resources development, promotes social accountability and inclusion; and improves decision making in innovation, project design, monitoring, and evaluation.

Investments in natural resources account for 47 percent of the wealth in low-income countries (The Changing Wealth of Nations, 2018), and there is great potential for the natural resources sector to promote sustainable economic growth. But the abundance of resources does not always translate into inclusive wealth. Indeed, at least 1.8 billion people live in poverty in resource-rich countries (NRGI 2017). Natural resources wealth can exacerbate inequalities, increase conflict, and leave countries vulnerable to corruption.

During the last decade, access to open data has been recognized as an essential component for improved transparency and accountability in the sector. Research by the International Finance Corporation (IFC) found that open data on license allocations, contracting, beneficial ownership, royalties, and environmental and social indicators can help equip stakeholders with the information they need to make fact-based decisions about investments. Governments and industry have joined international open data and transparency initiatives such as the Extractive Industries Transparency Initiative (EITI), and the Open Government Partnership (OGP), indicating a growing willingness to use data to improve transparency in the natural resources sector.

Data is increasingly freely available on the web and elsewhere. But it is often unstructured and lacks interoperability and open licensing for reuse. As a result, many countries face the "zombie transparency challenge," in which massive amounts of public and private sector data have been disclosed but much of this information remains underutilized. It is difficult

to measure how often companies use data they produce or report, but estimates suggest that in the natural resources sector, the figure may be less than 1 percent (Unlocking Data Innovation for Social License in Natural Resources, 2020).

For open data and information to be useful, companies, governments, and communities must acknowledge that transparency is not the ultimate goal but rather a means to an end in which all parties involved are better informed; ensured mutual benefit; have relevant, timely, and accurate information; and can begin to (re) build trust and maintain sustained engagements throughout the lifetime of the investment. Ultimately, companies and governments that efficiently collect, disclose, and use data with and for communities will be able to respond to the rising expectations and information demands of the public for equitable benefits and shared prosperity from investments.

The From Disclosure to Development Program

The From Disclosure to Development (D2D) program builds on IFC's extensive work in guiding private and public institutions in sharing the benefits of natural resources investments and the World Bank's experience in assisting governments and civil society with open data, EITI implementation, digital development, good governance, and transparency. D2D helps make existing natural resources data and information more accessible, enabling data use that can make investment processes more transparent and promote social accountability for improved governance. The global program aims to improve:

- the efficiency of disclosures and the use of existing open data and publicly available information
- the quality of data produced and collected by governments and companies
- the alignment between disclosed data and information and dissemination channels to fit end-user needs
- the capacity of data users, particularly infomediaries, in government, industry, civil society, media, and communities.

The program uses a three-pronged implementation approach (figure 1).

FIGURE 1 Implementation Approach

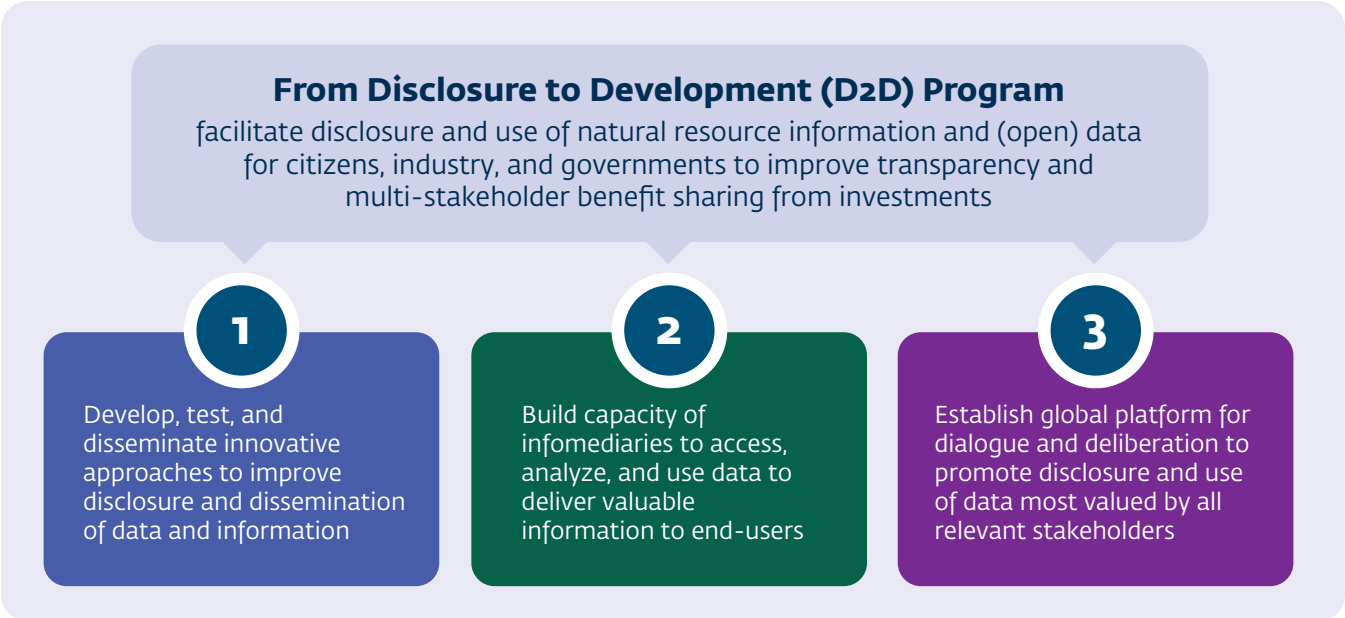


TABLE 1 Importance of mining in the four pilot countries

Mining sector data	Colombia	Ghana	Mongolia	Peru
Contribution of mining to GDP and exports[1]	6 Percent of GDP, 29 percent of exports (World Bank 2018; EITI 2019)	10 Percent of GDP, 64 percent of exports	23 Percent of GDP, 80 percent of exports	10 Percent of GDP, 60 percent of exports (Ministerio de Energía y Minas 2018)
Key commodity exports (2017)[2]	Crude oil: $11.0 billion Coal: $7.6 billion Gold: $1.5 billion	Gold: $8.3 billion Crude oil: $3.0 billion Manganese ore: $265 million	Coal: $2.3 billion Copper: $1.6 billion Gold: $1.3 billion	Copper ore: $12.0 billion Gold: $7.1 billion Zinc ore: $2.1 billion
EITI compliant	Yes	Yes	Yes	Yes

1 Data comes from D2D reports except where otherwise indicated.

2 Data is from the Observatory of Economic Complexity, which draws on data from UN COMTRADE.

In Phase 1 (2017–19), four pilot countries—Colombia, Ghana, Mongolia, and Peru—were selected. The importance of an active natural resources sector (metals, minerals, gas and/or oil) to the economy and growth of the countries was key in determining the selection (Table 1). Additionally, countries were selected using the following criteria

Additionally, the following criteria was used:

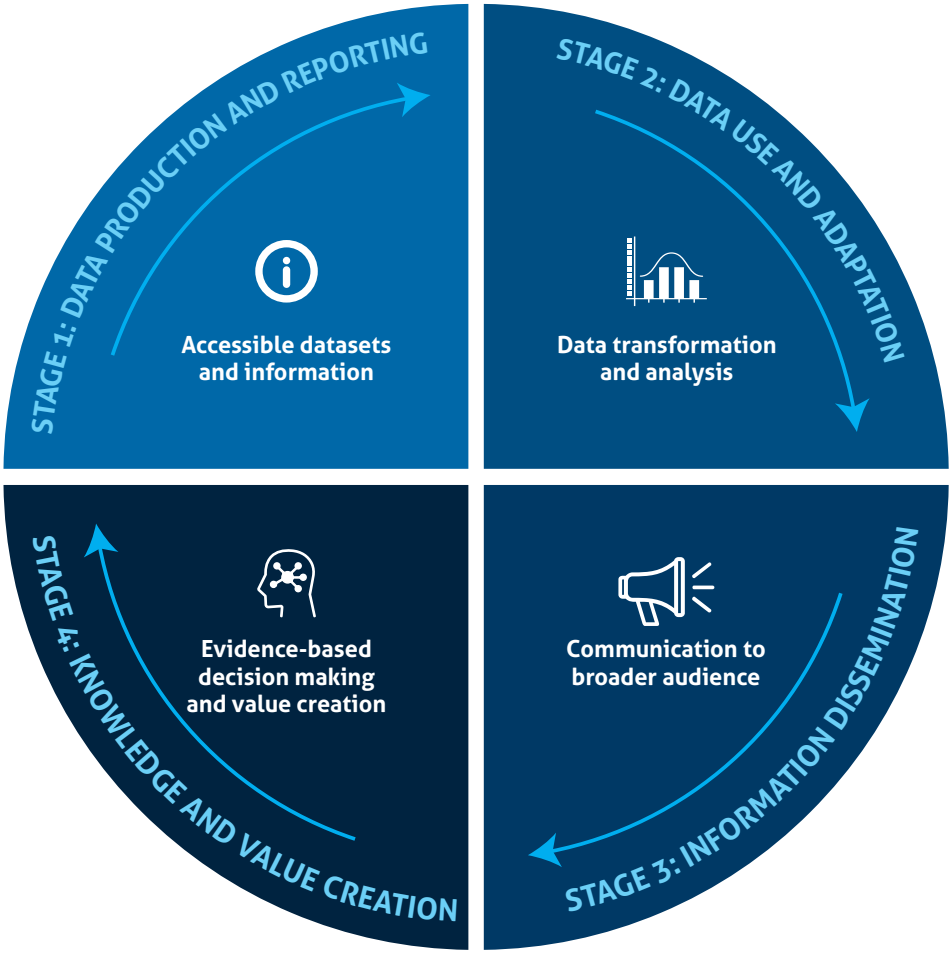
- geographical diversity across pilot countries to promote cross-regional learning
- instances of private and public sectors collaboration with civil society
- existence of data/information on natural resources in the public domain
- demand from stakeholders to improve the transparency and governance of the sector.

D2D's Natural Resource Data Assessment

D2D developed a sector-specific approach that places the user at the center of its data assessment. The methodology uses components of the World Bank's Open Data Readiness Assessment tool and GovLab's Open Data Demand Assessment and Segmentation Methodology to help industry, governments, and civil society identify information challenges and assess which gaps can be addressed using (open) data.

Creating value out of data is expected to bring advantages to a wide array of actors. To identify how it can happen and what data is important, the assessments focused on the information cycle specific for mining revenue. This analysis helped IFC map the data being produced and identify who is producing, using, and reusing it; at what stage; for what purposes; and for what audience. The information cycle in four distinct stages (figure 2):

FIGURE 2 Revenue management information cycle in the mining sector



- **Stage 1. Data production and reporting:** data producers identify, generate, and collect distinct data points in a systematic format for future use. This tends to be the official public data in relation to mining and local development. Governments and mining companies produce most of the data. Most recently, data collection has shifted toward cyber-physical systems using sensors, satellites, 3D imaging tools, among others (Unlocking Data Innovation for Social License in Natural Resources, 2020). Reporting of data depends on the producer. For example, companies may share datasets for compliance purposes with host governments or for internal purposes with shareholders.

- **Stage 2. Data use and adaptation:** Datasets are accessible and in reusable formats. Data can be aggregated with other sources and used for analysis by different stakeholders. Data is adapted to better reach final users and/or draw meaningful analysis relevant to end-users. For example, infomediaries, media, and/or academia can use available data to respond to a specific questions or concerns.

- **Stage 3. Information dissemination:** As data is contextualized and transformed into information, data users disseminate information to target audiences. Different channels and formats may be used to make the information accessible to broader audiences. Infomediaries are the primary actors at this stage.

- **Stage 4. Knowledge and value creation:** Insights are used to inform and influence decision-making and advocacy processes, catalyze innovation of new products and service delivery and maximize the efficiency of mining operations.

Enabling conditions must be present throughout each stage of the cycle for a healthy data and information ecosystem. D2D found that the following enabling conditions need to be present: 1) clear legal frameworks for royalty and tax payments 2) existing policies for revenue management, transparency, access to information and open data, 3) leadership buy-in from government authorities and company officials who can champion data, 4) free and open citizen participation and engagement, and 5) resources to build capacity of government officials, companies technical staff, and civil society groups.

The assessments identified the following roles for actors across all countries:

- **Data producers:** responsible for the initial collection, management, and dissemination of datasets. They strive to remain compliant with international and national standards and laws of mandatory disclosures. Actors can include governments, companies, academics, and CSOs.

- **Data users:** use data for a specific purpose or need. They generate insights that can inform decision making. They are not necessarily engaged in disseminating the information or knowledge created. Actors can include governments, companies, academics, and digital entrepreneurs.

    - **Infomediaries:** analyze and adapt data to make information and knowledge accessible to wider audiences. They are also data users. They gather and organize large volumes of data from single or multiple sources and package or contextualize the information for dissemination. Actors can include governments, private sector actors, CSOs, media entities, and community representatives.

- **End-users:** are everyday consumers of information. They seek information to guide decisions, serve advocacy purposes, and/or better understand the impacts of natural resource projects. End-users tend to be interested in consistent access to disaggregated insights on the local effects of natural resources projects on employment, procurement, use of revenues for local development, and social and environmental impacts. Actors include community members and the general public.

Within this typology, D2D identified seven actors in the information cycle that are versatile and can play different and simultaneous roles (Table 2). For example, as data producers, government agencies are responsible for collecting and reporting data. They also use data to generate insights that inform decision-making processes on development and revenue allocation, which requires engagement with communities and the dissemination of relevant information. They therefore also take on the infomediary role. Mining companies can play

TABLE 2 Actors in the information cycle in mining

Actor	Role
Governments	Governments at the national, regional, and local level collect, produce, and publish mining data for the public. Such data include data on license allocation, production, revenue (taxes and royalties), social and environmental impacts, and other relevant regulation and compliance topics on mining revenue management and information and disclosure.
Mining companies	Mining companies generate and supply data on production, compliance, royalty and tax payments, procurement, local content, environmental and social impacts, and social investments. Regulatory protocols often mandate that mining companies provide the government with data (requirements vary across countries and projects). Increasingly, companies also provide additional information and data on a voluntary basis. Companies also supply data to investors, who are seeking to align their investments to companies that manage risk well.
Communities	Civil society organizations (CSOs) use data to promote transparency, accountability, human rights, and environmental conservation efforts. They may advocate and negotiate on behalf of local communities. CSOs can also produce their own data on social and environmental impacts and the results of perception surveys, and they sometimes collect data for monitoring and evaluation. CSOs includes social organizations, NGOs, professional associations, and other social institutions.
Civil society organizations (CSOs)	Communities are end-users of public information and data (such as maps and data on rainfall, air pollution, and weather). Information on natural resources is usually obtained from television, radio, town meetings, social media, community newsletters, and local governments.
Academia	Academics collect and use data to generate knowledge for other data users. Think tanks, researchers, and universities can also serve as infomediaries for national-level policy makers, the academic community, and industry. Occasionally, they contribute to public opinion through collaboration with media.
Media	Media are the dominant source of information for the general public. They can gather complex data and transform them into understandable information for audiences.
Digital entrepreneurs	Digital entrepreneurs have the capacity to transform data into more user-friendly interfaces and platforms for end-users. They can serve as infomediaries to bridge information gaps with innovative digital products and services for local communities and beyond. Very few use data from the natural resources sector.

three roles: producing data across the value chain; using data to inform operations and community engagements; and serving as infomediaries to shareholders, lenders, governments, and communities.

Using this framework, the team collected inputs through national and subnational level consultations, surveys and focus group sessions (for sample guiding questions, see the appendix). The assessments covered thematic areas in mining, including local economic development in Ghana, natural resources open data in Mongolia, and mining royalties in Peru and Colombia. Findings and recommendations of the assessments were validated collaboratively with local stakeholders and experts. Their inputs helped capture capturing the contextual enabling conditions in policy, institutional settings and understanding the nuanced power dynamics among stakeholders. All stakeholders were invited to validate identified challenges and work collaboratively to develop concrete recommendations for companies, governments and civil society. The recommendations are presented in the last section of this report.

Natural Resource Data Challenges

Companies, governments, and civil society increasingly recognize that to meet information demands and expectations of diverse stakeholders they will have to become part of a broader data ecosystem. Operating in data silos will no longer be an option. Despite companies and governments' progress in adopting and embracing data-centric processes for transparency and better accountability, the results have been underwhelming and threaten to roll back progress achieved on disclosure to date (See Box 1).

D2D's assessments found that the prevalence of disclosure and data use challenges in the mining sector can partially be attributed to the complexity of royalty systems and revenue management processes. These tend to be complex, dynamic, and uncertain. Companies' contributions are difficult to link to local development projects, especially as allocation percentages and distributions schemes sporadically change. Civil society, media, academia, and other data users are left to navigate difficult structures, where information needs remain unmet, not necessarily as a result of data lacking, but the inability to access existing datasets in usable formats.

The critical barriers identified in this research relate to the mismatch between data supply and end-user demands. For example, data users were asked to identify the most critical datasets that could facilitate new types of analysis that better fulfill end-user demands. The datasets shown in table 3 were identified as key for bridging the gap between what industry and governments disclose and end-users demand.

Much of this data is collected by companies and governments, but not all of it is made available to the public in reusable formats. If the information is only nominally available, and not reusable in practice, the potential value of the data will continue to remain ambiguous for the sector. Data producers collect significant amounts of data but fail to see the true value in this asset beyond reporting and compliance.

BOX 1 Pilot countries' disclosure efforts

COLOMBIA

In 2018 the EITI Board recognized Colombia as the first country in the Americas to meet all the requirements of the EITI standard. Colombia is also part of the Open Government Partnership. It has a national policy on digital government and open data as well as a law on access to information. Government agencies have adopted guidelines for implementation of the Digital and Open Data Strategies, and progress has been made on subnational level disclosures through EITI.

GHANA

Ghana has been part of the Open Government Partnership since 2011. In 2019, the Right to Information Act (RTI) was passed by parliament. Through EITI, the mining sector has witnessed voluntary data disclosure in open data format published consistently for more than a decade, although reports are often delayed.

MONGOLIA

Mongolia joined the Open Government Partnership in 2013 and EITI in 2007. Mongolia discloses all mining industry revenue through EITI in an open data format and submits annual reports. The private sector has increasingly collected and publicly shared natural resource water data.

PERU

Peru recently legislated open data by default. It also participates in the Open Government Partnership since 2011 and is part of EITI since 2007. Peru also has a law on access to information and has a dedicated information committee initiative for the mining sector.

TABLE 3 Datasets identified by stakeholders as key in fulfilling end-users' demands

Areas of Public Interest	Types of data	Data owner
Production	▸ Production totals by resource type and site	• Ministry of mines, Extractive Industries Transparency Initiative (EITI), national statistics offices, and mining companies
Revenue allocation and distribution	▸ Total revenue collected ▸ Royalty payments and allocation (disaggregated) ▸ Taxes	• Ministry of finance, national statistics office, ministry of mines, national planning departments • Ministry of finance, revenue authority, ministry of mines, EITI, mining companies • Taxing and revenue authority, ministry of finance
Execution	▸ Public investments of natural resources revenue	• Mining authority, local governments, revenue authority, national planning departments
Monitoring	▸ Site-level auditing reports ▸ Environmental impacts (disaggregated): water availability and usage, air quality, usable pasturelands, and biodiversity ▸ Social impacts (disaggregated): access to education, health and other services like infrastructure, (predominantly water wells and roads)	• Revenue authority, ministry of finance, national planning departments, local governments • Mining Companies, local governments, water authority, ministry of mines, ministry of environment, ministry of land/agriculture, national statistics office, EITI • Local governments, national planning departments, mining companies, tax and revenue authority, ministry of finance, national statistics office, ministry of health, ministry of education, and public works authority
Local content	▸ Job opportunities for local communities ▸ Procurement opportunities for local vendors	• Mining companies' human resources departments • Mining companies' contracting and procurement departments
Contracts	▸ Contracts issued	• Mining companies, EITI
Exploration	▸ Exploration and extraction licenses ▸ Strategic impact assessments (environmental and/or social)	• Ministry of mines or mining authority • Mining companies' environmental, social, and governance (ESG) department and mining authorities
Private social investments	▸ Local development agreements ▸ Corporate social responsibility commitments and allocations by projects	• Mining companies' ESG and legal departments • Mining companies' corporate and social responsibility departments
Beneficial ownership	▸ Company "real" ownership information	• EITI, public registries, mining companies
Compliance and control	▸ Validated production reports (field visit verification) and review of mining titles	• Ministry of mines, mining authority, minerals commissions

Data users find revenue management information in mining opaque and distrust companies and governments' disclosed data.

Enabling access to the digital datasets in open format could help improve the types of analysis conducted by infomediaries, trigger innovation from actors like digital entrepreneurs, and provide key insights for companies on improving processes and operations. However, despite the disclosure of these datasets in countries like Peru and Colombia--considered leaders in open data policy and EITI compliance—governments, companies, civil society, and communities continue to face similar challenges

TABLE 4 Data and information challenges by actor

Role	Data and information challenges
Governments	• Complex revenue management systems expansive across various agencies. • Lack of data collection and reporting standards. Systems and platforms lack interoperability. • Limited buy-in from leadership to push and enforce open data • Limited capacity and resources for data management, especially at the municipal level. • Lack of legal frameworks on access to information laws and open data. • Limited collection of disaggregated local data and data on women, youth, indigenous communities, and other underrepresented populations
Mining companies	• Lack of clarity on how to meet evolving global and local data disclosure demands from investors, lenders, civil society, customers, governments, and environmental, social, and governance [ESG] standards. • Data that is published and disclosed does not match end-user demands or dissemination preferences. • Apprehension about disclosing data that could benefit competitors or information that could be used/misused against them. • Lack of strategy and processes for consolidating and managing data being collected or generated across all business functions and leveraging it for actionable insights and as a community engagement tool. • Lack of trust from communities on disclosed data. • How can you prove or measure transparency?
Communities	• Lack of real-time access to local information on employment, procurement, development projects, formalization processes for artisanal miners, water availability and usage, air quality, usable pastureland, and other topics in formats that are user friendly, culturally sensitive, timely and disseminated through preferred channels (in-person, radio, newsletters and WhatsApp) • Lack of trust in data and information provided by governments and companies. • Exclusion from the information cycle and perceived power asymmetries (particularly in the production of data) with companies and governments. • Lack of awareness of information rights. • The concept of open data is virtually unknown. • Limited technical capacity to understand complex processes in the mining value chain. • Local infomediaries lack capacity to transmit accurate information. • Fear of retribution and lack of safety in areas plagued by conflict and/or corruption; prefer to not access information. • Reluctance to use online platforms (despite improved access to the Internet);
Civil society organizations (CSOs)	• Lack of disaggregated and subnational data and information on environmental and social impacts. • Request for information mechanisms are limited and complex. • Capacity, resources, and time to work with and use data in time to influence decisions and actions taken by other stakeholder groups (for example, how revenues are going to be spent) is limited. • Engagement with government and companies on best data disclosure and use practices is limited.
Academia	• Datasets are of poor quality. Academics spend significant resources cleaning, compiling, and validating data from multiple sources. • Lack access to historical subnational and municipal level data to conduct time series analysis. • Lack opportunities to collaborate with mining companies on data disclosure and use. • Limited capacity to disseminate information to general audiences.

Role	Data and information challenges
Media	• Lack time and resources to access and use data on natural resources for in-depth analysis. • Local media often lack analytical capabilities to conduct analyses using datasets. • Lack access to granular, subnational data. • Incentives to engage with mining companies for information dissemination on investments are limited. • The media lack in-depth knowledge of the mining supply chain and processes. • Data journalism takes place at the national level and is a nascent concept in the sector.
Digital entrepreneurs	• Limited access to open data with an explicit license allowing reuse for any purpose, including commercial. • Limited resources and time to clean, verify, and organize data. • Datasets lack well-designed variables and accompanying metadata. • Limited incentives to engage with sector stakeholders

to those countries where this information is not available. Table 4 identifies recurring challenges across the four countries by actor type.

Using cross-reference analysis of the 4 data assessments and a qualitative trends analysis of the above list, D2D identified five key challenges.

1. **Overlooked end-user data and information needs.** The types of data and information being supplied and published often fail to match end-users' needs.

2. **Poor data quality.** Disclosed data tends to lack uniformity and has a complex structure. Best practices for natural resource data collection are nascent for financial data or nonexistent for contextual data.

3. **Limited access to data.** Datasets that are difficult to access, are dispersed, or are in hard-to-use, non-machine-readable formats. This limits data users' (including infomediaries) ability to transform data and constrains the consumption of information by targeted audiences.

4. **Limited capacity of data users.** Key infomediaries lack the skills needed to conduct meaningful analysis, and users that do have the technical skills to draw insights do not have effective dissemination strategies for reaching broader target audiences.

5. **Mistrust of of private sector data from communities.** Excluding communities from participating in the collection, analysis, and use of company data breeds mistrust and frequently creates the perception of information and power asymmetry, adversely affecting social license. Data disclosure is viewed only as supporting company interests and government compliance requirements, not prioritizing the needs of local communities.

The challenges represent an opportunity for companies, governments and civil society to shift from traditional perceptions that disclosure of information and data is enough to improve transparency in mining and consider less siloed techniques, encompassing a wider range of actors and promoting disclosures beyond revenue data (including expenditures and social/environmental impacts) that covers the entire mining value chain.

The next section describes the characteristics of these challenges and provides recommendations for companies, governments, and civil society on how they can respond to these issues.

Recommendations for Addressing Five Main Data Challenges

Challenge 1: Overlooked end-user data and information needs

Natural resources data supplied by public and private stakeholders often does not match the type of data that end-users find most valuable. For example, companies tend to provide financial data focused on revenue, while civil society and communities seek expenditure information. Users need disaggregated data that will enable them to draw insights and produce information that can help communities and other stakeholders understand how natural resources operations will impact their daily lives. Local civil society and community representatives prioritized the following information during the assessments: employment and procurement opportunities, community development

BOX 2 Pilot countries' progress in meeting end-user information and data demands

COLOMBIA

A pilot effort is currently underway to implement EITI at the municipal level. The pilot will provide municipal authorities and communities access to disaggregated data and information on royalties, taxes, and concessions on a monthly basis.

GHANA

Civil society and entities such as the Public Interest Accountability Committee (PIAC) are advocating that laws mandating information disclosure be updated to include specification of the type, detail, and format of information as a way to reduce the gap between the type of information needed and the type of information supplied.

Ghana's most recent EITI mining sector report attempted to fill the district-level information gap with detailed project expenditure information for one district. Other districts expressed interest in being included in future reports.

MONGOLIA

In an effort to meet community demands for better environmental statistics, Mongolia's annual EITI reports have expanded to include data on environmental rehabilitation, waste, and water usage. This information can help local citizens, especially nomadic herders, identify the best pasture lands for their livestock.

PERU

Anglo American uses data to gauge community sentiment in real time. Mobile-based community perception pulse surveys ask participants to respond to five questions a month—on trust, support, and topics relevant important to communities, such as noise pollution and dust levels.

projects funded with natural resources revenues, water availability, air quality, and usable pasture land. Such disaggregated data is not available in accessible formats or is not collected comprehensively by companies or governments. In some instances, relevant data is not collected at all. Further exacerbating this disconnect is the lack of feedback mechanisms that allow end-users to convey their needs.

As a result, the four stages of the information cycle are only partially informed by end-user demands and inputs, causing a systemic mismatch throughout. Drawing meaningful analysis of data for decision-making will only be effective if datasets are designed with the end-user in mind.

RECOMMENDATIONS

1. Companies and governments should assess community information needs to inform data collection strategies and disclosure. The most useful disclosures will be those that have been designed with the end-user in mind. New digital tools provide companies and government the ability to engage with and use real-time data to assess community sentiment and perceptions (as Peru has done [See box 2]). Understanding the underlying concerns of communities (which may not always be related to mining operations) equips governments and companies with the necessary information to better engage with communities and design interventions that speak to the challenges they are facing. For companies, targeted disclosures can be cost-saving, used as a tool for transparency and improve social license to operate. For governments, information about the primary concerns of communities can provide a tailored roadmap for the allocation of resources, service delivery that needs to be improved and fulfill their role as regulators, which should ensure equitable benefit sharing of natural resource investments among all stakeholders.

2. Data producers should prioritize disaggregated and project-level data for disclosure. Communities are most interested in specific insights about their municipality, district or mining project site. Companies and governments can provide more granular data on: local development investments, social and environmental impacts, job creation and local procurement opportunities that help address communities' primary concerns. Civil society, and media emphasized the importance of site-level data as critical in their efforts to promote accountability and transparency and to keep the public abreast of developments in the natural resources sector.

3. Dissemination and communications strategies should specifically target mining communities. Communication efforts and resources should be reallocated to mining community information strategies. Companies and governments should understand the target audience, the current information demand and the most effective (culturally sensitive) channel for disseminating it. Research across the four pilot shows that preferred dissemination channels include: townhall meetings, infographics, radio, WhatsApp, SMS, local newsletters and social media. Within this strategy, needs of minority populations (youth, women, seniors and indigenous people) should also be prioritized.

4. Feedback mechanisms are needed (via an open data portal or companies' data dashboards). These need to allow users to request datasets and information of interest to them. Companies and governments can also provide answers to questions about the data and information. These platforms can also be used for participatory data collection and verification, where citizens can provide missing data points, particularly for execution of public investment projects in their communities. Companies and governments must ensure that user inquiries collected are addressed in a timely and accurate manner to avoid the risk of disengagement and mistrust. Platforms with this functionality should be promoted locally (using offline and online channels) as a tool for engagement with companies and public officials. Data collected via this mechanism can also be valuable and therefore should be made available to all interested stakeholders, ideally in open format. For example, companies and government can consolidate the inquiries and publish frequently asked questions and answers on agency and companies' websites.

Challenge 2: Poor data quality

Data collection and disclosure standards are nascent in the sector and remain voluntary. For example, government agencies and companies that are EITI compliant are expected to publish data under an open license for reuse. Other private-sector transparency and accountability initiatives like the International Council on Mining and Metals (ICMM), also promote voluntary commitments for natural resource information disclosure. However, historically these efforts have been focused on revenue data and timeliness of the disclosed information is still a significant challenge—EITI reports have a one-year lag. Furthermore, data standards for relevant information in environmental and social impacts do not exist. Disclosed data therefore lacks consistency in collected variables, frequency of reporting, is incomplete, unverified and lacks meta data (key information that summarizes basic information about the dataset).

Issues with poor data quality persist, even in countries where EITI disclosures are available. Data users can not conduct meaningful analysis due to the poor quality of other relevant datasets. For example, relevant data like expenditures and production levels widely vary in reporting across regions and project sites. The lack of guidance in data collection and the speed at which data needs to be generated for decision-making contribute to poorly designed variables and datasets that are difficult to access and use. Poor data quality in this instance, makes it difficult to understand the correlation between production amounts, royalty payments and local development expenditures. Communities need this information to hold relevant stakeholders accountable.

BOX 3 Pilot countries' efforts to standardize natural resource data and disclosure and improve data quality

COLOMBIA

In 2018 EITI Colombia signed a cooperation agreement with Peru and Germany to triangulate EITI implementation of the its new standard. This agreement will explore technological solutions for the systematization of the standard, 100 percent digital reporting, beneficial ownership reporting, and EITI subnational implementation.

COLOMBIA AND PERU

EITI has formally been incorporated into the Ministry of Finance, ensuring sustainability and commitment to the transparency initiative. Additionally, the Ministry of Mines has mandated information committees to improve the quality of data collected for monitoring and accountability of public investments and improvement of disclosed information to communities.

MONGOLIA

Since 2012 the government has disseminated all revenue data collected from mining and petroleum companies through the EITI process. International audit firms verify the revenues of the top 200 companies (which contribute 98 percent of state budget revenue) disclosed in the process.

RECOMMENDATIONS

1. Governments can mandate to fund the design and implementation of open data initiatives, under the umbrella of national open data policies specifically for the natural resources sector. Initiatives can include institutional mechanisms to guide data collection and disclosure standards for agencies and industry, determine the types of data that must be collected, level of disaggregation, and provide templates and requirements for frequency of reporting. These platforms can also represent an opportunity for multi-stakeholder engagement for data validation, and establishment of monitoring mechanisms to ensure compliance of all parties.

2. Governments, companies and civil society should engage in cooperation agreements that push the agenda for natural resources data disclosure standards that can be practical for producers and end-users of data. Agreements can establish clear guidelines for data collection, outline reporting frequency

and format, and ensure consistency of application of the standards. Collaboration between industry, companies and civil society can ensure that data collection is useful and is structured for use.

3. **Governments can establish collaborative spaces for local peer learning networks that bring together industry, and civil society actors to promote adoption of open data standards and best practices of publicly available information.** These spaces can be used to promote the sharing of experiences, lessons learned, and strategies for implementing a unified standard for data collection and disclosure. Gathering evidence of the benefits of implementing these disclosure standards can further substantiate the business case for wider adoption of open data.

4. **Governments and companies can collaborate with private industry like the International Council on Mining and Metals.** Associations and unions can serve as platforms to further develop data and disclosure standards and promote the value of quality data. Membership contingent on meeting disclosure standards and compliance of disclosure commitments, can incentivize companies to rethink data collection strategies and begin acknowledging the increased risk and reputational costs of not disclosing quality and usable data.

Challenge 3: Limited access to data

Natural resource data is scattered across multiple public and private databases, websites, and physical files. In Colombia for example, the General System of Royalties generates data from at least 10 different agencies and many more individual departments. The data collected is stored in non-compatible formats, making access and analysis and dissemination difficult. Across all pilot countries, access to subnational level data on revenue expenditures and project-level information (participatory monitoring reports, audits, among others) are particularly challenging to access. Civil society highlighted that data exists in hard copies at the municipal and district offices and usually require an in-person visit and a personal connection to gain access to the documents. Communities in particular are unaware of their information rights and formal processes for requesting information.

In the last decade, revenue management in mining has widely been digitized. As a result, international and national transparency and accountability initiatives have launched online platforms to improve access to information in the sector. Data users, particularly civil society and media find these interfaces too complex and not user friendly. Many of the available portals provide basic level of functionality for simple quantitative analysis (for example visualizations of payments of royalties during a specific timeframe), however the data used to conduct this analysis cannot be downloaded or reused due to the lack of open licensing.

RECOMMENDATIONS

1. **Government and industry should use existing platforms to raise awareness about how to access existing data.** Targeted campaigns for data users (especially infomediaries in the media, academia, communities and civil society) should be launched at the national and subnational level to encourage traffic to the existing platforms. The campaigns should be accompanied by simple training and "how-to" materials, outlining the different steps needed to access the data and functionalities available to

BOX 4 Improving access to data in country pilots

COLOMBIA

Colombia has published an online training to teach municipal authorities how to navigate the EITI portal and look-up relevant information about their communities. Uptake has been strong, and authorities are making progress in relaying the information to communities.

MONGOLIA

Oyu Tolgoi (OT) and other companies are engaging with D2D to facilitate access and use of data on natural resources through capacity building and data innovation. Data users are incentivized to learn how to access and use data through competitions such as hackathons and transferable skill training on data analytics. Additionally, national and local governments, civil society, youth, and digital entrepreneurs are learning to access sources via OT's website, EITI, and other government platforms through skills training and capacity building

PERU

The Prime Minister's Office and the Ministry of Energy & Mines recently released the mining dashboard, an information platform managed by the Ministry of Energy & Mining that provides data on mining projects, investment, production, and employment at the national and regional levels. Information is updated monthly and presented as an interactive map with downloadable machine-readable data. The dashboard has enabled greater reuse of data by a variety of stakeholders, including mining companies, policy makers, and academics.

GHANA

MEST Incubator and D2D partnered to conduct data meet-up and dives to socialize existing datasets to local entrepreneurs interested in working with data from the oil, gas and mining sectors.

them. Governments and industry should ensure that all data is downloadable, interoperable, and contains metadata. Ideally, the data should be licensed for reuse.

2. **Design simple platforms with end-users in mind.** Government and industry have invested significant resources on public data platforms; the return on these investments has not yet been realized. Characteristics like search functionality, one-click download buttons, and feedback mechanisms are low-hanging fruits that can change the user experience and make these datasets accessible.

3. **Government and industry can promote access to existing platforms targeting diverse stakeholders.** Activities such as data meet-ups, data-dives, innovation challenges and hackathons can encourage engagement with diverse data-literate users and inspire creative data use in the sector, which can catalyze potential development of innovative data-driven products and services.

4. **Governments can digitize offline data and reporting to facilitate access.** Datasets that do not contain sensitive information and are not restricted under any law often exists but have not been uploaded to public platforms. Although governments are not expected to roll out all data in open format, existing datasets (whether in analog or online format) can be made accessible by uploading them to public platforms.

5. **Digital entrepreneurs can be engaged by industry and government to transform data and reports into interactive apps that share data in a readily consumable way.** They can create adaptable and reusable community dashboards (digital or paper-based, depending on the context), which can be populated with data and information specific to different communities. These platforms can be used to make information accessible to communities and allow end-users to engage with information that is most relevant to them.

Challenge 4: Limited Capacity of Data Users

Even when natural resource data is plentiful and publicly available, data users may have limited skills to use the data, analyze it and generate actionable insights from the analysis. In instances where data can be analyzed, dissemination strategies of insights may be lacking. Infomediaries across all surveyed groups in the D2D's assessments indicated capacity limitation on: accessing data, preparing data for analysis (cleaning, validating, and triangulating data), understanding sector-specific nuances, conducting quantitative and qualitative analysis, visualizing insights and efficiently disseminating the information.

RECOMMENDATIONS

1. **Government, industry, CSOs, and media need to identify skill gaps in key areas.** They should take stock of what skills are needed to improve understanding of natural resource data for end-users. Once the gaps have been identified, governments and industry can collaborate with civil society, donors and multi-lateral organizations to fund training and capacity building activities both at the national and local level. Donors, multilateral organizations and civil society can act as third-party conveners to ensure that infomediaries trust the validity of the skills they are acquiring and information they are receiving. For example, many international NGO's have launched successful programs (focusing on other sectors) on data journalism (journalists that use data and statistical analytics to enhance reporting and use it for different ways for storytelling).

2. **Partner with local universities and think tanks to build capacity of local infomediaries.** Government and industry can partner with local academic institutions and think tanks to create natural resources information centers ("InfoHubs") in regions with mining activities. These hubs can be a resource for communities in the area, providing trainings for local CSOs, leaders, and community members on data use. Industry and government can provide grants/fellowships for infomediaries interested in improving data capacity to improve transparency and natural resources governance at

BOX 5 Capacity building in pilot countries

COLOMBIA

The Ministry of Information Technology & Communication offers virtual trainings to government workers, journalists, and citizens, as well as capacity-development exercises for entrepreneurs, students, and, occasionally, elected officials. Topics include information management, data analysis and visualization, and open data concepts. These trainings encourage a variety of stakeholders to reuse and disseminate open data and prepare more actors to understand, analyze, and transform data on natural resource so that they can be used for decision making. Colombia currently ranks 14th in the Open Development Index (MinTic Colombia, 2018).

PERU

The Ministry of Mining and Heavy Industry engaged with D2D to provide training on data cleaning, use, and analytics (focusing on visualization). Public officials acquired practical skills on how to use data to promote dialogue, improve transparency, and overcome the most important information challenges faced by communities.

these institutions. Fellows and grant winners can be required to complete practicums and internships at these centers.

3. **Partner with technology companies to provide capacity building.** Governments and companies can partner with tech companies to provide trainings and skills transfer through established networks, academies and other certification programs. For example, as part of CISCO's Corporate Social Responsibility priorities, for example, it partners with different stakeholders to benefit local communities through the CISCO Networking Academy. In Peru, for example, D2D partnered with them to deliver a curriculum on digital transformation, internet use, and data literacy in Moquegua.

4. **Governments, industry, and CSOs can identify data champions within communities and provide financial support to train them in data analysis and information dissemination strategies.** An emphasis should be placed on supporting champions from underrepresented populations.

Challenge 5: Mistrust of Private Sector Data from Communities

Local leaders and community members frequently perceive data provided by mining companies (particularly data on production volume) as biased or incomplete. Data disclosure is viewed only as supporting company interests and government compliance requirements, and not prioritizing the needs of local communities. Exacerbating this lack of trust is the perceived information and power asymmetries between companies, governments and communities. Excluding local actors from participating in the collection, analysis and use of company data breeds further mistrust and adversely affects social license. In D2D's assessments, communities in Peru, Colombia and Ghana indicated that their leaders need fact-based evidence they can trust to fairly participate in decision-making and hold companies and governments accountable. Failure to involve them often contributes to conflicts and to community opposition to a project, which can cause costly delays and even halt projects all together.

BOX 6 Mining companies' efforts to rebuild trust in private sector data

MONGOLIA

Companies like Oyu Tolgoi (OT) are engaging with Mongolian youth through data analytics training and outreach focusing on water issues. OT partnered with D2D, the Ministry of Environment, media and the water authorities to address the identified water issues with public and private datasets which were available. Water topics were identified using surveys of the community, the tripartite committee (comprised of company, local government and herder communities' representatives) and research. Mongolian youth then had the opportunity to work with international and local experts on mining, water and innovation to address these topic areas. Teams were able to validate data using different sources, had ownership of their own analysis and were able to voice their ideas in a collaborative and fair space.

PERU

The Peruvian Mining Association launched a communication campaign, Mineria de Todos (Mining for All), to provide information that addressed community concerns. Activities included collecting questions from local communities in mining regions and answering them during outreach efforts in those areas. As the information demands of local actors were met, communities felt heard and better informed to engage with companies and local leaders. Answers to their questions were provided in several formats, including infographics, comics, videos, and radio programs, and a website was launched on which questions and answers were made public and additional questions could be posted.

The mining company Cerro Verde uses technology and face-to-face interaction to improve transparency in operations and increase trust. It provides real-time information about fresh water and treated water consumption. Using new flowmeters at the Chilli River intake, which were verified by national authorities to ensure data reliability, and a digital platform to host all the data with the National Water Authority, the company shares data with the local water authority on a daily and monthly basis. Cerro Verde complements this initiative with meetings with community stakeholders to explain and validate information as needed. For the full case study, see Unlocking Data Innovation for Social License, 2020.

RECOMMENDATIONS

1. **Design participatory data collection and validation initiatives.** Companies and governments can use data to engage with local communities in a new way and improve accountability of investments and build trust. Co-creation of data can: opens communication channels to bridge disclosure to development, provides communities with ownership of the data/information (therefore increasing credibility and trust on what is disseminated) and empowers citizen participation in decision making. Connecting more directly with communities by incorporating participatory processes is conducive to dialogue and interaction—not just disclosure, which helps build relationships, open new communication channels, identify action plans collaboratively and ultimately helps rebuild and maintain trust.

2. **Link disclosure to accountability and action.** Feedback and grievances mechanisms are a critical component of establishing trust with the private sector and government. However, these mechanisms are only effective if companies can adequately respond to the concerns presented and take action. Companies and governments can upgrade official online data platforms to establish mechanisms for CSOs, community leaders, and members to submit service requests, queries, and grievances related to natural resources activities. These efforts would

allow users to submit geolocated photos to pinpoint specific issues that need to be addressed (for example, if a promised project has stalled, a photo could demonstrate that activities had been delayed and provide the location of the project, so the issues could be addressed by the relevant authority or company). These enhancements could be promoted through social media platforms to build awareness of the new functionality. Mechanisms would have to clearly delineate roles and responsibilities of all actors involved. For example, if a concern reaches the wrong stakeholder, the platform would allow for the redirection of the query to the pertinent authority.

3. **Companies need to create chief data officer positions that can work with corporate social responsibility teams and develop an integrated approach to community engagement using data and leveraging it as a tool for dialogue and participation.**

4. **Collaborate with academia and CSOs to improve quality and accuracy of data.** Academia and CSOs are key partners in data verification. Collaboration with academia and CSOs to verify and contextualize data could improve the quality of information shared with communities. Triangulated information and verification by various sources who are perceived as impartial are key in rebuilding trust. Local academic institutions can help verify insights yielded by private sector data and local CSOs can work with companies to ensure that the outputs attend to community concerns and are disseminated through the right channels.

Conclusion

Investments in natural resources have the potential to significantly contribute to sustainable development and economic growth. Data on natural resources plays a critical role in moving the needle on global transparency efforts and improved governance of natural resources.

Significant challenges continue to prevent the effective use of data. However, implementation of the cross-cutting recommendations presented in this paper could contribute to the emergence of a landscape based on the fundamental principles of open data. These recommendations were formulated based on potential entry points to construct a shared vision of transparency observed in the four pilot countries and on the diverse strengths of each stakeholder.

The sharing of the D2D assessment findings is intended to catalyze dialogue on the value of data on natural resources and to spark cross-country learning on approaches that have been successful. The examples presented emphasize the collaborative nature of the work ahead and the changing landscape of transparency as the world becomes more connected and information flows more quickly. Improving data is a first step on the road to greater transparency and more equitable sharing of benefits from investments in natural resources.

Appendix D2D Sample Assessment Questions

The sample questions shown below were used to collect national and subnational inputs for D2D's data assessments. This set of questions can serve as a guide for implementers seeking to better understand the natural resources data landscape. Questions from this list can be selected and/or modified to accommodate the context. D2D collected inputs from companies, governments, civil society, communities, academia, media, and digital entrepreneurs.

Section I Preliminary Consultations: Stakeholder Mapping and Challenge Identification

Objective:	Identifying key actors in the revenue management information cycle through preliminary consultations to understand challenges of communities, civil society, companies, governments, media, academia and digital entrepreneurs.
Format:	Focus groups or interviews format
Stakeholders:	Governments, Companies, Civil Society

Which government agencies are responsible for the management/disclosure of information on mining royalties? _____

_____

Do these agencies use data to address questions/concerns about royalties? Are they aware of what datasets can used to answer these concerns? _____

_____

Do government agencies identify information gaps about mining royalties? How? _____

_____

Which mining companies contribute to royalties? _____

_____

Which think tanks and academic institutions, CSOs, digital entrepreneurs, media outlets (traditional and alternative), and networks (such as EITI) actively work with revenue management and/or open data? _____

_____

What information or data do you need about mining royalties? Why? _____

_____

How will you use this information? _____

_____

Do you know where to obtain this data and information? From whom? _____

_____

Do you face any challenges or barriers in accessing this information? _____

_____

Do you generate any data on mining royalties? What type? For what purpose? _____

_____

What are your challenges in disclosure of information and data on mining royalties? (for data generators) _____

_____

Can you provide examples of successful current disclosure practices by government agencies managing mining royalty data? _____

_____

What challenges and barriers do mining communities face? (for all stakeholders and community representatives) _____

_____

Are you familiar with open data? Do you use it? How? _____

_____

Section II Policy and Institutional Setting

Objective:	Identifying key enabling conditions for effective disclosure and analysis of institutional settings to understand operating context and landscape.
Format:	Interview format
Stakeholders:	Governments, Companies, Civil Society

These questions were selected based on three iterations of this methodology conducted in D2D pilot countries:

Do the political context and national priorities/plans provide an enabling environment for disclosing mining royalties? _____

_____

Does the legal and policy framework recognize the right of the public to access information on mining royalties? _____

_____

Is the legal and policy framework clear about public engagement in revenue management (consultations, policy dialogues, observation, and monitoring)? _____

_____

Is there an agency responsible for the management/disclosure of information on mining royalties? _____

_____

Is there an open data unit operating in the country or a government agency leading the open data agenda? _____

_____

What is the flow of information in the revenue management process? Which agencies are involved? What information is produced?

Is there interinstitutional collaboration among key data-owing agencies on managing/disclosing information on mining royalties?

What mechanisms (specific platforms with clear procedures) allow citizens, infomediaries, and companies to access information on mining royalties?

Has the government demonstrated the ICT capacity to implement open data programs in the natural resource sector, focusing on revenue management? Are there differences across levels of government (national, subnational)?

Section III Open Data Assessment

Objective:	Provide a brief overview of the open data landscape in mining revenue management. Please note that these questions complement other methodologies like the ODRA and GovLab's Open Data Segmented Methodology.
Format:	Focus groups, survey and interview format
Stakeholders:	Companies, Governments, Civil Society, Communities, Academia, Media, And Digital Entrepreneurs

What type of information is available on revenue management (inspection, settlement and collections reports, distribution of resources, transfers, and so forth)?

Is information on mining royalties collected centrally?

Which data systems hold data on mining royalties? What data is disclosed?

Is the data validated? If so, by whom?

Is information on mining royalties published (online or offline) in a timely manner? How often is it updated? Are there restrictions on access to the documents, such as the requirement to log-in or have special permissions before downloading them?

Is the information on mining royalties published online in an open and structured machine-readable format (CSV,[2] XML,[3] or JSON[4])? If not, in which format is it published? Is there evidence of APIs or national data portals for dumps of mining royalty data? Are open licenses granted for the use of the data disclosed?

Section IV Stakeholders' Analysis

Objective: Qualitative analysis to identify roles, responsibilities of actors involved in the information cycle. This analysis should yield whether the right information is being made accessible to the right people, through effective channels and at the right time.

Format: Focus groups, survey and interview format

Stakeholders: Companies, Governments, Civil Society, Communities, Academia, Media, And Digital Entrepreneurs

The following questions can guide the analysis of stakeholders:

Do data producers have clarity about whom they want to reach and for what purpose? _____

Have data producers defined what information to release and in what form? _____

Is the data available in the appropriate format for users? _____

What challenges do infomediaries face in accessing and transforming data? _____

What are examples of data transformation and dissemination initiatives led by infomediaries? _____

What dissemination practices and channels do producers and infomediaries use? _____

Do producers and infomediaries monitor the use of the data they supply? _____

Do producers and infomediaries seek feedback to inform what information is sought and how to best present it? _____

Are actors aware of any restrictions, threats, or controls limiting the use of mining royalty data? _____

Are the needs/interests and barriers to data use identified during the stakeholder mapping (Section I) equally relevant to the focus groups? _____

What enabling conditions could help users makes effective use of mining royalty data? _____

Section V Conclusions and Actionable Recommendations

The following considerations should be taken into account when formulating recommendations:

What key challenges are relevant for each group? How should they be prioritized? _____

_____

What are the entry points for an effective approach? _____

_____

Is a recommendation intended for a single actor or multiple actors? _____

_____

What are the limitations/considerations for each recommendation? _____

_____

The following questions can provide guidance when formulating recommendations. These questions may be applicable to more than one group of stakeholders.

Government

1. What policies and practices could be improved to increase transparency of information and open data of the revenue management cycle of mining activities? _____

   _____

2. How can access to mining royalty data help solve development challenges at the national or subnational level? _____

   _____

3. What mechanisms should be in place to make disclosed information useful to the government, the private sector, and civil society for policymaking, business development, and advocacy? _____

   _____

4. To what extent can open data initiatives improve the interoperability of intra- and interinstitutional government systems? What are some quick wins? _____

   _____

5. What policies and practices could be improved in terms of allowing citizen participation in matters related to the revenue management cycle of mining activities? _____

   _____

6. What kinds of multi-stakeholder collaboration (government, mining companies, civil society) could result in more effective disclosure and use of revenue management data? _____

   _____

7. How can government agencies benefit from the digital innovations for data disclosure made by open data organizations and digital entrepreneurs? _____

   _____

Industry

1. How can information flow between mining companies and relevant government agencies be improved? _____

2. What mechanisms should be in place to allow greater transparency of the mining business? How can they be improved to generate trust? _____

3. What strategies should be considered to foster more stable engagement with communities based on the disclosure of relevant information and data on revenue management? _____

4. What areas of multi-stakeholder collaboration (government, mining companies, civil society) could result in more effective disclosure and use of revenue management data? _____

Civil Society

1. What examples of citizen engagement initiatives could be enhanced and/or replicated through the use of information and data?

2. What should the role of CSOs be in fostering better communication among local governments, mining companies, and communities in the area of influence of projects? _____

3. What type of changes in the policies and practices of the revenue management cycle of mining activities can CSOs advocate for?

4. What areas of multi-stakeholder collaboration could result in more effective disclosure and use of revenue management data?

5. How can ideas and initiatives from open data organizations and digital entrepreneurs be adapted to address the challenges and barriers in the disclosure and use of mining royalty data? _____

Donors

1. What opportunities for and projects aimed at supporting increased use of data might benefit from donor funding? _____

2. What organizations working on open data, citizen engagement, and the natural resources sector could potentially play important roles in project ideas? _____

3. Are there research or advocacy efforts central to promoting transparency, dialogue, and engagement in the mining sector that could benefit from donors' support? _____

4. What areas of multi-stakeholder collaboration could result in more effective disclosure and use of revenue management data?

5. What areas of multistakeholder collaboration could result in more effective disclosure and use of revenue management data?

Endnotes

1. The information cycle focuses on the generation and dissemination of information and knowledge as identified in the D2D Assessments. Distinctly, the data value chain focuses on the value creation of data across four steps: collection, storage/aggregation, analytics/application, and exchange/dissemination. For an introduction to the data value chain, see the Data Innovation Paper (Unlocking Data Innovation for Social License in Natural Resources 2020).
2. A CSV (comma-separated values) file format delimits values using commas or semicolons. It is a simple way to publish information, but publishers must also publish information about the data the file contains (meta data), without which this information will be difficult to interpret.
3. Extensible Markup Language (XML) is a language that allows labels or brands to be defined in a format that is readable by both people and machines.
4. Java Script Object Notation (JSON) is a very simple machine-readable language used for the exchange of information.

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