# 008

# Extractives

Anders Pedersen

## Key points

- During the last decade, data has rapidly become more available across the extractives sector. Civil society, researchers, and journalists have responded by finding new ways to examine natural resource revenues, locations, production statistics, and corporate filings, drawing on data which, until recently, was only available to the companies involved or locked up in databases of proprietary data providers.

- The Extractives Industry Transparency Initiative (EITI) adopted an Open Data Policy in 2015 and has since introduced a database of revenue payments for its 51 members, demonstrating a shared view that open data can serve as an enabler of accountability.[1]

- Open data principles have also been gaining traction within government-led extractive industry reporting regimes, including requirements to submit structured and standardised data. However, experience shows that unless reporting as data is made mandatory, companies prefer to provide unstructured PDFs.

- New extractives open data has, in some cases, allowed for vibrant and timely evidence-based debate on taxation in resource-rich countries, offering a public space for review of various public policy options. However, it is important that analysis, journalism, and evidence-based advocacy reaches policy-makers in order for it to achieve lasting impact.

## Introduction

Since the 1990s, academics, civil society organisations (CSOs), and multilateral institutions have paid increasing attention to the impact of oil, gas, and mining operations on human development in resource-rich countries. The apparent paradox that abundant natural resources have not, in many countries, translated into economic growth and human development[2] has sparked considerable work toward shining a light on how extractive industries operate. Questions of

policy and taxation, of the local impact of extractive operations, and of governance and corruption, have all found their way onto the agenda.

At the start of this millennium, substantial international advocacy efforts toward greater transparency for the extractives sector started to make up ground with the creation of the Extractives Industry Transparency Initiative (EITI), Revenue Watch Institute (RWI), which later merged with the Natural Resource Charter to form the Natural Resources Governance Institute (NRGI) in 2013, and the Publish What You Pay (PWYP) global coalition among others. A focus on the disclosure of information about payments made from extractives companies to governments and on contracts and concessions have led, over the last 15 years, to a number of new legal disclosure requirements, national-level multi-stakeholder partnerships, and voluntary disclosure schemes. In the last few years, these reforms have started to yield new flows of documents, and, in some cases, open data.

However, persistent problems of unequal access to data and poor data quality in the extractives sector are far from solved, and it has long been acknowledged that a lack of accessible data affects everyone from grassroots civil society groups and national anti-corruption watchdogs through to multilateral institutions engaged in economic planning. This chapter will examine how stakeholders in the extractives sector have engaged with open data over the last decade, working in parallel to secure incremental policy change on data publication and to put the data that is already available to use. It will also explore how the broad community of practice around open extractives data has supported a cross-pollination of ideas and research methods, helping to break down silos between different development disciplines and to more rapidly facilitate informed and evidence-based debate.

## Driving context-specific use: Open Jade Data Myanmar

OpenJadeData.org[3] is a public data portal launched by the Natural Resource Governance Institute (NGRI) in May 2018. The site, available in English and Burmese, aims to support engagement with new datasets on Myanmar's Jade trade. It has three main objectives: provide clean, collated data on jade to be used for further analysis; allow users to visualise the information with an online tool; and help users to dive deeper into some of the prevalent issues related to the jade industry through original "data stories". Each feature was developed with input from users in Myanmar and developed with different audiences and skills levels in mind, including researchers, journalists, and interested members of the general public.[4]

So far, the portal features stories re-examining estimates of the size of the Jade industry, highlighting the lack of accurate data on the scale of the sector with estimates ranging from USD 5 to USD 31 billion.[5,6]

Another clear goal of the portal is to support ongoing efforts of the government and civil society groups to increase transparency and conduct regular analysis of the jade sector. NRGI describes the portal as "focused on jade, at the moment, since it has become one of the symbols of Myanmar's inextricable political-economic situation which links a precious natural resource worth billions of dollars annually – and characterised by illegal

trade and a huge amount of uncollected potential state revenues – with domestic conflicts and the peace process; as well as environmental and social disasters and unregulated, mass migration of workers with no safety regulations. Addressing the multiple challenges faced by the jade sector could be one of the best proofs that the 2015 elections and the consecutive National League for Democracy government are really ushering in a new era for Myanmar's politics and economy."[7]
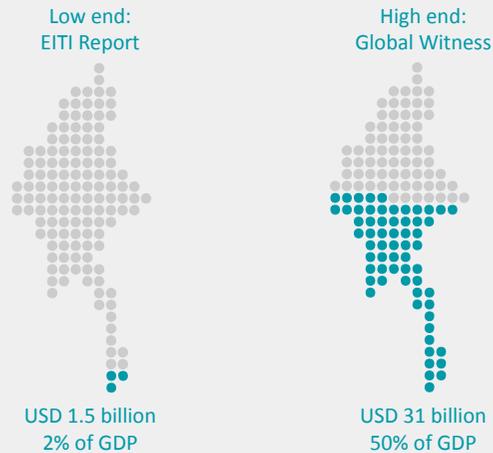


Low end:
EITI Report

High end:
Global Witness

USD 1.5 billion
2% of GDP

USD 31 billion
50% of GDP

**Figure 1:**    Data story showing estimates of the size of the Jade trade in Myanmar
Source: https://openjadedata.org/Stories/how_much_jade_worth.html

## Improving disclosure: Toward open data by default

Understanding the extractive sector requires data. A country's fiscal regimes provide detailed rules on how oil and minerals can be extracted, how extracted resources will be priced, the deductible costs for extractors, and how revenues are to be collected.[8] Further rules and environmental regulations regarding where and how extraction can take place are mapped through mining cadastre datasets. Information on the companies, corporate structures, the public–private partnerships involved, and the mechanisms through which they are financed, can only be understood through data analysis. Global commodity traders manage the transfer of oil, gas, and minerals around the world using complex data systems.

Although transparency efforts in the extractives industry in the early 2000s were focused primarily on the publication of documents ready to be checked and reconciled through an audit process, by the start of this decade, there was an increasing emphasis on disclosure in the form of data. This coincides with the emergence of the open data movement on the global stage, marking the extractives transparency sector as an early adopter of open data methodologies.

Notably, work on transparency in the extractives sector has focused as much on requiring the private sector to open up data as it has on opening up government data. PWYP has described how this framing was a strategic choice, noting that "At the time of the launch [of PWYP] there was little recourse at the global level to push for disclosure of revenues by resource-rich developing country governments", but "mechanisms to require disclosure by companies which are listed on stock exchanges and subject to accounting regulations were available and could be amended".[9] There is, within this work, an ambitious programme of re-imagining how a global market should function, with concerted work to rebalance the line between public and proprietary information. For some, this is simply a corrective action in a market where governance has not kept up with the globalised industry. For others, such as Berlin-based social enterprise OpenOil, launched in 2011 and operating under the tagline "imagine an open oil industry …",[10] there may be a deeper vision at play of transforming the way natural resources are managed and the role that policy-makers and citizens have in their exploitation.

As government agencies gain new data, both public and private, from companies, the attention of civil society and researchers has turned to the lack of cross-agency data sharing. Various government agencies tend to obtain different types of data which can all be of value when, for example, assessing tax payments and the other contractual obligations of companies. But if the data from different agencies is not brought together, opportunities to use it may be missed. In a survey of government officials in African resource-rich countries, OpenOil identified, in particular, that project costs, reserves, and production data were identified as areas where the gap between the perceived need for joined-up data and data availability was the most pronounced.[11] More research is necessary in order to determine the appropriate limits for how much data should be made public, but, in the meantime, models for data sharing between trusted agencies could be further advanced. In support of this, recent research in the mining sector noted that "Revenue authorities could improve their analysis of risks through sharing production data, findings from cost audits, mining agreements, and information on beneficial owners as a matter of course rather than just before a tax audit."[12] Concretely, the African Tax Administration Forum has indicated that such work is being explored.[13]

## Putting mandatory disclosure data in action

In 2010, President Obama signed into law the Dodd-Frank Act[14] with a provision (Section 1504) which requires extractives companies to report on their project-level payments to governments as part of official security filings. The European Union followed suit with the 2013 Accounting and Transparency Directive that was subsequently transposed into national law across Europe,[15] and, in Canada, the Extractive Sector Transparency Measures Act (ESTMA) was passed at the end of 2014.[16] Although a decision by the United States (US) Congress, under President Trump, to vacate the rules for Section 1504 of the Dodd-Frank Act means that disclosure from US-listed extractives companies is currently on hold, other countries are pushing forward with disclosure. Fifty-one EITI member countries have now agreed to provide project-level disclosure for the 2018 financial year in open data formats.[17]

Experiences to date demonstrate that the implementation of these mandatory disclosure regulations and processes have a large impact on how far the disclosures lead to machine-readable

and user-friendly open data. In Canada, where more than 500 companies have disclosed payments data, companies can choose under the regulations to either publish machine-readable data in XLS format or to publish PDF documents which place a heavy processing burden on anyone wanting to carry out detailed analysis of the reports. For the fiscal year 2016–2017, only 27 company reports were provided in machine-readable XLS format, while 687 reports were provided in PDF format.[18] According to PricewaterhouseCoopers Canada (PwC), an auditing company, the share of company reports submitted with one or more deficiencies in company reports fell from 80% in the first year to 46% in the second year.[19] In the United Kingdom (UK), the company register, Companies House, has developed an application programming interface (API) for the digital submission of reports, attracting structured data reports from 115 companies for the financial year 2015–2016.[20] Working with this released data, PWYP has noted that "Despite its value and importance, [...] the quality of mandatory extractive company reporting to date indicates that improvement is needed in several areas",[21] highlighting the impact that definitions and disclosure formats defined in the regulations has on the data output. Gaining an agreement on global standards and infrastructures for joined-up extractives reporting to improve quality will be no small task.

## Demonstrating the value of data

One of the key ways in which mandatory disclosure can be improved is by different actors making use of, and providing feedback on, data disclosures. This enables civil society to provide detailed technical feedback that can strengthen implementation of new disclosure processes during their critical early years. High-profile use cases demonstrating the value of disclosures are also important to overcome resistance to ongoing publication. For example, in 2017, PWYP France, Oxfam France, ONE, and Sherpa analysed payments from the uranium mining company, Areva, to the Government of Niger. They concluded that a contract renegotiated in 2014 had led to a substantial reduction in government revenue.[22] The same year, NRGI published an analysis of oil revenues in Ghana[23] and in Nigeria[24] demonstrating how, with better access to data, civil society can ask more precise questions of both national oil companies and the government.

It is important that data use can be sustained and that potential users of data are supported in navigating a complex data landscape. In 2018, PWYP in the UK conducted a detailed study of extractives disclosures,[25] and, Global Witness and Resources for Development Consulting published a guide for using mandatory disclosure data, highlighting both sources of data and the "red flags" to look for.[26] To facilitate the use of disparate data, NRGI also pioneered the development of the ResourceProjects.org data platform which collects, processes, and standardises mandatory disclosure data across jurisdictions, taking some of the hard work out of data access. At the time of writing, the ResourceProjects.org platform contains mandatory disclosures covering more than 18 000 payments from 747 reporting companies with payments worth more than USD 537 billion. The platform allows users to navigate disclosure data either by reporting by company or by country. By collating disclosures from across reporting jurisdictions, the platform reduces the complexity of acquiring the data for local civil society users, thus lowering barriers to using the data.

There is also evidence that governments are beginning to consider how to better engage citizens as data users, applying open source and human-centred design principles to support the

dissemination of data. In the US, the US Digital Service helped to develop the US EITI data platform. Although the US withdrew from EITI in 2017,[27] EITI Multi-Stakeholder Group (MSG) of Germany adopted the same open source developed platform.[28] In the Philippines, the government has pursued local workshops to stimulate the use of data collected through the EITI process.[29]

## The wider data landscape

Disclosures secured by regulations are not the only source of data becoming available on the extractives sector. There exists a much wider landscape of data collection with increasing efforts to standardise and align data. Data ranges from high-level economic statistics from institutions like the World Bank and International Centre for Tax and Development (ICTD)[30] to extractives data on revenues and contracts published by companies and governments. In some cases, the data narrowly focuses on extractives; however, in other cases, extractives-relevant data is drawn from wider data sources, such as corporate registries (see Chapter 3: Corporate ownership), satellite data (see Chapter 9: Geospatial), and trade statistics.

A key source of comparable data about extractives is EITI. Through its implementation in 51 countries, EITI has established multi-stakeholder-led processes for regular data collection on several topics, such as the production of extractives, revenues paid to governments, and licences issued. In the past, this information was largely captured in PDF reports, but EITI has, since 2016, maintained a database of country-level data. In 2018, this was followed by the release of a public API that provides a feed of more than 300 reporting years from EITI member states and USD 2 trillion in revenue payments.[31] In December 2015, EITI had already adopted an Open Data Policy, which, a year later, became part of the EITI Standard. This encourages the development of open-by-default systems and the use of unique identifiers to link data between years and reporting sources.[32] As a sign of growing interest, the World Bank published a comprehensive study in 2016 on how the extractives sector could leverage existing open data standards for new disclosures.[33]

Aligned reporting requirements are key to mapping revenue flows between datasets. Between 2014 and 2017, the International Monetary Fund (IMF) engaged in a series of country pilots to examine how revenue in resource-rich countries could be matched to their Government Finance Statistics Manual. Beyond the studies themselves, the result of this has been a crosswalk between EITI and IMF standards and a new standard data collection template for resource revenue data.[34]

EITI has also developed a strategy for "mainstreaming" transparency requirements within country data systems, recognising the importance of having government agencies in charge of collecting disaggregated revenue data and sketching out how new and existing information systems, including financial systems and cadastres, can be oriented toward the development of standardised open data using case studies from Kazakhstan, Timor-Leste, Norway, and Mongolia.[35]

Contracts, licences, and information on fiscal terms are increasingly recognised as critical building blocks for analysing the public long-term benefits of extractives projects. During the past few years, substantive improvements have occurred in the publishing practices of both

major companies and governments.[36] A focus on contracts has also helped build links to other complex sectors, such as land, infrastructure, and private–public partnerships, and has offered opportunities to work systematically on improvements to open contracting.[37] However, key standards, such as the Open Contracting Data Standard (OCDS), are yet to be fully adapted to capture structured data on concessions and extractives contracts, meaning that extracting data from disclosed contract documents continues to rely heavily on civil society and researchers.

Commercial data providers have, during recent years, also served as key actors in the rapid digitisation of extractives records management within government, thanks, in particular, to international donor funding. Yet open data principles have often failed to materialise within these projects. For example, among funded mining cadastres in 15 Sub-Saharan African countries, none have, to date, published the underlying licensed data in open formats. These constraints make it more difficult for civil society to scrutinise the data.

However, one example of progress on open data among ICT system providers can be found in the Revenue Development Foundation (RDF), which facilitates the publication of mining licences and revenue data for government ministries with plans to provide a public API in the future.[38] RDF reports 5 000 registered users, of which 65% are from mining companies and investors, 8% are researchers, and another 8% are from civil society. To date, RDF has launched four public data portals across Sierra Leone, Liberia, Mali, and Ghana, tracking a total of 17 000 mining licences and 30 000 payments.[39]

In some cases, countries are going beyond the minimum requirements for disclosure. In Mexico, for example, the EITI MSG developed a data portal with input from civil society, making contracts, production data, and revenue data available to the public. In Myanmar, the EITI MSG expanded its disclosure of disaggregated data on the Jade trade, thus enabling new analysis which has achieved coverage in national media.[40] In the coming years, implementation of beneficial ownership registers will be a new critical data priority, following commitments made by members of EITI to include the publication of beneficial ownership information as open data by 2020.[41] In several countries, reforms are currently underway to establish the legal frameworks that will mandate beneficial ownership disclosure.

In looking at extractives, we should also not ignore forestry and agriculture. In 2017, the World Resources Institute (WRI) examined the transparency of logging, mining, and agricultural concession data in 14 countries. The WRI concluded that, while data disclosure varies significantly by country and sector, its quality is limited by the absence of internationally agreed upon data standards, stating that "civil society can be a significant source of concessions information where official data are unavailable".[42] The forestry sector has also been a major user of satellite data, working in partnership with academia to process global landsat data to detect changes in land use.[43]

Although there is a long way to go before all relevant extractives-related data is well-structured, standardised, and open by default, the sector can no longer be considered data-poor as NRGI's mapping of the data supply ecosystem illustrates, identifying over 35 repositories and databases for extractive sector open data.[44] The ways in which the sector has engaged with the available data is instructive both to understanding what can be done even when data gaps persist and also to identifying the most crucial areas for advocacy to further improve data supply.

### Measuring extractives governance

Neither the Open Data Barometer, Open Data Index, nor the Open Data Inventory measure specific variables on extractives governance. However, a number of sector-specific projects are now tracking data availability and offer the chance to continuously monitor trends in the future.

In 2017, the **Resource Governance Index (RGI)** launched the most comprehensive measurement of extractives governance to date, including assessments of 81 countries (accounting for 82% of the world's oil production and a significant proportion of mineral extraction).[45] A number of the questions assess availability and machine-readability of key disclosures, and the index itself has published raw data across all its 149 questions. The RGI has also provided almost 10 000 supporting documents.[46]

Launched in 2018, the **Responsible Mining Index (RMI)** has developed "an evidence-based assessment of mining company policies and practices on economic, environmental, social, and governance issues", including assessments at the company and mine-site level. The RMI examines the extent to which companies are supplying open data on a number of aspects of their operations.[47]

## Working with what is available

Critical to the use of extractives data is an emerging ecosystem of platforms, infomediaries, and capacity-building activities.[48] Organisations, such as OpenOil, have deployed the Aleph platform that enables the search of security exchange filings from extractives companies, which helps data users to find the needle in the haystack of disclosure. In 2016, PWYP, in partnership with OpenOil, launched a global Data Extractors programme dedicated to building skills among CSOs working on extractives accountability issues,[49] and the WRI has released mapping platforms, Global Forest Watch and Resource Watch, which provide access to raw data and visualisations from public domain mining datasets.[50] All these activities are illustrative of the comparatively (to other sectors) well-resourced environment for data use in extractives. The following sections outline four different ways in which data is being put into use.

### Going deeper: Running the numbers

With the increasing availability of contract information, information on revenue payments, and other key data points, a growing community of CSOs and consultants have engaged in financial modelling to help the public understand how different policies can lead to vastly different outcomes from resource extraction. OpenOil describe their modelling as "building an Excel-based model that recreates the past and forecasts the future cashflows of a specific mining or petroleum (oil and/or gas) project, and evaluates how these cashflows are shared between the resource owner – usually the government – and the investor – usually a mining or oil company – over the life of the project, under the fiscal rules (the fiscal regime) that apply to the project".[51]

So far, OpenOil has modelled eleven oil and mining projects across several countries, including Indonesia,[52] Mongolia, and Brazil.[53] Similarly, the Columbia Center for Sustainable Investment (CCSI) has produced an analysis of gold mines,[54] and NRGI has used modelling to offer quantitative analysis on sector-wide fiscal regimes in order to contribute to national policy debates in many countries, such as Ghana, Kyrgyzstan, Uganda, Mongolia, and the Democratic Republic of Congo (DRC). In addition, the IMF released details on its modelling in 2015 following calls by civil society for transparency around how their models were built.[55]

Modelling has proven effective at closing the gap between disclosure and discussion by taking advantage of improvements in data availability, and the work of a critical audience of infomediaries, to increase public scrutiny and debate. This was evident in Guyana, where the publication of the contract for the Stabroek project led to OpenOil publishing a financial model three months later which assessed that the government take from the project (52% at today's prices) was "low even for frontier provinces".[56] As another example, in the US, the Project on Government Oversight (POGO) used auction data to analyse how the price per acre for extracting oil in the Gulf of Mexico had "declined by 95.7 percent from $9,068 to $391".[57] Among multilateral institutions, the IMF has also contributed to this emerging open community of modelling practitioners with the publication of its official IMF model and methodology.[58]

Besides the modelling of individual extractives projects, a range of actors are using available data for long-term forecasting. For example, in 2018, NRGI published a tool for visualising IMF forecasting data from the World Economic Outlook "to assess how countries have been coping with resource sector volatility and uncertainty".[59] In several countries, improved access to revenue data has also provided input for improved macro-economic analysis and revenue forecasting with implications relevant to open budget communities. In one example from Mongolia, revenue forecasts from five of the largest mines were used to feed into an openly licensed macro-economic analysis.[60]

## The disruption of black box data services

While civil society may, until recently, have referred to the extractives sector as data poor, the private sector has long benefitted from proprietary data provided by highly valued business intelligence companies, one of which was recently sold in a multi-billion dollar deal.[61] Companies, such as S&P Global, Rystad Energy, and Wood Mackenzie,[62] all produce commercial databases for oil and mining production, which, due to the high subscription fees, are rarely accessible to civil society, journalists, or even governments. Some have hoped that mandatory disclosure data, data from EITI reporting and contract information, will, over time, make these proprietary databases redundant and level the playing field between governments and CSOs on one side and companies on the other. However, government data releases to date have, to some extent, provided a sobering moment. Mandatory disclosure data does not, for example, provide the reserve and cost figures which are often needed for developing financial models. While some governments have, for a considerable period, had processes for obtaining independently produced data on cost and reserves that can be utilised for monitoring costs by operating companies, others have only more recently begun considering these options.[63]

In the area of oil shipping, there are signs that new types of analytical products are emerging which could improve scrutiny of the commodity trading sector. The TankerTrackers platform has been publishing analysis based on open or public data on production and shipping since 2016, generating regular coverage in major news outlets.[64] This success highlights how incumbent commercial data providers may have left a number of users unserved due to high subscription costs for data services and the lack of data provenance within proprietary databases.

Looking ahead, the development of new business models across the extractives business intelligence market could play an important role in addressing data gaps created by the current unaffordable commercial databases, which often lack transparent methodologies and have limited coverage in developing countries. An analysis by the Organisation for Economic Co-operation and Development (OECD) of privately provided datasets for use in transfer price analysis underscores that often these proprietary sources have major limitations, leaving substantial gaps in the market for data products better oriented toward government and multilateral needs.[65] As yet, it is not clear whether the combination of entrepreneurs and investors needed to fill these gaps will emerge.

---

### Use of microtasking to uncover oil spills

The limited extent of open data standardisation for extractives can sometimes mean that it can be difficult to use data to advance accountability. In Nigeria, the National Oil Spill Detection and Response Agency (NOSDRA) began providing online data for oil spill reports reported by companies operating in the country in 2014.[66] When approaching the data, Amnesty International was, however, faced with thousands of PDF documents without any standardised information. They turned to their Amnesty Decoders online community of human rights volunteers, working with them to deliver 1 300 hours of data cleaning and generating the structured data needed in order to analyse the track record of different companies' oil spill reports.

The investigation showed that figures reported by companies were vastly different from those of the Nigerian government. The Decoders helped identify massive delays in resolving spills with some spills continuing for months after they were reported. The investigation earned widespread media mentions and illustrated how "microtasking" can leverage volunteers to expand the investigative reach of CSOs.[67]

---

## Telling the story: Investigations and journalism

Collaboration between civil society and investigative journalists working with new sources of data has helped with the scrutiny of extractives companies and corruption in resource-rich developing countries. Journalists used the Panama Papers to report how the Panama-based law firm, Mossack-Fonseca, served as "a major provider of secrecy to companies involved in extractive industries" in countries such as Algeria,[68] and Global Witness has leveraged company register data to report on how former generals in Myanmar benefitted from the opaque jade trade.[69] In fragile states, established and new media outlets have worked side-by-side to leverage satellite imagery and open datasets in order to uncover the role of natural resources in conflict.

During the rise of the Islamic State in Syria, the *Washington Post* mapped makeshift oil refineries using satellite imagery from Digital Globe,[70] and the *Financial Times* covered the political economy of conflict in Iraq using local oil price data.[71] In Libya, Al Jazeera has mapped oil fields in order to contextualise coverage of the ongoing civil war.[72]

In reporting with data, civil society and journalists both surface stories for wider public attention and demonstrate what could be done with data on a more systematic basis. The citizens' journalism collective, Bellingcat, for example, has noted that their "open-source research is only a small attempt to demonstrate that much more work can be undertaken to identify conflict pollution and improve humanitarian response and post-conflict reconstruction work" and have provided workshops and training to humanitarian organisations and UN agencies. They used satellite imagery to examine oil pollution in Syria during the civil war.[73] In Peru, the Amazon Conservation Association, a CSO, has documented deforestation from illegal gold mining. Lastly, a civil society-initiated project in Indonesia explored how community-based drone mapping could reveal land grabs related to mining.[74]

## Research: Data, information, and action

There is a well-developed research community around extractives governance with signs of growing interest in the potential of quantitative and experimental research methods to generate policy-relevant knowledge from new data sources. Pioneering work by AidData, which combines geo-referenced concession data with remote sensing satellite data in order to look at connections between natural resource concessions and local economic development in Liberia, is illustrative of the new kind of approach researchers are exploring.[75] This research does not wait for perfect open data but rather brings together data in new configurations to rigorously generate new insights. International institutions are also heavily embedded in the research community, engaging with new data flows. For example, the IMF has explored the potential to monitor real-time fiscal data[76] which could be particularly useful for countries with volatile extractives revenues.

Central to the goal of turning research into action are strong connections between researchers, policy-makers, and non-governmental organisations (NGOs). The recently launched Project on Resources and Governance (PRG) describes how it is working to address the scant evidence about effective interventions in the extractives sector by bringing together a "network of social scientists, policy-makers, NGOs, and industry representatives dedicated to finding policies that promote welfare, peace, and accountability in resource-rich countries".[77] In the Disclosure to Development (D2D) programme, led by the International Finance Corporation, a message emerging from research so far is "that data needs to connect to policy and accountability within both government and the private sector",[78] and that this requires local voices and citizen participation. It is the combination of rigorous data analysis and local insight that can ultimately move the sector from being "data rich and information poor" to having actionable know-how for securing better impacts.[79] The initiative Leveraging Transparency to Reduce Corruption, headed by the Brookings Institution, released an annotated bibliography in 2018 which "reviewed more than 650 books, papers, and other resources in the transparency, accountability, and participation and/or natural resource space".[80]

Ultimately, as this chapter has sought to demonstrate, one of the key roles that increased data accessibility has played is to break down the silos of the different actors, enabling collaboration, knowledge transfer, and creative development of new methods and approaches.

## Looking ahead: Future frontiers

In this chapter, we have highlighted trends in data collection and use which are starting to have an impact at both a global and country level. We see more robust analysis, more data-driven experimentation, and improved cross-sectional work to build skills among extractives-focused NGOs.

The extractives sector remains a highly volatile and capital-intensive sector. While there are different opinions on the pace, there is broad agreement that the sector will continue to invest heavily in new technologies, digitisation, and automation in the future.[81] The World Economic Forum has also identified a wide area of technologies which could impact the extractives value chains, including artificial intelligence, robotics, privately owned trading platforms drawing on distributed ledgers (blockchain technology), and automation across the supply chain.[82] This indicates that, while progress has been made in the last decade on data openness, private sector investments in data collection and management across extractives operations is likely to expand. At this stage, however, it is unclear how CSOs, activists, journalists, and policy-makers will be able to keep up with the pace of change to maintain access to data and to scrutinise a rapidly changing market.

As the extractives transparency movement heads into its third decade, and extractives open data enters its second, there is a need to draw on learning so far to sharpen our focus on clearly defined problems. Improvements are needed in providing reliable data, generating analysis which can address timely policy challenges, and finally getting the analysis and policy recommendations into the hands of broad-based civil society campaigns, journalists, and, ultimately, policy-makers. There are major benefits to be sought from linking up the sector with other "Follow the Money" efforts,[83] building alliances to trace funds across extractives, budgets, contracting, aid, and service delivery. While substantive research is yet to emerge beyond initial mapping,[84] there are opportunities here to go beyond breaking down silos in a single sector and to build bridges between groups concerned with fundamental questions of how public resources are managed. There is also a need to strengthen links with sustainability and climate change networks. Notable efforts are being made to connect analysis of extractives revenues, fiscal policy, and implications for climate change, for example, in areas such as fossil fuel subsidies[85] and through the Green Fiscal Policy Network.[86] Lastly, the emergence of the Task Force on Climate-related Financial Disclosures has led to the development of a framework for company disclosure of climate risks with commitments from 1 800 major companies.[87] Moving forward, these climate disclosures will be an important source for analysis.

As this chapter has shown, when machine-readable open data is available, infomediaries, civil society, and governments can leverage it to develop analysis and evidence-based policy recommendations. Yet, it is important to recognise that the road from data acquisition to analysis and policy impact remains highly complex and dependent on many factors, such as the political

context, the capacity of civil society and other potential users, and opportunities for decision-making based on the results of analysis. The extractives sector will be able to continue to learn from peer research across the open government space.[88] Scaling up the use of extractives data is not necessarily about building mass-movements or substantially increasing investment in open data, but it does involve supporting the development of specialist skills among key stakeholders and leveraging those skills effectively, for example, by expanding work on fiscal modelling, which, if enabled by open data, would bring extensive domain expertise to bear on specific weaknesses in extractives governance. The future of open data in extractives will also rest on how well regulations for disclosure are implemented in practice by national agencies and how far multi-stakeholder initiatives advance interoperable disclosure requirements. The importance of getting the technical definitions and details right cannot be underestimated, and this will demand much deeper collaboration between open data and standards specialists, policy advocates, and policy-makers.

Overall, if the multi-stakeholder approach that has characterised extractives governance work over recent years can be sustained, and open data specialists can be further integrated into the process, then the next decade should see open data become an unprecedented tool for extractives governance.

## Further reading

Natural Resource Governance Institute. (2017). 2017 Resource Governance Index. https://resourcegovernanceindex.org/about/global-report

Ray, N., Lacroix, P.M.A., Giuliani, G., Upla, P., Rajabifard, A., & Jensen, D. (2016). Open spatial data infrastructures for the sustainable development of the extractives sector: Promises and challenges. In D. Coleman, A. Rajabifard, & J. Crompvoets (Eds.), *Spatial enablement in a smart world* (pp. 53–69). Quebec City: Global Spatial Data Infrastructure Association Press. https://archive-ouverte.unige.ch/unige:90248

Saavedra, S. & Romero, M. (2017). *Local incentives and national tax evasion: The response of illegal mining to a tax reform in Colombia.* Job Market Paper. Stanford, CA: Stanford University. http://web.stanford.edu/~santisap/Saavedra_JMP.pdf

Srivastava, N., Agarwal, V., Bhattacharjya, S., Gopalakrishnan, T., Meenawat, H., Nayak, B., & Soni, A. (2014). *Open government data for regulation of energy resources in India.* New Delhi: The Energy and Resources Institute. http://opendataresearch.org/sites/default/files/publications/Full%20-%20TERI%20OGD%20and%20energy%20resources%20July%202014-print.pdf

World Bank. (2016). *Options for data reporting – EITI Standard, 2016: The good, the better and the best.* Washington, DC: World Bank. http://documents.worldbank.org/curated/en/793601469102170609/pdf/107171-WP-P152662-PUBLIC.pdf

## About the author

**Anders Pedersen** is a Senior Open Data Officer at the NRGI. At NRGI, Anders has overseen the development of global data platforms and technical assistance on open data and data-driven decision-making in more than a dozen countries across Asia, Latin America, and Africa. He has engaged with global stakeholders, such as IMF, Open Contracting Partnership, the World Bank, and IETI, on interoperability, data standards, and open licensing. Before joining NRGI, Anders worked for more than a decade in the field of open data, international development, and journalism at the Open Knowledge Foundation.

## How to cite this chapter

Pedersen, A. (2019). Open data and extractives. In T. Davies, S. Walker, M. Rubinstein, & F. Perini (Eds.), *The state of open data: Histories and horizons* (pp. 119–136). Cape Town and Ottawa: African Minds and International Development Research Centre. http://stateofopendata.od4d.net.

## Endnotes

1   https://www.resourcedata.org/organization/eiti

2   Humphreys, M., Sachs, J.D., & Stiglitz, J.E. (2007). *Escaping the resource curse*. New York, NY: Columbia University Press.

3   http://openjadedata.org/

4   Kyithar Swe, A. & Salomon, M. (2018). New data demystify Myanmar's jade sector. *Myanmar Times*, 2 August. https://www.mmtimes.com/news/new-data-demystify-myanmars-jade-sector.html

5   Global Witness. (2015). Jade: Myanmar's "big state secret": The biggest natural resources heist in history? *Global Witness*, 23 October. https://www.globalwitness.org/en/campaigns/oil-gas-and-mining/myanmarjade/

6   Dapice, D. (2018). *A grand bargain: What it is and why it is needed*. Cambridge, MA: Ash Center for Democratic Governance and Innovation, Harvard Kennedy School. https://ash.harvard.edu/files/ash/files/20160815_a_grand_bargain_eng_oct_24.2016.pdf

7   Author's interview with key informant.

8   IMF. (2012). *Fiscal regimes for extractive industries: Design and implementation*. Washington, DC: Fiscal Affairs Department, International Monetary Fund. https://www.imf.org/en/Publications/Policy-Papers/Issues/2016/12/31/Fiscal-Regimes-for-Extractive-Industries-Design-and-Implementation-PP4701

9   Van Oranje, M. & Parham, H. (2009). *Publishing what we learned: An assessment of the Publish What You Pay Coalition*. London: Publish What You Pay, p. 30. https://eiti.org/document/publishing-what-we-learned-assessment-of-publish-what-you-pay-coalition

10   http://openoil.net/about-openoil/

11   African Natural Resources Center, African Development Bank, and OpenOil. (2017). *Running the numbers: How African governments model the extractive projects*. African Natural Resources Center, African Development Bank, and OpenOil. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/anrc/Running_the_Numbers_Analytical_report.pdf

12   Readhead, A. (2016). *Preventing tax base erosion in Africa: A regional study of transfer pricing challenges in the mining sector*. New York, NY: Natural Resource Governance Institute. https://resourcegovernance.org/sites/default/files/documents/nrgi_transfer-pricing-study.pdf

13   https://www.ataftax.org/Exchange-of-information

14   Security and Exchange Commission. (2010). *Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010*, 24 May. http://legcounsel.house.gov/Comps/Dodd-Frank%20Wall%20Street%20Reform%20and%20Consumer%20Protection%20Act.pdf

15   https://eur-lex.europa.eu/legal-content/EN/NIM/?uri=celex:32013L0050

16   https://laws-lois.justice.gc.ca/eng/acts/E-22.7/page-1.html

17   EITI. (2017). *Project-level reporting guidance note 29 – Requirement 4.7*. Oslo: Extractive Industries Transparency Initiative. https://eiti.org/sites/default/files/documents/guidance_note_29_on_project-level_reporting.pdf

18   Author's calculation based on available reports on Natural Resources Canada's disclosure site, Links to ESTMA reports, at https://www.nrcan.gc.ca/mining-materials/estma/18198

19   PwC Canada. (2017). *The Extractive Sector Transparency Measures Act – Year 1 reporting highlights*. Ottawa: PricewaterhouseCoopers LLP. https://www.pwc.com/ca/en/energy-utilities/publications/pwc-energy-canada-estma-year-1-reporting-highlights-July%2014,2017-EN.pdf and author's review of PwC Canada's 2018 review.

20   Litvinoff, M. (2017). *Submission to UK government review of the reports on payments to governments regulations 2014*. London: Publish What You Pay UK, p. 7. http://www.publishwhatyoupay.org/wp-content/uploads/2017/11/2017.11.17-PWYP-submission-to-UK-review-final.pdf

21   Ibid., pp. 2–4.

22   Alliot, C., Cortin, M., Kurkjian, M., Lemaître, S., Ly, S., & Parrinello, Q. (2017). *Beyond transparency: Investigating the new extractive industry disclosures*. Paris: PWYP France, One, Oxfam France, and Sherpa. https://www.oxfamamerica.org/explore/research-publications/beyond-transparency-investigating-the-new-extractive-industry-disclosures/

23   Malden, A. & Osei, E. (2018). Ghana's gold mining revenues: An analysis of company disclosures. *Natural Resource Governance Institute*, 11 September. https://resourcegovernance.org/analysis-tools/publications/ghanas-gold-mining-revenues-analysis-company-disclosures

24   Malden, A. (2017). Nigeria's oil and gas revenues: Insights from new company disclosures. *Natural Resource Governance Institute*. https://resourcegovernance.org/sites/default/files/documents/nigeria-oil-revenue.pdf

25   Litvinoff, M. (2018). *Comparing UK EITI and mandatory payments to governments data for 2016: Assessment report*. London: Publish What You Pay UK. www.publishwhatyoupay.org/wp-content/uploads/2018/09/Comparing-UK-EITI-mandatory-data-assessment-report-PWYP-UK-Sept18.pdf

26   Global Witness & Resources for Development Consulting. (2018). Finding the missing millions: A handbook for using extractive companies' revenue disclosures to hold governments and industry to account. https://www.globalwitness.org/en/campaigns/oil-gas-and-mining/finding-missing-millions/#chapter-0/section-0

27   Simon, J. (2017). US withdraws from extractive industries anti-corruption effort. *Reuters*, 2 November. https://www.reuters.com/article/us-usa-eiti/u-s-withdraws-from-extractive-industries-anti-corruption-effort-idUSKBN1D2290

28   https://revenuedata.doi.gov/

29   Palawan News. (2018). PH-EITI Roadshow 2018 pushes for extractives transparency in local development. *Palawan News*, 13 July. https://palawan-news.com/ph-eiti-roadshow-2018-pushes-for-extractives-transparency-in-local-development/

30   The International Centre for Tax and Development (ICTD) has developed the Government Revenue Dataset (GRD), which serves as a key source for government revenues in resource-rich countries. The dataset is hosted by UN Wider. https://www.wider.unu.edu/project/government-revenue-dataset

31   https://eiti.org/explore-data-portal

32   Extractive Industries Transparency Initiative. (2016). EITI Open Data Policy. https://eiti.org/document/eiti-open-data-policy

33  World Bank. (2016). *Options for data reporting – EITI Standard, 2016: The good, the better and the best*. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/793601469102170609/ pdf/107171-WP-P152662-PUBLIC.pdf

34  IMF. (2017). *Update on the standard template to collect data on government revenues from natural resources*. Washington, DC: International Monetary Fund. https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/04/27/ update-on-the-standard-template-to-collect-data-on-government-revenues-from-natural-resources

35  EITI. (2016). *Towards mainstreaming action plan*. Oslo: Extractive Industries Transparency Initiative.

36  For disclosing companies, see Oxfam. (2018). *Contract disclosure survey 2018: A review of the contract disclosure policies of 40 oil, gas and mining companies*. Oxfam Briefing Paper. Oxford: Oxfam. https:// oxfamilibrary.openrepository.com/bitstream/handle/10546/620465/bp-contract-disclosure-extractives-2018-030518-en.pdf;jsessionid=9F7A2330301E95422B0426167E88B854?sequence=4. For disclosure practices among governments, see Hubert, D. & Pitman, R. (2017). *Past the tipping point? Contract disclosure within EITI.* New York, NY: Natural Resource Governance Institute. https://resourcegovernance. org/sites/default/files/documents/past-the-tipping-point-contract-disclosure-within-eiti-web.pdf

37  Pitman, R., Shafaie, A., Hayman, G., & Kluttz, C. (2018). *Open contracting for oil, gas and mineral rights: Shining a light on good practice*. New York, NY: Open Contracting Partnership & Natural Resource Governance Institute. https://resourcegovernance.org/sites/default/files/documents/open-contracting-for-oil-and-gas-mineral-rights.pdf

38  Revenue Development Foundation. (n.d.). The RDx Data Exchange Standard & API Service: Piloting and ongoing case studies. https://revenuedevelopment.org/page/rdx-data-exchange

39  Written interview, Aasmund Andersen, Revenue Development Foundation, August 2018.

40  https://www.mmtimes.com/news/new-data-demystify-myanmars-jade-sector.html

41  EITI. (2017). *2017 Progress report: Ending company anonymity – The key to fighting corruption*. Oslo: Extractive Industries Transparency Initiative, p. 14. https://eiti.org/sites/default/files/documents/eiti_ progress_report_2017.pdf

42  Webb, J., Petersen, R., Moses, E., Excell, C., Weisse, M., Cole, E., & Szoke-Burke, S. (2017). *Logging, mining, and agricultural concessions data transparency: A survey of 14 forested countries*. Washington, DC: World Resources Institute. http://wriorg.s3.amazonaws.com/s3fs-public/Logging_Mining_and_Agricultural_ Concessions_Data_Transparency_A_Survey_of_14_Forested_Countries.pdf

43  Hansen, M.C., Krylov, A., Tyukavina, A., Potapov, P.V., Turubanova, S., Zutta, B., Ifo, S., Margono, B., Stolle, F., & Moore, R. (2016). Humid tropical forest disturbance alerts using Landsat data. *Environmental Research Letters*, *11(3)*. https://doi.org/10.1088/1748-9326/11/3/034008

44  http://apps.resourcegovernance.org/supply-ecosystem/

45  The Economist. (2017). Resource Governance Index. *The Economist*, 1 July. https://www.economist.com/ economic-and-financial-indicators/2017/07/01/resource-governance-index

46  Natural Resource Governance Institute. (2017). 2017 Resource Governance Index. https:// resourcegovernanceindex.org/

47  https://responsibleminingindex.org/en/downloads

48  Van Schalkwyk, F., Willmers, M., & McNaughton, M. (2016). Viscous open data: The roles of intermediaries in an open data ecosystem. *Information Technology for Development*, *22(1)*, 68–83. https://www. tandfonline.com/doi/pdf/10.1080/02681102.2015.1081868?needAccess=true

49  https://www.pwyp.org/pwyp-news/qa-mining-new-company-data-with-pwyps-open-extractors/

50  https://data.globalforestwatch.org/datasets/26a457ee3b584824bb930f2ec791b60d_0

51  OpenOil. (n.d.). Financial Modeling Program. http://openoil.net/contract-modeling/ financial-modeling-program/

52  http://openoil.net/wp/wp-content/uploads/2014/09/OO_id_batuhijau_narrative_v1.0_161109.pdf

53  http://openoil.net/wp/wp-content/uploads/2014/09/OO_br_Libra_narrative_1.0_161104.pdf

54  http://ccsi.columbia.edu/work/projects/open-fiscal-models/

55  Cust, J. & Mihalyi, D. (2015). IMF's Open FARI Model Release an Important First Step. *Natural Resource Governance Institute* [Blog post], 9 October. https://resourcegovernance.org/blog/imfs-open-fari-model-release-important-first-step

56  West, J. (2018). *Stabroek Oil Field, Guyana: Narrative report*. Berlin: OpenOil. http://openoil.net/wp/wp-content/uploads/2018/03/oo_gy_stabroek_narrative_v1.0_180315_1025_jw.pdf

57  Hilzenrath, D.S. & Pacifico, N. (2018). Drilling down: Big oil's bidding. *Project On Government Oversight (POGO)*, 22 January. http://www.pogo.org/our-work/articles/2018/drilling-down-big-oils-bidding.html

58  Luca, O. & Mesa Puyo, D. (2016). *Fiscal Analysis of Resource Industries (FARI) methodology*. Washington, DC: Fiscal Affairs Department, International Monetary Fund. https://www.imf.org/external/pubs/ft/tnm/2016/tnm1601.pdf

59  Mihalyi, D. & Morrison, T. (2018). World Economic Outlook Forecast Tracker. *Natural Resource Governance Institute*. https://resourcegovernance.org/analysis-tools/tools/world-economic-outlook-forecast-tracker

60  Mihalyi, D., Baksa, D., & Romhanyi, B. (2017). Mongolia Macro-Fiscal Model. *Natural Resource Governance Institute*. https://resourcegovernance.org/analysis-tools/tools/mongolia-macro-fiscal-model

61  Kent, S. (2015). Verisk analytics to buy Wood Mackenzie for $2.8 Billion. *Wall Street Journal*, 10 March. https://www.wsj.com/articles/verisk-analytics-to-buy-wood-mackenzie-for-2-8-billion-1425981462

62  See https://www.spglobal.com/en/, https://www.rystadenergy.com/, and https://www.woodmac.com/, respectively.

63  Readhead, A., Mulé, D., & Op de Beke, A. (2018*). Examining the crude details: Government audits of oil and gas project costs to maximize revenue collection. Ghana case study*. Oxfam Briefing Paper. Oxford: Oxfam. https://oxfamilibrary.openrepository.com/bitstream/handle/10546/620595/bp-examining-the-crude-details-ghana-131118-en.pdf

64  Tanker Trackers. (2018). Iran, September 2018 with oil production calculation*. https://tankertrackers.com/news/crude-oil-exports-report/iran-september-2018

65  For a rare discussion on the quality, coverage, and cost of commercial databases, see pp. 22–24 of OECD & World Bank Group. (2017). *A toolkit for addressing difficulties in accessing comparables data for transfer pricing analyses*. The Platform for Collaboration on Tax Discussion Draft. Paris: Organisation for Economic Co-operation and Development. https://www.oecd.org/tax/discussion-draft-a-toolkit-for-addressing-difficulties-in-accessing-comparables-data-for-transfer-pricing-analyses.pdf

66  https://oilspillmonitor.ng/

67  Carstens, P. (2018). Amnesty says Shell, Eni negligent on Nigeria oil spills, *Reuters*, 15 March. https://www.reuters.com/article/us-oil-nigeria/amnesty-says-shell-eni-negligent-on-nigeria-oil-spills-idUSKCN1GS00A

68  Fitzgibbon, W. (2016). Secret offshore deals deprive Africa of billions in natural resource dollars. *International Consortium for Investigative Journalists*, 25 July. https://www.icij.org/investigations/panama-papers/20160725-natural-resource-africa-offshore/

69  https://www.globalwitness.org/jade-story/

70  Warrick, J. (2016). Satellite photos show Islamic State installing hundreds of makeshift oil refineries to offset losses from airstrikes. *Washington Post*, 7 July. https://www.washingtonpost.com/news/worldviews/wp/2016/07/07/satellite-photos-show-isis-installing-hundreds-of-makeshift-oil-refineries-to-offset-losses-from-air-strikes/?utm_term=.fdcf81ae44a9

71  Solomon, E., Kwong, R., & Bernard, S. (2016). Inside Isis Inc: The journey of a barrel of oil. *Financial Times*, 29 February. https://ig.ft.com/sites/2015/isis-oil/?

72  Raymond, P.A. & Haddad, M. (2015). The battle for Libya's oil: Fighting over Libya's oil resources is placing the country's future in jeopardy. *Al Jazeera*, 19 February. https://www.aljazeera.com/indepth/interactive/2015/02/battle-libyas-oil-150219124633572.html

73  Zwijnenburg, W. (2018). Nefarious negligence: Post-conflict oil pollution in Eastern Syria. *Bellingcat*, 9 April. https://www.bellingcat.com/news/mena/2018/04/09/nefarious-negligence-post-conflict-oil-pollution-in-eastern-syria/

74  Radjawali, I. & Pye, O. (2015). Counter-mapping land grabs with community drones in Indonesia. Paper presented at *Land Grabbing, Conflict and Agrarian–Environmental Transformations: Perspectives from East and Southeast Asia, 5–6 June 2015, Chiang Mai University, Bangkok.* https://www.iss.nl/sites/corporate/files/CMCP_80-Radjawali_and_Pye.pdf

75  Bunte, J.B., Desai, H., Gbala, K., Parks, B., & Runfola, D.M. (2017). *Natural resource sector FDI and growth in post-conflict settings: Subnational evidence from Liberia.* AidData Working Paper 34. Washington, DC: AidData. http://docs.aiddata.org/ad4/files/wps34_natural_resource_sector_fdi_and_growth_in_post-conflict_settings.pdf

76  Olden B., Poplawski-Ribeiro, M., & Kejji, L. (2017). *Nowcashing: Using daily fiscal data for real-time macroeconomic analysis*. Washington, DC: International Monetary Fund. http://www.imf.org/en/publications/wp/issues/2017/11/06/nowcashing-using-daily-fiscal-data-for-real-time-macroeconomic-analysis-45372

77  https://projectrg.org/

78  Kharma, S. & Crist, L. (2018). Data rich and information poor: Increasing the effectiveness of data disclosure in the natural resource sectors. *CommDev*. https://www.commdev.org/data-rich-and-information-poor-increasing-the-effectiveness-of-data-disclosure-in-the-natural-resource-sectors/

79  Ibid.

80  Eisen, N., Kaufmann, D., & Heller, N. (2018). *Annotated bibliography: Transparency, accountability, and participation along the natural resource value chain.* Washington, DC: Brookings Institution. https://www.brookings.edu/about-the-leveraging-transparency-to-reduce-corruption-project/

81  http://ccsi.columbia.edu/files/2015/07/mining-a-mirage-CCSI-IISD-EWB-2016.pdf

82  https://www.weforum.org/agenda/archive/fourth-industrial-revolution

83  http://followthemoney.net/

84  https://www.opengovpartnership.org/stories/share-love-share-data-follow-money

85  Ross, M., Hazlett, C., & Mahdavi, P. (2015). *The politics of petroleum prices: A new global dataset*. https://www.sscnet.ucla.edu/polisci/faculty/ross/papers/working/IPES_final.pdf

86  http://greenfiscalpolicy.org

87  https://www.fsb-tcfd.org/publications/final-recommendations-report/#

88  Berdou, E. & Shutt, C. (2017). Shifting the spotlight: Understanding crowdsourcing intermediaries in transparency and accountability initiatives. *Making All Voices Count*, 22 February. https://www.makingallvoicescount.org/publication/shifting-spotlight-understanding-crowdsourcing-intermediaries-transparency-accountability-initiatives/