

# Measuring Extractives Dependency: Why it Matters and New Approaches

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## Key messages

- Dependence on oil, gas and/or mining (“extractives”) holds back development.
- Measuring dependence is important to help countries diversify.
- Extractives dependence is multi-dimensional, and measurements need to reflect that.
- The Natural Resource Governance Institute (NRGI) is presenting a new dataset that covers a broad range of indicators related to extractives dependence. This can help researchers to understand how dependent individual countries are, and allow them to analyze the causes & consequences of extractives dependence.
- Diversification requires policies to develop the rest of the economy; good governance of the extractive sector is not enough by itself.

## INTRODUCTION

When countries depend too heavily on extractive industries (extraction of non-renewable natural resources), this can pose problems for their economies.<sup>1</sup>

These include:

- The volatility of natural resource commodity prices, which can cause shocks that are difficult for the country to manage
- The exhaustibility of natural resources and the challenges of replacing them as a source of income when they run out
- The political economy of governments relying on natural resources, which seems to make governments less effective (e.g., if they rely on resource wealth to fund themselves rather than developing other sectors of the economy)

Reducing the dependency on natural resources of key aspects of the economy (such as government revenues or foreign exchange earnings)—for example, by developing other sectors of the economy or changing the tax system to broaden the tax base—could help to reduce these problems.

To address resource dependency, we need to be able to measure it—both to show its consequences and make the case to decision-makers to tackle it, and also to see what approaches have helped countries to diversify and reduce dependency.

1 Syed Mansoob Murshed and Zafar Altaf, “What Turns a Blessing into a Curse? The Political Economy of Natural Resource Wealth [with Comments],” *Pakistan Development Review* 46, no. 4 (November 2007): 351–377, [www.jstor.org/stable/41261170](http://www.jstor.org/stable/41261170).

## APPROACHES TO MEASURING EXTRACTIVES DEPENDENCY

With this in mind, NRGi has been reflecting on how to better measure extractives dependency. We started by looking at how different institutions have done this to date.

For instance, the International Monetary Fund (IMF) in its Macroeconomic Policy Framework for Resource-Rich Developing Countries (2012) considered a country “resource-rich” if extractives accounted for at least 20 percent of exports or 20 percent of public fiscal revenues.<sup>2</sup> The International Council on Mining and Metals and researchers at the United Nations Development Programme (UNDP) have each proposed indices for measuring extractives dependency based on the share of extractives in exports and gross domestic product (GDP) (and in government revenues, for the UNDP researchers).<sup>3</sup> All of these measures of dependency note that there are different types of dependency and that various indicators are needed to measure it.

In more recent work on this topic, the Multidimensional Indicator of Extractives-based Development (MINDEX) expands the number of indicators used, underlining that it is important to distinguish between resource abundance (i.e., a high level of natural resource wealth per capita) and resource dependence (i.e., a proportionately high share of natural resource extraction in the economy).<sup>4</sup> For example, countries can be resource dependent but not resource abundant if they have little resource wealth in absolute or per capita terms but the rest of the economy is so small that resources still dominate (e.g., in Chad).

The MINDEX uses the value per capita (of extractives exports, government revenues, rents and reserves) to capture abundance, while using the share of extractives in total exports and government revenues to capture dependency. The MINDEX suggests that resource dependency is multifaceted, and that to measure it we need a range of different indicators. Country profiles that consider the various indicators together can also help to show the type of dependency a country is facing. But most research has to date focused on a limited range of such indicators, and this approach may overlook important aspects of dependency and/or its impacts.<sup>5</sup>

## A NEW DATASET ON EXTRACTIVES DEPENDENCY

Given the problems mentioned above, tackling extractives dependency is an essential part of NRGi’s work (as outlined in its 2020–2025 Strategy).<sup>6</sup> It is a key issue for several of NRGi’s priority countries such as Nigeria, which has faced severe economic disruption as a result of its dependency on oil.<sup>7</sup> Fossil fuel dependency is particularly

2 IMF, “Macroeconomic Policy Frameworks for Resource-Rich Developing Countries—Background Paper 1—Supplement 1” (Washington, D.C., August 2012), [www.imf.org/external/np/pp/eng/2012/082412a.pdf](http://www.imf.org/external/np/pp/eng/2012/082412a.pdf).

3 International Council on Mining and Metals, *Role of Mining in National Economies Mining Contribution Index (MCI)*, 5th edition (London, December 2020). [www.icmm.com/website/publications/pdfs/social-performance/2020/research\\_mci-5.pdf](http://www.icmm.com/website/publications/pdfs/social-performance/2020/research_mci-5.pdf); Degol Hailu and Chinpihoi Kipgen, “The Extractives Dependence Index (EDI),” *Resources Policy* 51 (March 2017): 251–264, [doi.org/10.1016/j.resourpol.2017.01.004](https://doi.org/10.1016/j.resourpol.2017.01.004).

4 Amir Lebdioui, “The Multidimensional Indicator of Extractives-Based Development (MINDEX): A New Approach to Measuring Resource Wealth and Dependence,” *World Development* 147 (November 2021): 105633, [doi.org/10.1016/j.worlddev.2021.105633](https://doi.org/10.1016/j.worlddev.2021.105633).

5 Lebdioui, “The Multidimensional Indicator of Extractives-Based Development (MINDEX).”

6 NRGi, “2020–2025 Strategy” (New York), accessed 12 August 2022, [resourcegovernance.org/sites/default/files/documents/nrgi-strategy-2020-2025.pdf](https://resourcegovernance.org/sites/default/files/documents/nrgi-strategy-2020-2025.pdf).

7 Nafi Chinery and Tengi George-Ikoli, “Ending Nigeria’s Oil Dependency: Not If, But When ... and How,” NRGi blog, 9 March 2022, [resourcegovernance.org/blog/ending-nigeria-oil-dependency-not-if-but-when-and-how](https://resourcegovernance.org/blog/ending-nigeria-oil-dependency-not-if-but-when-and-how).

risky given the transition to renewable energy, which is likely to upend the economic model of countries that rely on carbon-based energy resource production.

It is therefore important to have data that properly measure dependency, as a first step toward addressing it. NRGi has decided to produce a dataset on the topic, intended primarily as an internal resource.

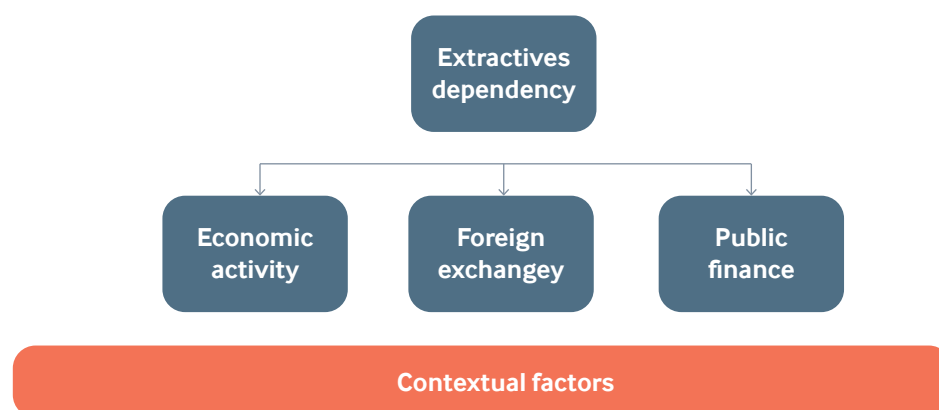
The dataset builds on insights from existing work, such as the examples mentioned above. We have also introduced new indicators of resource dependency to fill gaps in the literature. These include trade in value added and other value chain measures, the share of extractives in investment and wealth, and dependency on national oil companies.

We decided to share the dataset externally in the hope that it will prove useful to researchers, including by spurring further thought on more multifaceted analysis. We have also included “contextual factors” that help make sense of how much countries are at risk as a result of their dependency on extractives.

The Measuring Dependency dataset (that can be accessed [here](#)) includes 215 countries and territories from 1960 to 2021. Depending on the indicator, data does not exist for all countries and/or all years. Data availability for our indicators generally improves over time and is generally at its best from the year 2000 onwards. On average across indicators, data is available for 68 countries, or about 32 percent of those in the dataset, before 2000, and 84 countries, or 39 percent of the dataset, from 2000 onwards.

We have organized the data under three main pillars of extractives dependency: economic activity, foreign exchange and public finance.

Figure 1. Structure of the dataset



## DATASET DIMENSIONS AND INDICATORS

We now describe the dataset’s dimensions in more detail and provide references to where users can find various indicators.

- **Economic activity.** In addition to traditional measures of the extractive sector’s place within overall economic activity, such as the share of extractives rents in GDP (MINDEX tab, column K), we have included data measuring the extent to which the rest of the economy depends on natural resources (e.g., earnings for domestic firms from supplying the extractive sector). For example, we include data on global value chains (from the U.N. Conference on Trade and Development (UNCTAD) Eora dataset and the World Bank’s World Development Report 2020) to better measure the value to the economy of both resource extraction and

support services/inputs to it.<sup>8</sup> (See the “Economic activity” tab, columns L to Q, and “Foreign exchange,” columns K to N.)

In addition, we include under this pillar data looking at how far a country’s economic future is likely to be tied to extractives, namely an indicator of the share of investment going to the sector (“Economic activity,” columns V to Z); we also include the share of national wealth that is tied to extractives (“Public finance,” columns AA to AC). Where investment is highly concentrated in the resource sector, this can provide a warning sign that dependency is likely to worsen over time and suggests the need for corrective action. And we include indicators of the extent to which employment depends on the extractive sector (“Economic activity,” columns I and J) as well as of the share of domestic energy that comes from a country’s own fossil fuels (column K).

- **Foreign exchange.** Currently, measures of dependency use gross extractives exports as a proxy for foreign exchange earnings from the sector (“Foreign exchange,” columns G to J). This may give a distorted view of extractives dependency because it ignores the foreign exchange spent on inputs used to produce those exports. We therefore include net foreign exchange earnings from extractives (i.e., extractives foreign exchange exports minus the value of imported inputs used to produce them) (columns K and M). We also look at the importance of extractives foreign exchange earnings for financing the country’s import bill in columns L and N, and its food import dependency in column P, to place this importance in context.
- **Public finance.** In addition to existing indicators of the share of extractives in government revenues (“Public finance,” columns H to K), we include indicators of the ratio of extractive revenues to service payments on government external debt (column V).<sup>9</sup> We also include contextual factors that help show how far countries are at risk from depending on natural resources for their public revenues—such as the level of revenues from other sources, government debt (total and external: columns T and W respectively), fiscal space (column AA) and government financial assets and liabilities (columns S and U). And we include indicators from NRCI’s National Oil Company Database showing the extent to which certain countries depend on their national oil companies, which may be even riskier than depending on a resource by itself (columns L, M and AC).<sup>10</sup>
- **Contextual factors.** We include cross-cutting contextual factors that, while not in themselves measurements of dependency, help show how much of a risk a country’s extractives dependency is likely to be for its economic stability. These factors include: how concentrated a country’s extractives exports are in terms of a few trading partners (“Cross-cutting contextual factors,” column J); the country’s reserves-to-production ratio (as a proxy for the resources’ time to depletion, or exhaustibility) (columns K to N); and indicators related to the country’s overall income level, since, all else being equal, more wealth may help countries to weather volatility and/or exhaustibility of their earnings from extractives (columns O to Q).

8 UNCTAD, “UNCTAD-Eora Global Value Chain [GVC] Database,” 2022, [worldmrio.com/unctadgvc/](http://worldmrio.com/unctadgvc/); World Bank, *World Development Report 2020: Trading for Development in the Age of Global Value Chains* (Washington, D.C., 2020), doi:10.1596/978-1-4648-1457-0.

9 When combined with indicators on fiscal space (which we also include), the indicators on debt service show how far countries may be at risk of defaulting on their public debt if extractive revenues collapse.

10 Patrick R.P. Heller and David Mihalychi, *Massive and Misunderstood: Data-Driven Insights into National Oil Companies* (New York: NRCI, April 2019), [resourcegovernance.org/sites/default/files/documents/massive\\_and\\_misunderstood\\_data\\_driven\\_insights\\_into\\_national\\_oil\\_companies.pdf](http://resourcegovernance.org/sites/default/files/documents/massive_and_misunderstood_data_driven_insights_into_national_oil_companies.pdf); NRCI, “National Oil Company Database,” 2022, [nationaloilcompanydata.org/](http://nationaloilcompanydata.org/).

- **MINDEX.** We also reproduce (and in some cases update) indicators from the MINDEX.<sup>11</sup> These indicators help us understand how the country fits into the MINDEX's typology of different types of resource dependency. Though some indicators in the MINDEX overlap with others in the dataset (e.g., on exports and revenues), we considered it important to present data on the MINDEX in a separate section of the dataset, making it easier for users to analyze where each country fits in the above-mentioned typology.<sup>12</sup>

In addition to economic considerations, political processes can also depend on the fortunes of the natural resources sector. This can be harmful; e.g., where the extractive industries hold great influence over politicians, this can make governments less responsive to the views of citizens. In addition, if public policies change with the fortunes of a country's extractive industries, their volatility can prevent countries from following through on long-term projects like developing new sectors.

Because of the dependency of politics on the natural resources sector, we initially sought to include politics as a fourth pillar of extractives dependency. However, we were unable to find sufficient data for our indicators of interest, such as the share of political finance coming from the extractive sector or the share of official development assistance (i.e., international aid provided by governments) going to the extractive sector. But further research could be of interest in terms of correlations between the fortunes of the extractive sector and political outcomes, such as changes of government through elections, coups or conflict.

## HOW CAN WE USE EXTRACTIVES DEPENDENCY DATA?

We can use the data to assess an individual country's level and type of extractives dependency, and to highlight how urgent it is for the country to diversify. The data can also help pinpoint the economic indicators where countries' dependency is greatest, and therefore where diversification efforts should focus. For example, in Nigeria, according to our data, extractives were the source of around 46 percent of government revenues in 2019 (see "Public finance," column I).<sup>13</sup> But these revenues are highly volatile and during the COVID-19 pandemic they fell to only around 33 percent of government revenues; partly as a result, total government revenues fell by one third, and the country cut public spending drastically.<sup>14</sup>

Nigeria is also dependent on extractives exports for foreign exchange. Based on traditional trade data for 2019, extractives exports accounted for around 68 percent of the country's foreign exchange needs (see "Foreign exchange," column I).<sup>15,16</sup> Contextual information of the type we include in the dataset puts this in perspective.

11 Lebdoui, "The Multidimensional Indicator of Extractives-Based Development (MINDEX)."

12 Lebdoui, "The Multidimensional Indicator of Extractives-Based Development (MINDEX)."

13 Author's analysis of Anna Fleming, "Natural Resource Revenue Dataset," NRG, 2022, [www.resourcedata.org/dataset/natural-resource-revenue-dataset](http://www.resourcedata.org/dataset/natural-resource-revenue-dataset).

14 Chinery and George-Ikoli, "Ending Nigeria's Oil Dependency."

15 According to data for 2015 (the latest available year), Nigeria's total extractives exports accounted for 47 percent of its foreign exchange spending that year. Calculations based on author's analysis of UN Statistics Division, "UN Comtrade Database" data (8 September 2022), accessed via the World Bank's World Integrated Trade Solution (WITS), [wits.worldbank.org/](http://wits.worldbank.org/)

16 However, once we take into account the imported inputs used in the extractive sector, "net" foreign exchange earnings from extractives exports (upstream only) are estimated at 25 percent (see column L). This compares to 36 percent for "gross" foreign exchange earnings from upstream extractives exports, calculated using traditional trade data. Calculation based on author's analysis of UN Statistics Division, "UN Comtrade Database" data (8 September 2022, accessed via the World Bank's World Integrated Trade Solution (WITS), (for "gross" foreign exchange earnings), IMF's, "Imports of Goods, Services and Primary Income (BoP, Current US\$)," 20 July 2022, [data.worldbank.org/indicator/BM.GSR.TOTL.CD](http://data.worldbank.org/indicator/BM.GSR.TOTL.CD) (for foreign exchange needs) and World Bank, *World Development Report 2020* (for "net" foreign exchange earnings).

Nigeria is also a net food importer (22 percent of its food by value was imported in 2018), suggesting potential risks to food security if the value of oil exports rapidly declines and foreign exchange dries up (see column P).

Countries can depend on extractives in different ways and to different extents, and these differences can exist even where two countries have a very similar share of extractives value added in GDP. For example, in 2018 in both Egypt and Nigeria extractives value added accounted for 11 percent of GDP (see “Economic activity,” column H). But Egypt depends much less than Nigeria on extractives for government revenue; the sector accounted for 12 percent of Egypt’s government revenue in 2018 and 2019, a much lower level than in Nigeria (“Public finance,” column I).<sup>17</sup> This is partly because, in absolute terms, Egypt’s revenues from its extractive sector are less than Nigeria’s, according to our data. This comes as no surprise. Egypt has a significant mining sector, whereas Nigeria’s extractive sector is dominated by oil and gas; the latter tend to have higher rents (which are available to be taxed) than mining, where for a given value of production a greater share is spent on costs.<sup>18</sup>

Further, according to our data, Egypt has mobilized more revenue from outside the extractive sector than Nigeria; this reduces Egypt’s share of extractives in total revenue, making the country less dependent on extractives rents than Nigeria. The most recent data (2019) indicates that Egypt was able to mobilise 14 percent of its GDP in revenues from outside the extractive sector; for Nigeria, this figure was just 4 percent (column R).<sup>19</sup>

In addition to the size of the rents available, how much revenue countries mobilize from their natural resources is also influenced by their effective tax rates for the sector. According to our latest data for this indicator (for 2019), Egypt and Nigeria had around the same effective tax rate on extractive sector profits, 37 percent (column K).<sup>20</sup>

Aside from government revenues and foreign exchange, we can also assess how much of the country’s economic activity depends on the extractive sector. One way to do this is to look at the value added by the sector (i.e., the value of its output minus the cost of inputs it purchases) as a share of GDP.<sup>21</sup> Our data on this considers only extraction and related support services, not downstream processing (see “Economic activity,” column H).<sup>22</sup>

For example, in 2020 Saudi Arabia’s extractive sector accounted for 20 percent of its GDP. This is a significant decline from the latest peak in 2008, when it stood at around 50 percent. For most of the intervening period the country’s economy continued to grow, which may suggest that the economy is diversifying away from resource extraction (see Figures 2a and 2b). At least some of this trend appears to be driven by downstream processing of extractive commodities becoming increasingly important as a share of foreign exchange in Saudi Arabia.<sup>23</sup>

17 Author’s analysis of Fleming, “Natural Resource Revenue Dataset.”

18 B.C. Land, “The Similarities and Differences between Mining and Petroleum Investment: A Comparison of Investment Characteristics, Company Decisions and Host Government Regulation,” *Oil, Gas & Energy Law Intelligence* 5, no. 2 (2007), 260.

19 Author’s analysis of Fleming, “Natural Resource Revenue Dataset.”

20 Author’s analysis of Fleming, “Natural Resource Revenue Dataset” and World Bank data on natural resource rents.

21 For a fuller explanation of value added, see Organisation for Economic Co-operation and Development (OECD), “Value Added by Activity,” accessed 9 September 2022, [data.oecd.org/natincome/value-added-by-activity.htm](http://data.oecd.org/natincome/value-added-by-activity.htm).

22 Chris Hinchcliffe, Marshall Reinsdorf and Michael Stanger, *Guide to Analyze Natural Resources in National Accounts* (Washington, D.C.: IMF, January 2017), [www.imf.org/external/pubs/ft/qna/pdf/na.pdf](http://www.imf.org/external/pubs/ft/qna/pdf/na.pdf).

23 Whereas Saudi Arabia’s exports of extractive commodities did not permanently increase (any increases during this period were followed by greater declines), the share of value-added extractives in Saudi Arabia’s total exports did increase (see ‘Foreign exchange’, (col G minus col H) ÷ col H). Authors’ analysis of “UN Comtrade Database” data, accessed 8 September 2022, [comtrade.un.org/data/](http://comtrade.un.org/data/).



Figure 2a. Share of extractives value added in GDP, Saudi Arabia, 2000-2020<sup>24</sup>

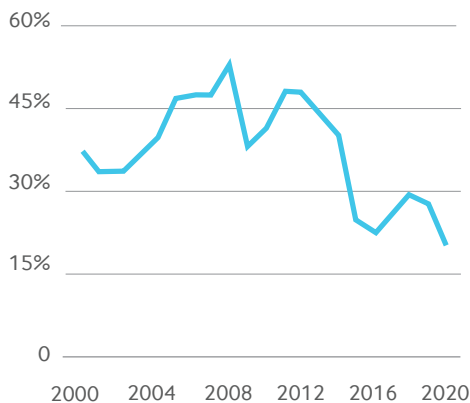
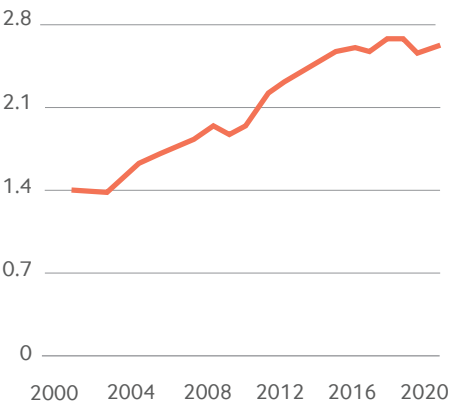
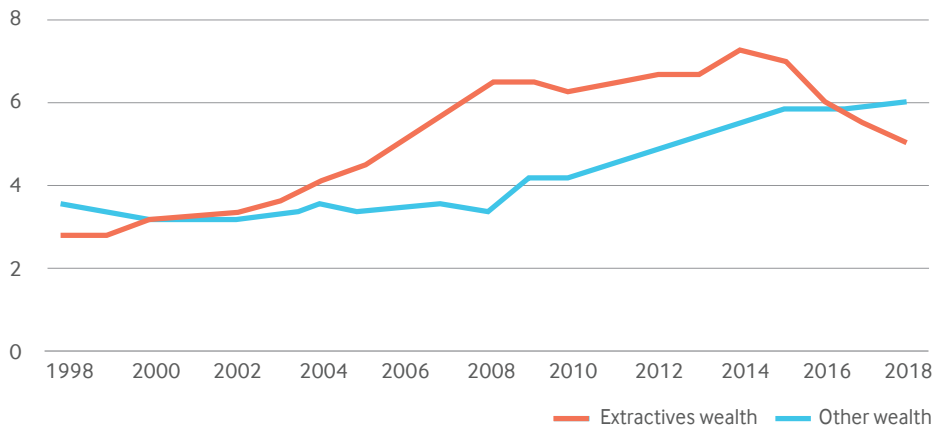


Figure 2b. GDP of Saudi Arabia, SAR trillion (constant prices), 2000-2020



Although Saudi Arabia has reduced the share of extractives in its GDP since 2008 while growing its economy, it may be difficult for the country to sustain this trend. In the last few years, the value of Saudi Arabia’s natural resource wealth (as measured by the World Bank’s Changing Wealth of Nations data) has been declining faster than its other wealth has been increasing (see Figure 3 and “Public finance” in our dataset, column AA).<sup>25</sup> The country might therefore struggle to maintain standards of living over the long term without further efforts to boost its non-extractive sectors during the energy transition (assuming we consider the current high oil price in 2022 a “blip” and expect a decline over the coming decades).

Figure 3. Saudi Arabia’s wealth, USD trillion (2018 prices), 1998-2018<sup>26</sup>



24 Sources for Figures 2a and 2b: author's analysis of “GDP (Constant LCU) - Saudi Arabia,” The World Bank | Data, 2022, [data.worldbank.org/indicator/NY.GDP.MKTP.KN?locations=SA](https://data.worldbank.org/indicator/NY.GDP.MKTP.KN?locations=SA), for GDP and United Nations Statistics Division, “UNdata,” United Nations, 2022, [data.un.org](https://data.un.org), for extractives value added.

25 The decline in Saudi Arabia’s extractive wealth is not due to the depletion of the country’s oil and gas reserves, which actually increased over the same period (author’s analysis of U.S. Energy Information Administration data, [www.eia.gov/international/data/world](https://www.eia.gov/international/data/world)). It is therefore likely to be due to the decline in long-term oil and gas prices used to forecast future rents. This is because in the source data on national wealth that we use here, the World Bank measures extractive wealth as discounted future cash flows from extractive sector rents. Future annual cashflows are forecast using average rents of the last five years. After 2014, oil prices declined significantly and did not recover by 2018. As a result, the five-year moving average of oil prices declined each year up to 2019. Assessment based on author’s analysis of U.S. EIA, “Data 1: Crude Oil,” 10 August 2022, downloaded by the author at [tinyurl.com/mvzejuvf](https://tinyurl.com/mvzejuvf), and World Bank, *The Changing Wealth of Nations 2021: Managing Assets for the Future* (Washington, D.C., 2021).

26 Source for Figure 3: author’s analysis of World Bank, “DataBank | Wealth Accounts,” 10 July 2021, [databank.worldbank.org/source/wealth-accounts](https://databank.worldbank.org/source/wealth-accounts). “Other wealth” in Figure 3 refers to the sum of net foreign assets, human capital, machinery, equipment, urban land, intangible wealth such as intellectual property, agricultural land, forests, protected areas, mangroves and marine fisheries: see World Bank, *The Changing Wealth of Nations 2021*, 28, for further details.

We can also use the data to assess how far extraction of a country's natural resources relies on labor and capital based domestically, instead of depending on imported inputs. The estimated share of domestic value added in upstream exports (see "Economic activity," column Q) shows how much of the value of exports is paid to workers and capital based in-country.<sup>27</sup> In most countries, this share is higher than might be expected; the average in 2018 was around 65 percent, though there is considerable variation.

We can contrast Zimbabwe, where the share of value added was lowest (among countries for which we have data) in 2018 at 14 percent, with Bulgaria, where the share was much higher at 64 percent.<sup>28</sup> This difference may be, at least in part, because Zimbabwe's workers receive a low share of the value of the country's extractives output, with only 7 percent of its value paid to Zimbabwean workers as wages. Bulgarian workers, by contrast, receive a share around 2.5 times the level in Zimbabwe (see "Economic activity," column U).<sup>29</sup> Average wages are substantially higher in Bulgaria's extractive sector than in Zimbabwe, at around USD 7,000 per year compared to around USD 400 per year in Zimbabwe. This (and other factors) enable Bulgarian workers in the sector to capture a higher share of the value of the extractives commodities the country produces (see columns S and T).<sup>30</sup>

Countries can also depend on the extractive sector as a source of employment. Although extractives generally provide a small share of total employment, the absolute numbers in some countries can be large. For example, in Colombia almost 200,000 people worked in the extractive sector in 2020 (see "Economic activity," column J).<sup>31</sup> For countries or regions that depend on fossil fuel production for employment (e.g., the Cesar and La Guajira regions of Colombia), the transition away from these fuels could have a significant negative impact on employment.<sup>32</sup>

Beyond looking at individual countries, researchers can also use these data to consider how countries can reduce their dependency on extractives. As referenced in NRGi's *2021 Resource Governance Index*, few countries have managed to truly diversify their economies away from the sector over the long term.<sup>33</sup>

Countries with well-governed extractive sectors (as measured by NRGi's Resource Governance Index) have not generally performed much better than others at diversifying away from extractives.<sup>34</sup> As can be expected, these countries seem to attract more investment for extractives, including for exploration, so the sector tends to grow, rather than the economy diversifying. This suggests that resource-dependent countries need to make a concerted effort to diversify their economies. Promoting

27 The data relate to exports that either are raw or have undergone only some basic processing. The data correspond to the outputs of the mining and quarrying sector (which also includes extraction of oil and gas) in the internationally agreed System of National Accounts. The data are presented net of taxes levied on production or sales but inclusive of subsidies applying to production/sales (i.e., they are presented "at basic prices").

28 Author's analysis of UNCTAD, "UNCTAD-Eora GVC Database."

29 Author's analysis of UN Industrial Development Organization (UNIDO) "UNIDO Statistics Data Portal," accessed 13 September 2022, [stat.unido.org/](http://stat.unido.org/) this reflects workers in upstream extractives, i.e., mining, quarrying, oil and gas extraction, and related support services.

30 Authors' analysis of UNIDO, "UNIDO Statistics Data Portal" and of ILO, "Employment by Sex and Economic Activity—Thousands," ILOSTAT, accessed 4 March 2022 and 6 October 2022, [www.ilo.org/shinyapps/bulkexplorer55/?lang=en&segment=indicator&id=EMP\\_TEMP\\_SEX\\_ECO\\_NB\\_A](http://www.ilo.org/shinyapps/bulkexplorer55/?lang=en&segment=indicator&id=EMP_TEMP_SEX_ECO_NB_A), and World Bank, "World Bank Open Data," accessed 6 October 2022, [data.worldbank.org/](http://data.worldbank.org/).

31 ILO, "Employment by Sex and Economic Activity—Thousands."

32 Silvio López and Fernando Patzy, *Thermal Coal in Colombia: Perspectives and Risks for the Economies of La Guajira and Cesar Departments* (New York: NRGi, April 2021), [resourcegovernance.org/sites/default/files/documents/summary\\_thermal\\_coal\\_in\\_colombia\\_perspectives\\_and\\_risks\\_for\\_the\\_economies\\_of\\_la\\_guajira\\_and\\_cesar.pdf](http://resourcegovernance.org/sites/default/files/documents/summary_thermal_coal_in_colombia_perspectives_and_risks_for_the_economies_of_la_guajira_and_cesar.pdf).

33 NRGi, *2021 Resource Governance Index*, (New York, 2021) 28, [default/files/documents/2021\\_resource\\_governance\\_index.pdf](http://default/files/documents/2021_resource_governance_index.pdf).

34 NRGi, *2021 Resource Governance Index*.



good governance of the extractive sector, while very important given the sector's economic and social impacts, will not be enough to achieve diversification.

How can countries diversify away from the extractive sector? The academic literature offers a number of solutions:

- Government policies can support the development of new industries outside extractives by applying subsidies, tax breaks, directed finance, and so on, and/or regulation that allows those industries to grow, while encouraging competition and/or exports (“active industrial policies”).<sup>35</sup>
- In some cases, adding value to extractive commodities can help countries diversify; for example, where commodity processing stimulates other sectors of the economy outside of extractives (such as providers of inputs to the downstream processing sector).<sup>36</sup>
- Some evidence suggests that general good governance of the economy as a whole can assist diversification.<sup>37</sup>

Further research using our data may help provide new insights into how resource-rich countries can reduce their dependency in various different aspects, or at least limit it.

In addition, our data on value chains in the extractive sector may help researchers better track where countries can boost other sectors of the economy by adding value to extractives and/or supplying goods and services to the sector. In turn, we can use these data to complement existing research on whether such strategies can support diversification.

NRGI's new dataset, entitled Measuring Dependency, is available for download [here](#).

35 See, e.g., Reda Cherif and Fuad Hasanov, “Principles of True Industrial Policy,” *Journal of Globalization and Development* 10, no. 1 (2019), doi.org/doi:10.1515/jgd-2019-003; Mariana Mazzucato, “From Market Fixing to Market-Creating: A New Framework for Innovation Policy,” *Industry and Innovation* 23, no. 2 (13 May 2016): 140–156, doi.org/10.1080/13662716.2016.1146124; and Amir Lebdioui, “Chile's Export Diversification since 1960: A Free Market Miracle or Mirage?” *Development and Change* 50, no. 6 (November 2019): 1624–1663, doi.org/10.1111/DECH.12545.

36 Amir Lebdioui and Pavel Bilek, *Do Forward Linkages Reduce or Worsen Dependency in the Extractive Sector?* (New York: NRG, 2021), resourcegovernance.org/sites/default/files/documents/do-forward-linkages-reduce-or-worsen-dependency-in-the-extractive-sector.pdf.

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## ANNEX 1. INDICATORS AND METADATA

Note: More detailed variable definitions and formulas are included in the dataset.

Dimension	Sub-dimension	Variable name	Variable definition/formula (includes hyperlinks to underlying data)	Data source
Economic activity	Production	Extractives value added	Value added from mining, quarrying, oil and gas extraction, and basic processing	de Vries et al. (2021); UNdata (for Saudi Arabia)
Economic activity	Production	Extractives value added as % of GDP	Extractives value added ÷ GDP	de Vries et al. (2021); UNdata (for Saudi Arabia); GDP from World Bank (as of 30 Jun. 2022)
Economic activity	Employment	Employment in extractives	Employment in extractive sector (mining, quarrying, oil and gas extraction, and basic processing)	ILO (ILOSTAT)
Economic activity	Employment	Employment in extractives as % of total population	Employment in extractive sector (mining, quarrying, oil and gas extraction, and basic processing)	ILO (ILOSTAT) for employment data; population data from World Bank
Economic activity	Energy	Fossil fuels as % of total energy use	Fossil fuels as % of total energy use	OECD and International Energy Agency
Economic activity	Production	Estimated value of domestic extractives value chains (basic prices)	Output from extractives × (share of domestic added in extractives exports)	Author's analysis based on UNCTAD-Eora GVC Database (for share of foreign value added in extractives exports) and on UNdata (for output)
Economic activity	Contextual factors	Share of domestic value added in extractives exports (estimates)	Estimated share of local participation in upstream value chains = domestic share of value added in upstream extractives exports	Authors' analysis based on UNCTAD-Eora GVC Database
Economic activity	Contextual factors	Total extractive sector compensation of employees (current USD)—ISIC rev. 4	Wages and salaries for the extractive sector—ISIC rev. 4	UNIDO MINSTAT ISIC rev. 4 2022 database
Economic activity	Contextual factors	Extractive sector average wages per worker (current USD per year)	Total extractive sector compensation of employees ÷ extractive sector employment	Numerator: UNIDO MINSTAT ISIC rev. 4 2022 database (as of 13 Sep. 2022); denominator: ILOSTAT
Economic activity	Contextual factors	Extractive sector average wages per worker (current USD per year)	Mean annual earnings of employees in USD	ILOSTAT (wage data); IMF International Financial Statistics (exchange rate data)
Economic activity	Contextual factors	Share of compensation of country's workers in national extractives output (ISIC rev. 4, producers' prices)	Total extractive sector compensation of employees ÷ extractive sector output	NRGI calculations based on UNIDO MINSTAT 2022, ISIC rev. 4 database
Economic activity	Production	Share of investment directed to the extractive sector	Gross fixed capital formation for extractives ÷ gross fixed capital formation for whole economy	NRGI calculations based on UN National Accounts Database
Foreign exchange	Exports	Extractives exports (current USD millions)	Exports from the extractive sector; extractives exports defined as Standard International Trade Classification (SITC) codes 3 (excluding 35), 27 (excluding 2721) 28, 68, 6672, 6673 and 97	Authors' analysis based on UN Comtrade data accessed via World Bank World Integrated Trade Solution (WITS)

Foreign exchange	Exports	Extractives upstream exports (current USD millions)—ISIC rev. 4 mining and quarrying	Exports from the extractive sector; extractives exports defined as SITC codes equivalent to ISIC rev. 4 mining and quarrying sector (includes oil and gas extraction)	Authors' analysis based on UN Comtrade data accessed via World Bank WITS
Foreign exchange	Exports	Share of extractives exports in total foreign exchange spending	Extractives exports ÷ imports of goods, services and primary income	Authors' analysis based on UN Comtrade data via World Bank WITS (extractives export data) and IMF (total imports of goods, services and primary income)
Foreign exchange	Exports	Share of upstream extractives exports in total foreign exchange spending	Upstream extractives exports ÷ imports of goods, services and primary income	Authors' analysis based on UN Comtrade data via World Bank WITS (extractives export data) and IMF (total exports of goods, services and primary income)
Foreign exchange	Exports of value added	Domestic value added embodied in extractives exports	Domestic value added embodied in extractives exports	World Development Report 2020 GVC database
Foreign exchange	Exports of value added	Share of domestic value added embodied in extractives exports in foreign exchange spending	Domestic value added embodied in extractives exports ÷ imports of goods, services and primary income	Authors' analysis based on World Development Report 2020 GVC database (numerator) and IMF (denominator)
Foreign exchange	Exports of value added	Domestic extractives value added in country's total exports	Domestic extractives value added in country's total exports	Authors' analysis based on UNCTAD-Eora GVC Database
Foreign exchange	Exports of value added	Share of exported domestic extractives value added in country's foreign exchange needs	Domestic extractives value added in country's total exports ÷ imports of goods, services and primary income	Authors' analysis based on UNCTAD-Eora GVC Database (numerator) and IMF (denominator)
Foreign exchange	Contextual factors	Foreign exchange reserves in months of imports	Number of months of the country's imports that foreign exchange reserves could pay for	World Bank and IMF International Financial Statistics
Foreign exchange	Contextual factors	Estimated food import dependency	Food imports ÷ (value of food production – value of food exports + value of food imports)	Authors' analysis based on Food and Agriculture Organization statistics (food production) and World Bank (food trade)
Public finance	Revenue dependency	Government resource revenue (USD)	Government resource revenue (USD)	NRGI Resource Revenue Dataset (31 Mar. 2022)
Public finance	Revenue dependency	Share of resources in government revenue	Resource government revenues ÷ general government revenues	NRGI Resource Revenue Database (31 Mar. 2022) for numerator; UN University World Institute for Development Economics Research (UNU-WIDER) Government Revenue Dataset 2021 update for denominator
Public finance	Revenue dependency	Change in government resource revenue (current USD)	Annual change in general government resource revenues	NRGI Resource Revenue Dataset (31 Mar. 2022) for numerator; UNU-WIDER Government Revenue Dataset 2021 update for denominator
Public finance	Revenue dependency	Share of extractives government revenues in total extractives rents	Total extractives rents ÷ government resource revenue (current prices, USD millions)	World Bank for extractives rents and GDP (15 Sep. 2021) and GDP deflator (20 Jul. 2022); NRGI Resource Revenue Dataset (31 Mar. 2022 update) for denominator
Public finance	National oil company (NOC) dependency	NOC transfers to government	NOC transfers to government	NRGI NOC Database (May 2021)

Public finance	NOC dependency	Share of NOC total transfers to government to total government revenue	NOC total transfers to government ÷ total government revenue	NRGI, NOC Database (2019)
Public finance	Total non-extractives revenues	Government revenue % of GDP	Total government revenues ÷ GDP	Authors' analysis based on NRGI Resource Revenue Dataset (Mar. 2022)
Public finance	Total non-extractives revenues	Government resource revenue per capita	General government resource revenue per capita (current USD)	UNU-WIDER Government Revenue Dataset (2021)
Public finance	Total non-extractives revenues	Non-extractives general government revenue (current USD)	General government non-extractives resource revenue (current USD).	Authors' analysis based on NRGI Resource Revenue Dataset (Mar. 2022)
Public finance	Total non-extractives revenues	Non-extractives government revenue as % of GDP	General government non-extractives resource revenue	Authors' analysis based on NRGI Resource Revenue Dataset (Mar. 2022)
Public finance	Contextual factors	Government financial assets/liabilities	Stocks of government financial assets/liabilities	IMF Government Finance Statistics
Public finance	Contextual factors	Central government debt as % of GDP	Total central government debt ÷ GDP	World Bank World Development Indicators (WDI)
Public finance	Revenue dependency	Ratio of extractives revenue to public external debt service	Extractives government revenue ÷ external debt service (public sector)	NRGI Resource Revenue Dataset (Mar. 2022) (numerator); World Bank (denominator)
Public finance	Contextual factors	External public debt % of GDP	and publicly guaranteed ÷ GDP	World Bank WDI
Public finance	Contextual factors	Estimated fiscal space	5-year sovereign Credit default swap spreads, basis points	Kose et al. (2017); World Bank
Public finance	Contextual factors	Government spending and investment (2010 USD)	General government spending and investment	IMF World Economic Outlook Databases (Apr. 2021) for general government total expenditure; World Bank for GDP
Public finance	Revenue dependency	Public spending % of GDP	General government total expenditure ÷ GDP	IMF World Economic Outlook
Public finance	Wealth dependency	National wealth (constant 2018 USD millions)	Sum of estimates of each component of wealth: produced capital, natural capital, human capital and net foreign assets	World Bank Changing Wealth of Nations dataset (2021)
Public finance	Wealth dependency	Share of extractives wealth in total national wealth	(Fossil fuel wealth + mineral wealth) ÷ total national wealth	World Bank Changing Wealth of Nations dataset (2021)
Public finance	NOC dependency	Share of NOC net assets to total national wealth	(NOC total assets – NOC total liabilities) ÷ total national wealth	NRGI Resource Revenue Dataset; World Bank Wealth Accounts using pre-Changing Wealth of Nations 2021 data
Cross-cutting contextual factors	Market power	Share in global market for extractive resources	Annual extractives production for country ÷ global annual extractives production	Authors' calculations based on U.S. EIA
Cross-cutting contextual factors	Market power	Resource trade partner concentration index	Herfindahl–Hirschmann Index based on share of extractives exports that go to each of the exporting country's trading partners	Chatham House <a href="https://resourcetrade.earth/">https://resourcetrade.earth/</a> (2021)
Cross-cutting contextual factors	Reserves to production	Reserves to production ratio	Reserves ÷ annual production	Authors' calculations based on U.S. EIA

Cross-cutting contextual factors	Level of development	Gross National Income (GNI) per capita (USD 2010)	GNI per capita (2010 USD prices)	World Bank WDI for GNI and GDP deflator; UN for population
Cross-cutting contextual factors	Level of development	Human Development Index	A composite index measuring average achievement in three basic dimensions of human development: health, education and income	UNDP
Cross-cutting contextual factors	Level of development	Human Development Index (percentile)	Percentile in human development index; uses Excel formula Percentrank.inc for that year's data	UNDP
MINDEX		Extractives exports (USD per capita)	Extractives exports (defined as SITC codes 3, 28, 68, 6672, 6673 and 97) (2010 USD per capita); note: this is not the same as the export indicator in the "Foreign exchange" tab	NRGI analysis based on World Bank staff estimates through the WITS platform from the UN Comtrade Database; population data from: UN Population Division, World Population Prospects (2019 revision); national statistical office census reports and other statistical publications; Eurostat, demographic statistics; UN Statistics Division, Population and Vital Statistics Report (various years); U.S. Census Bureau, International Database; Secretariat of the Pacific Community, Statistics and Demography Programme, accessed via World Bank (data dated 16 Sep. 2022); U.S. Consumer Price Index data accessed via World Bank (data dated 16 Sep. 2022)
MINDEX		Extractives in total goods exports (%)	Extractives exports (defined as SITC codes 3, 28, 68, 6672, 6673 and 97) as % of total merchandise exports; note: this is not the same as the export indicator in the "Foreign exchange" tab	NRGI analysis based on World Bank staff estimates through the WITS platform from the UN Comtrade database
MINDEX		Extractives rents	Absolute value of extractive rents (World Bank estimate)	NRGI analysis based on World Bank
MINDEX		Value of extractives rents (USD per capita)	Total natural resource rents (World Bank estimate)	World Bank
MINDEX		Value of extractives reserves	Absolute value of reserves of extractives	Amir Lebdioui
MINDEX	Revenue dependency	Government resource revenue (USD) per capita	Government resource revenue (USD) per capita	NRGI Resource Revenue Dataset (31 Mar. 2022); population data from UN Population Division
MINDEX	Revenue dependency	Share of extractives in government revenue	Extractives government revenues ÷ general government revenues	NRGI Resource Revenue Dataset (31 Mar. 2022)

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