We identify 6 key "characteristics" of the net-zero transition

1 Universal

- **All major energy and land-use systems** would need to be transformed in order to achieve net-zero emissions
- **Every country** and **every sector** of the economy would be affected

2 Significant

- Spending on physical assets would be **$9.2 trillion** annually, up $3.5 trillion per year from today and up $1 **trillion** per year after accounting for current policies, and expected growth in population and incomes
- Total spend to 2050 would reach ~**$275 trillion**

3 Front-loaded

- Spending would rise to **8.8% of GDP** from 2026 to 2030 vs. just under 6.8% today, before falling back down

4 Uneven

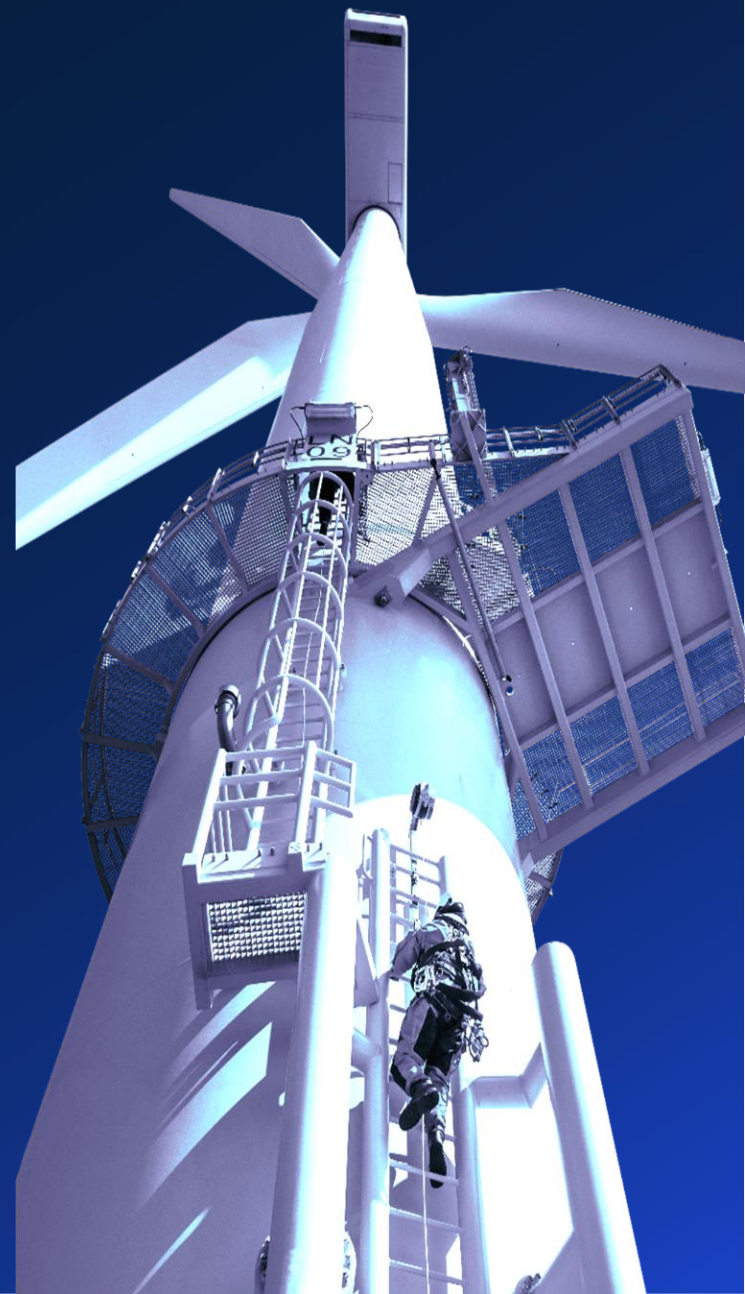
- **Developing** countries and **fossil fuel-rich** regions are most exposed
- Sectors accounting for **20%** of GDP are disproportionately exposed

5 Exposed to risks

- There would be increased risk of **supply shortages, price increases, volatility**
- Switching from high to low-emissions assets could **strand assets** (~$2.1 trillion of power assets by 2050)

6 Rich with opportunity

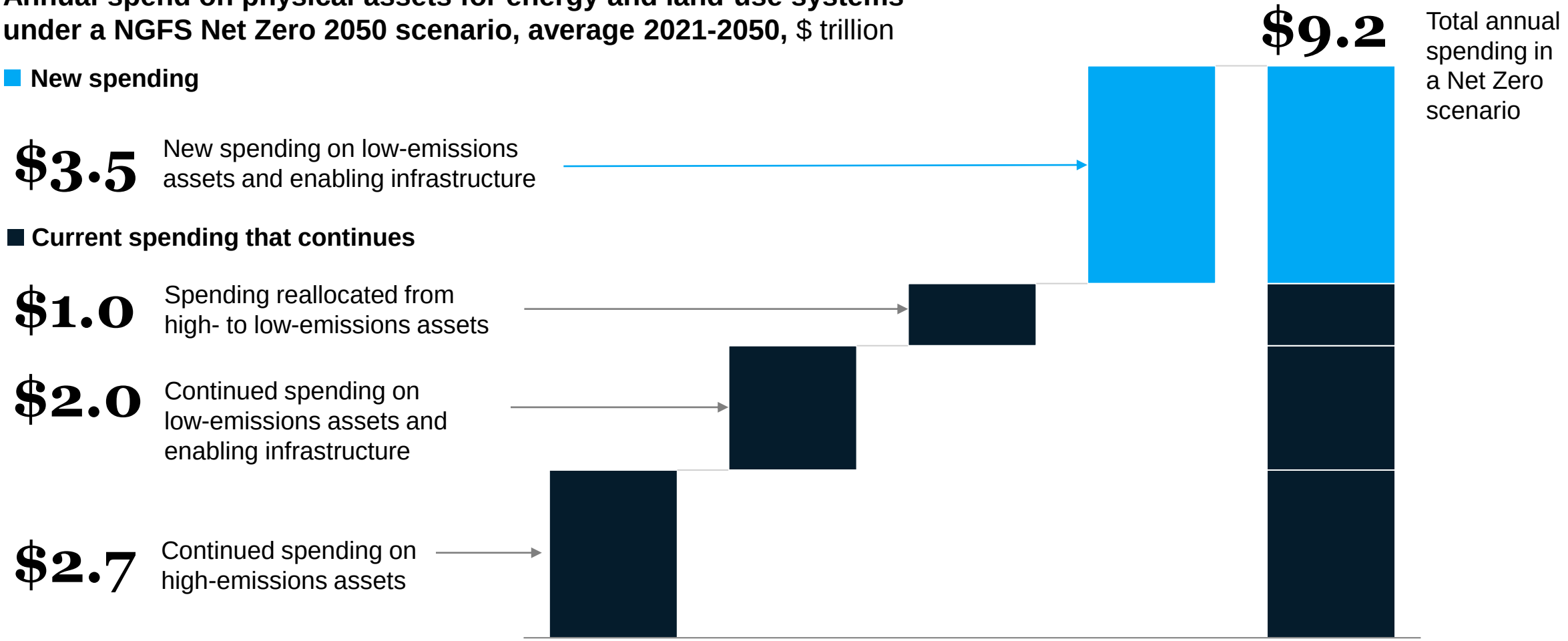
- The transition would **minimize** the further buildup of **physical risks**
- It could create more **efficient operations** from decarbonization as well as **new markets** for low-emissions goods and services



Source: The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022. Based on the NGFS Net Zero 2050 scenario, a hypothetical scenario and not a projection.

2 | During the transition, annual spending on physical assets would rise to about $9.2 trillion, or about $3.5 trillion more than today

Annual spend on physical assets for energy and land-use systems under a NGFS Net Zero 2050 scenario, average 2021-2050, $ trillion



4| Lower-income countries like Sub-Saharan Africa and India would need to invest more as a share of their GDP compared with higher-income countries

Investments under NGFS net-zero 2050 scenario,[1] 2020-2050,

percent of 2020-2050 GDP

SELECTION OF REGIONS

NOT EXHAUSTIVE

	Sub-Saharian Africa	India	Latin America	United States	Canada, Australia, New Zealand	European Union and UK	Japan	World[2]
Total investment under NGFS net-zero 2050 scenario,[1] $ trillion	11.5	19.4	21.7	52.3	8.9	43.6	8.0	276.5

1. The net zero scenario is based on the NGFS “Net Zero 2050” scenario using REMIND-MAgPIE, Phase 2.
2. “World” includes regions not shown on this chart

Source: Network for Greening the Financial System scenario analysis 2021 Phase 2 (Net Zero 2050 scenarios) REMIND-MAGPIE model VIVID Economics, The World Bank Data (https://data.worldbank.org), McKinsey Center for Future Mobility, McKinsey Hydrogen Cost Model, McKinsey Decarbonization Pathway Optimizer, McKinsey Energy Insights, McKinsey Nature Analytics, McKinsey analysis

5 | Exposed to risks

The transition is exposed to a multitude of short-term risks

Supply constraints and price volatility

Labor market disruptions

Stranding of high-emissions assets

Exacerbated higher-order effects

Acceleration of physical climate risks

Source: The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022. Based on the NGFS Net Zero 2050 scenario, a hypothetical scenario and not a projection.

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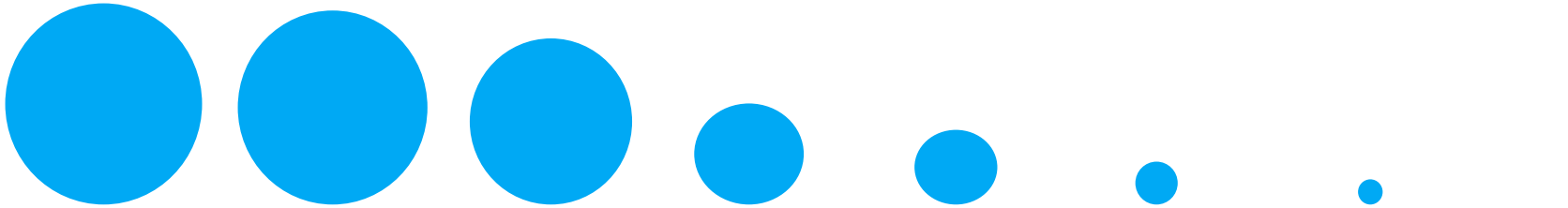
Low-emissions investments would total $6.5 trillion[1] p.a. over the next three decades

Low-emissions investments by sector, NGFS Net Zero 2050 scenario,

annual average 2021–50, $ trillions USD[2]



$2.2	$1.9	$1.5	$0.5	$0.3	$0.1	$0.05
Mobility	**Power**	**Buildings**	**Agriculture**	**Hydrogen and Biofuel**	**Industry**	**Forestry and other land use**
Purchase of cars, trucks, buses, and 2/3 wheelers Charging and refueling infrastructure	Power generation from wind, solar, hydro, nuclear, biomass, and gas with CCS Heat production from biomass Transmission and distribution, battery storage	Heating equipment including heat pumps, biomass boilers, and district heating networks Electric cooking equipment Insulation retrofits	Emissions mitigation measures such as variable fertilizer and irrigation use, livestock feed supplements, and spending on food crops, poultry and eggs	Hydrogen production from electricity, biomass, and natural gas with CCS[1] Biofuel production, including with CCS	Biomass cement kilns Steel production from DRI-EAF and BF-BOF with CCS	Nature restoration including afforestation and avoided deforestation

Source: NGFS Net Zero 2050 scenario using REMIND-MAgPIE (phase 2); The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022. Based on the NGFS Net Zero 2050 scenario, a hypothetical scenario and not a projection.

1. Sum of figures in the chart shown does not add up to $6.5 trillion due to rounding.
2. Rounded to the nearest $100 billion, excepting forestry and other land use, which is rounded to the nearest $50 billion.

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Countries could capture potential growth opportunities from the transition to net-zero emissions: Renewable power example

Average theoretical solar potential[1], Kilowatt-hour per square meter per day

<2.0 >6.4

Mean wind power density of 10% windiest areas at 100m height[2], watt per square meter

<25 >1,300

1. Calculated as the power output achievable by a typical configuration of the utility scale PV system, taking into account GHI (global horizontal irradiation, or the total solar radiation that reaches a horizontal surface), the air temperature affecting the system performance, the system configuration, shading and soiling, and topographic and land-use constraints.
2. Calculated by downscaling large-scale forecasting data from the European Centre for Medium-Range Weather Forecasts. These data are then entered into the DTU Wind Energy modeling system to model local wind climates for a 250m grid across the globe.

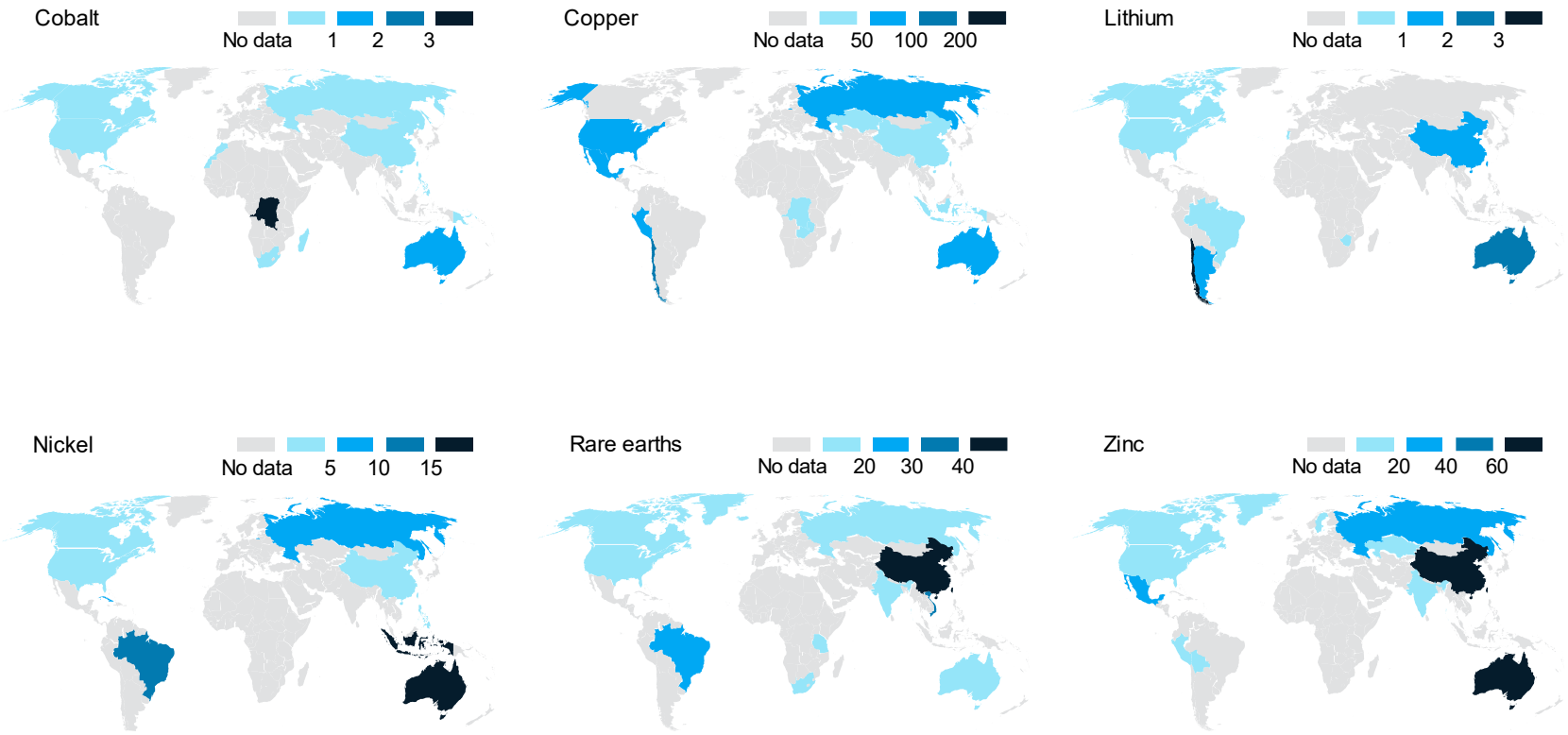
Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by McKinsey & Company.

Source: Global Solar Atlas; Global Wind Atlas; The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022.

6 | Rich with opportunity

Countries could capture potential growth opportunities from the transition to net-zero emissions: Minerals example

Reserves of minerals that are used in low-emissions technologies, average ratio of mineral reserves to global production[1]



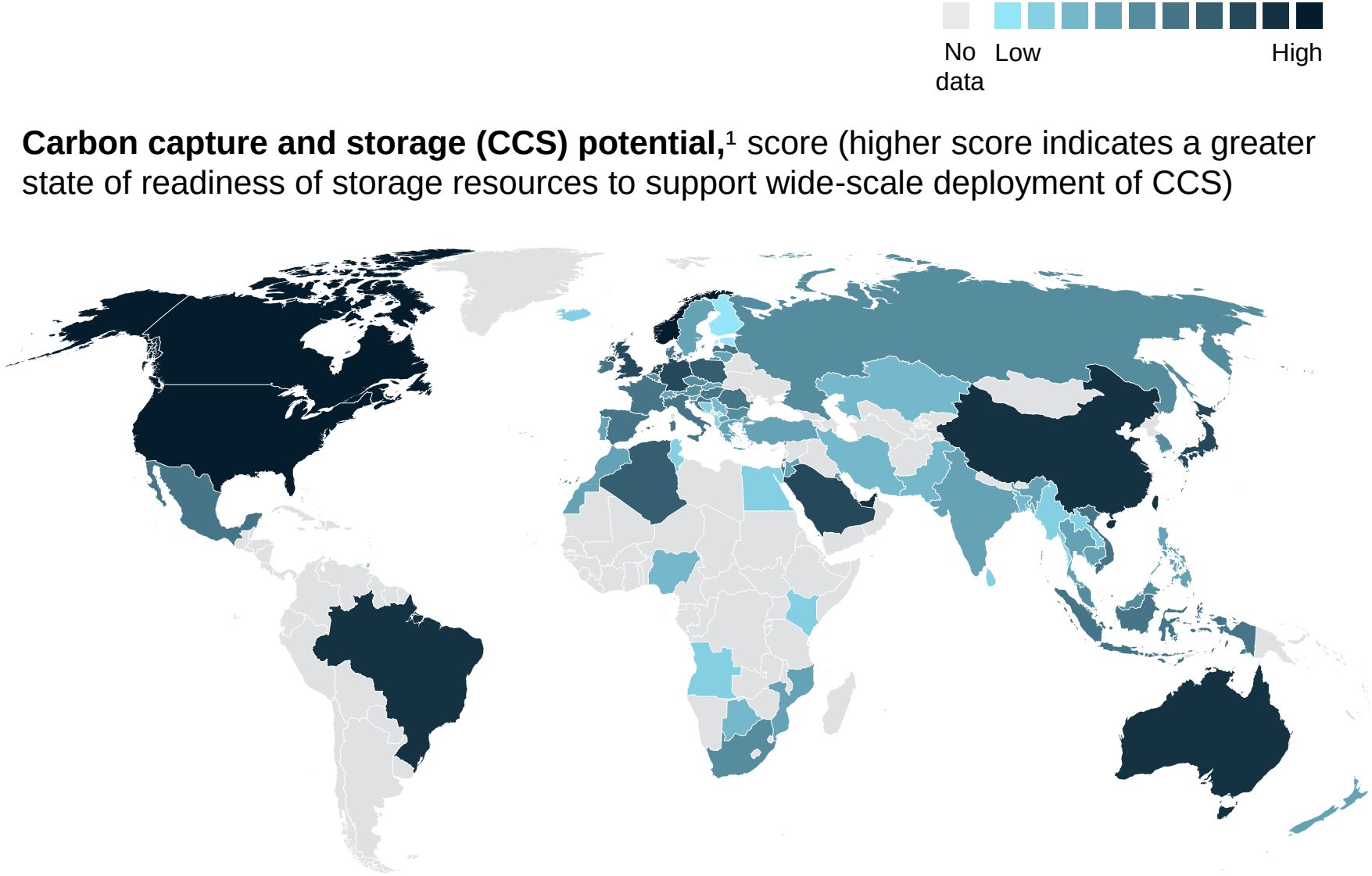
1. Each ratio expresses a country's total proven reserves of the mineral, divided by total current annual global production of the mineral. This is to normalize for different levels of usage of each mineral, acknowledging that usage may change during or after the transition.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by McKinsey & Company.

Source: US Geological Survey; The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022.

6 | Rich with opportunity

Countries could capture potential growth opportunities from the transition to net-zero emissions: Carbon capture and storage example



Carbon capture and storage (CCS) potential,[1] score (higher score indicates a greater state of readiness of storage resources to support wide-scale deployment of CCS)

1. The score out of 100 is calculated based on three factors: (1) Natural geological storage potential, (2) Maturity and confidence of storage resource assessments, (3) Experience in CO_2 storage project development to date. Higher scores indicate a greater readiness of storage resources to support wide-scale deployment of CCS.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by McKinsey & Company.

Source: The net-zero transition: What it would cost, what it could bring, McKinsey Global Institute, 2022; Global CCS Institute, 2018 CCS-SI update.

Governments could establish incentives, support vulnerable stakeholders, and foster collective action

	Assess	Plan	Do
Companies	Develop capabilities to assess transition risks and opportunities	Develop and evolve decarbonization plans supported by agile business strategies	Integrate climate-related factors into key business decisions
Governments and multilateral institutions	Develop capabilities to assess transition risks and opportunities	Develop and evolve decarbonization plans and create net-zero strategies	Institute support programs for workers and lower-income consumers Establish funds to support low-carbon investment and manage stranded-asset risk Use policy measurers to support cross-sector action
Financial institutions	Develop capabilities to assess transition risks and opportunities	Rethink conventions for risk and returns	Measure and reduce financed emissions Develop new financial products and markets
Enabling institutions		Develop and enforce governing standards, tracking, and market mechanisms	Elevate risks and opportunities for workers and communities Convene stakeholders and facilitate collaboration

Source: The net-zero transition: What it would cost, what it could bring