**Purpose, objective: N-shot prompts**

**Prompt:**

. As a decision maker in the Department of Energy of the United States, I have the following situation. The US needs minerals such as cobalt and nickel for high-end electronics and wants to reduce its dependency on supply from China. The aim is to identify supply alternatives and evaluate their impact.

Example 1: mine for critical minerals in the US.

Example 2: increase sourcing of minerals from Democratic Republic of Congo.

Example 3: increase in recycled and recovered metals.

Example 4: deep sea mining. Provide other alternatives if any. For each alternative, evaluate the economic impact, and evaluate the environmental impact.

Advise on the best sourcing strategy and justify your decision. Indicate what information sources were used.

A paper with text on it

AI-generated content may be incorrect.

**Answer** :

Certainly! Let's evaluate each alternative for sourcing cobalt and nickel, considering both economic and environmental impacts:

**1. Mining for Critical Minerals in the US**

**Economic Impact:**

* **Job Creation**: Domestic mining can create numerous jobs in extraction, processing, and related industries [[1]](https://www.federalregister.gov/documents/2025/04/29/2025-07470/unleashing-americas-offshore-critical-minerals-and-resources).
* **Investment**: Significant investment in infrastructure and technology is required [[2]](https://www.energy.gov/sites/default/files/2025-01/critical-minerals-materials-program-january2025.pdf).
* **Supply Chain Security**: Reduces dependency on foreign sources, enhancing national security [[3]](https://www.realclearenergy.org/articles/2025/01/14/critical_minerals_a_roadmap_for_us_dominance_1084615.html).

**Environmental Impact:**

* **Habitat Destruction**: Mining operations can lead to habitat destruction and biodiversity loss [[4]](https://miningworld.com/the-environmental-costs-of-critical-mineral-extraction/).
* **Pollution**: Potential for water and soil contamination from mining activities [[5]](https://www.wri.org/insights/critical-minerals-us-climate-goals).
* **Carbon Emissions**: Mining and processing are energy-intensive, contributing to carbon emissions [[6]](https://www.csis.org/analysis/critical-minerals-and-role-us-mining-low-carbon-future).

**2. Increasing Sourcing of Minerals from Democratic Republic of Congo (DRC)**

**Economic Impact:**

* **Cost Efficiency**: Lower extraction costs compared to domestic mining [[7]](https://ipisresearch.be/weekly-briefing/revisiting-responsible-sourcing-lessons-from-the-democratic-republic-of-congo/).
* **Supply Chain Risks**: Political instability and conflict can disrupt supply chains [[8]](https://www.oecd.org/en/publications/mineral-supply-chain-and-conflict-links-in-the-eastern-democratic-republic-of-congo_86e0c04b-en.html).

**Environmental Impact:**

* **Pollution**: Industrial mining in DRC has led to significant water and soil pollution [[9]](https://raid-uk.org/report-environmental-pollution-human-costs-drc-cobalt-demand-industrial-mines-green-energy-evs-2024/).
* **Human Rights Issues**: Mining operations often violate human rights, impacting local communities [[7]](https://ipisresearch.be/weekly-briefing/revisiting-responsible-sourcing-lessons-from-the-democratic-republic-of-congo/).

**3. Increasing Recycled and Recovered Metals**

**Economic Impact:**

* **Cost Savings**: Recycling is generally less expensive than mining new materials [[10]](https://www.reference.com/business-finance/economic-impact-metal-recycling-job-creation-revenue-generation).
* **Job Creation**: The recycling industry supports numerous jobs [[10]](https://www.reference.com/business-finance/economic-impact-metal-recycling-job-creation-revenue-generation) [[11]](https://www.epa.gov/sites/default/files/2020-11/documents/rei_report_508_compliant.pdf).
* **Revenue Generation**: Recycling contributes to local and national economies through tax revenues [[11]](https://www.epa.gov/sites/default/files/2020-11/documents/rei_report_508_compliant.pdf).

**Environmental Impact:**

* **Resource Conservation**: Reduces the need for new mining, conserving natural resources [[12]](https://www.okonrecycling.com/industrial-scrap-metal-recycling/steel-and-aluminum/environmental-impact-of-metal-waste/).
* **Energy Efficiency**: Recycling metals consumes less energy compared to extracting and processing new ores [[13]](https://greencleanguide.com/the-environmental-impact-of-scrap-metal-recycling/).
* **Pollution Reduction**: Minimizes environmental pollution associated with mining [[14]](https://www.recyclemetals.org/about-metal-recycling/sustainability-the-environment.html).

**4. Deep Sea Mining**

**Economic Impact:**

* **Resource Availability**: Access to vast quantities of minerals [[15]](https://eos.org/articles/deep-sea-mining-may-have-deep-economic-environmental-impacts).
* **High Costs**: Significant investment required for technology and exploration [[16]](https://sciencecouncil.noaa.gov/wp-content/uploads/2025/03/SoS_Deep_Sea_Mining_Jan2025.pdf).
* **Market Impact**: Potential to disrupt global metal markets [[15]](https://eos.org/articles/deep-sea-mining-may-have-deep-economic-environmental-impacts).

**Environmental Impact:**

* **Ecosystem Disruption**: Deep sea mining can cause irreversible damage to marine ecosystems [[17]](https://bulletin.ceramics.org/article/the-environmental-impacts-of-deep-sea-mining/).
* **Carbon Release**: Disturbing the seabed may release stored carbon, impacting climate [[18]](https://hir.harvard.edu/deep-sea-mining-and-the-green-transition/).
* **Biodiversity Loss**: Threatens unique deep-sea species [[19]](https://www.iucn.nl/en/story/the-impact-of-deep-sea-mining-on-biodiversity-climate-and-human-cultures/).

**Other Alternatives**

\*\*5. \**Sourcing from Other Countries with Stable Political Environments*\*

* **Economic Impact**: Diversifies supply chains, reducing risk of disruption.
* **Environmental Impact**: Varies by country; requires assessment of local mining practices.

\*\*6. \**Investing in Sustainable Mining Technologies*\*

* **Economic Impact**: Long-term cost savings through efficient and cleaner technologies.
* **Environmental Impact**: Reduces environmental footprint of mining operations.

**Best Sourcing Strategy**

**Recommendation: Increase Recycled and Recovered Metals** **Justification:**

* **Economic Benefits**: Cost-effective, supports job creation, and generates revenue [[10]](https://www.reference.com/business-finance/economic-impact-metal-recycling-job-creation-revenue-generation) [[11]](https://www.epa.gov/sites/default/files/2020-11/documents/rei_report_508_compliant.pdf).
* **Environmental Benefits**: Conserves resources, reduces energy consumption, and minimizes pollution [[12]](https://www.okonrecycling.com/industrial-scrap-metal-recycling/steel-and-aluminum/environmental-impact-of-metal-waste/) [[13]](https://greencleanguide.com/the-environmental-impact-of-scrap-metal-recycling/) [[14]](https://www.recyclemetals.org/about-metal-recycling/sustainability-the-environment.html).
* **Sustainability**: Aligns with long-term goals for a circular economy and sustainable resource management.

**Sources Used:**

* Federal Register [[1]](https://www.federalregister.gov/documents/2025/04/29/2025-07470/unleashing-americas-offshore-critical-minerals-and-resources)
* U.S. Department of Energy[[2]](https://www.energy.gov/sites/default/files/2025-01/critical-minerals-materials-program-january2025.pdf)
* RealClearEnergy [[3]](https://www.realclearenergy.org/articles/2025/01/14/critical_minerals_a_roadmap_for_us_dominance_1084615.html)
* IPIS Research [[7]](https://ipisresearch.be/weekly-briefing/revisiting-responsible-sourcing-lessons-from-the-democratic-republic-of-congo/)
* RAID[[9]](https://raid-uk.org/report-environmental-pollution-human-costs-drc-cobalt-demand-industrial-mines-green-energy-evs-2024/)
* OECD [[8]](https://www.oecd.org/en/publications/mineral-supply-chain-and-conflict-links-in-the-eastern-democratic-republic-of-congo_86e0c04b-en.html)
* Reference.com [[10]](https://www.reference.com/business-finance/economic-impact-metal-recycling-job-creation-revenue-generation)
* U.S. Environmental Protection Agency [[11]](https://www.epa.gov/sites/default/files/2020-11/documents/rei_report_508_compliant.pdf)
* Okon Recycling [[12]](https://www.okonrecycling.com/industrial-scrap-metal-recycling/steel-and-aluminum/environmental-impact-of-metal-waste/)
* Green Clean Guide [[13]](https://greencleanguide.com/the-environmental-impact-of-scrap-metal-recycling/)
* BMRA[[14]](https://www.recyclemetals.org/about-metal-recycling/sustainability-the-environment.html)
* Eos [[15]](https://eos.org/articles/deep-sea-mining-may-have-deep-economic-environmental-impacts)
* NOAA [[16]](https://sciencecouncil.noaa.gov/wp-content/uploads/2025/03/SoS_Deep_Sea_Mining_Jan2025.pdf)
* Harvard International Review[[18]](https://hir.harvard.edu/deep-sea-mining-and-the-green-transition/)
* IUCN [[19]](https://www.iucn.nl/en/story/the-impact-of-deep-sea-mining-on-biodiversity-climate-and-human-cultures/)
* MiningWorld [[4]](https://miningworld.com/the-environmental-costs-of-critical-mineral-extraction/)
* World Resources Institute[[5]](https://www.wri.org/insights/critical-minerals-us-climate-goals)
* CSIS [[6]](https://www.csis.org/analysis/critical-minerals-and-role-us-mining-low-carbon-future)

Would you like more detailed information on any of these alternatives?

**References**

[1] [Unleashing America's Offshore Critical Minerals and Resources](https://www.federalregister.gov/documents/2025/04/29/2025-07470/unleashing-americas-offshore-critical-minerals-and-resources)

[2] [The U.S. Department of Energy’s Critical Minerals and Materials Program](https://www.energy.gov/sites/default/files/2025-01/critical-minerals-materials-program-january2025.pdf)

[3] [Critical Minerals: A Roadmap for U.S. Dominance](https://www.realclearenergy.org/articles/2025/01/14/critical_minerals_a_roadmap_for_us_dominance_1084615.html)

[4] [The Environmental Costs of Critical Mineral Extraction](https://miningworld.com/the-environmental-costs-of-critical-mineral-extraction/)

[5] [Securing Critical Minerals Supply Is Key to US Climate Action | World ...](https://www.wri.org/insights/critical-minerals-us-climate-goals)

[6] [Critical Minerals and the Role of U.S. Mining in a Low-Carbon Future - CSIS](https://www.csis.org/analysis/critical-minerals-and-role-us-mining-low-carbon-future)

[7] [Revisiting responsible sourcing: Lessons from the Democratic Republic ...](https://ipisresearch.be/weekly-briefing/revisiting-responsible-sourcing-lessons-from-the-democratic-republic-of-congo/)

[8] [Mineral Supply Chain and Conflict Links in the Eastern Democratic ...](https://www.oecd.org/en/publications/mineral-supply-chain-and-conflict-links-in-the-eastern-democratic-republic-of-congo_86e0c04b-en.html)

[9] [New report exposes the environmental and human costs of DRC’s ... - RAID](https://raid-uk.org/report-environmental-pollution-human-costs-drc-cobalt-demand-industrial-mines-green-energy-evs-2024/)

[10] [The Economic Impact of Metal Recycling: Job Creation and Revenue ...](https://www.reference.com/business-finance/economic-impact-metal-recycling-job-creation-revenue-generation)

[11] [2020 Recycling Economic Information Report - U.S. Environmental ...](https://www.epa.gov/sites/default/files/2020-11/documents/rei_report_508_compliant.pdf)

[12] [Understanding the Environmental Impact of Metal Waste](https://www.okonrecycling.com/industrial-scrap-metal-recycling/steel-and-aluminum/environmental-impact-of-metal-waste/)

[13] [The Environmental Impact of Scrap Metal Recycling](https://greencleanguide.com/the-environmental-impact-of-scrap-metal-recycling/)

[14] [Scrap metal recycling| Sustainability & the environment | BMRA](https://www.recyclemetals.org/about-metal-recycling/sustainability-the-environment.html)

[15] [Deep-Sea Mining May Have Deep Economic, Environmental Impacts](https://eos.org/articles/deep-sea-mining-may-have-deep-economic-environmental-impacts)

[16] [State of the Science Fact Sheet Deep-Sea Mining](https://sciencecouncil.noaa.gov/wp-content/uploads/2025/03/SoS_Deep_Sea_Mining_Jan2025.pdf)

[17] [The environmental impacts of deep-sea mining](https://bulletin.ceramics.org/article/the-environmental-impacts-of-deep-sea-mining/)

[18] [Deep Sea Mining and the Green Transition - Harvard International Review](https://hir.harvard.edu/deep-sea-mining-and-the-green-transition/)

[19] [The impact of deep-sea mining on biodiversity, climate and human ...](https://www.iucn.nl/en/story/the-impact-of-deep-sea-mining-on-biodiversity-climate-and-human-cultures/)

**Observation**: Excellent answer, evaluating each alternative in detail from economic, social, environmental viewpoints, weighting pro-cons and proposing a sustainable choice out of those options. On top of the 4 proposed answers it added additionally 2 more, GREAT. The list of references is very pertinent and well used. Top quality answer and actionable. This is what is expected from such a query. 5/5.

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