

Stranded assets

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Stranded Assets

Accelerated climate change and the global expansion of climate policies have been increasing the multifaceted risks of investments in carbon-intensive sectors, particularly fossil-fuel industries. The Paris Agreement requires that global financial flows need to be consistent with a low-carbon pathway to limit global warming to well below 2°C, preferably to 1.5°C, above pre-industrial levels. It means that investments in fossil fuel businesses will be discouraged and lead to a large volume of assets stranding; in other words, climate-related stranded assets (Rempel and Gupta 2021). The 2022 IPCC reports also warns of the increasing risk of stranded assets because of drastically growing climate change impacts and devalued carbon-intensive projects. Stranded assets are one of the key issues in global climate governance debates.

What are stranded assets?

In recent years, many global political and economic leaders have brought public attention to the concept of stranded assets, such as Jim Kim, the president of the World Bank, or Mark Carney, the former governor of the Bank of England and the last chair of the G20 Financial Stability Board (Caldecott 2017, 1). On the other hand, there are various definitions of the term. The most general understanding is “the assets that lose economic values ahead of their anticipated useful life as a result of changes in legislation, market forces, disruptive innovation, societal norms, or *environmental shocks*” (Bos and Gupta 2019, emphasis added; van der Ploeg and Rezai 2020; Semieniuk et al. 2022). These assets “suffer from unanticipated or premature write-downs, devaluations, or conversion to liabilities” (Caldecott et al. 2013; Caldecott 2017; Caldecott et al. 2021).

Some literature sees stranded assets as a broader concept linked to stranded resources (beyond financial resources) that cannot be used or developed further. For instance, Rempel and Gupta explain that a policy change phasing out fossil fuels can cause diverse types of stranded assets as follow: natural assets, such as oil and gas, physical assets (e.g., fossil fuel infrastructure), financial assets such as debts, and social and human assets (e.g., jobs and networks)

(Rempel and Gupta 2021, 2). In this sense, stranded assets are linked to “financial, legislative, technological, market-related, environmental and social” aspects broadly (Bos and Gupta 2019, 2).

Even though any types of unexpected risks can render stranded assets, the concept has been increasingly linked to environmental issues, particularly climate change (Bos and Gupta 2019). “Unburnable carbon” and “carbon bubble” are other key concepts to understand climate change-related stranded assets. Fossil fuel owners cannot extract and burn their fossil fuel resources under business as usual because of increasing efforts to halt global warming. In other words, they have a limited carbon budget due to their unburnable carbon (Caldecott et al. 2021). Notably, the unburnable carbon indicates that the current fossil fuel assets are overvalued and have created a financial bubble, i.e., a carbon bubble (Caldecott 2017). This carbon bubble is a serious risk to fossil fuel investments and renders their assets stranded. When more countries enforce a net zero policy, fossil fuel companies cannot extract their reserves or should sell at a lower price because of decreasing fossil fuel demand. The transition would make the overvalued prices of the companies’ current shares drop and lead to a loss of investors (e.g., a rapid decrease in their stock exchange value). It is a potential mechanism for how a carbon bubble in fossil fuel investments would burst and harm shareholders’ interests.

Causes of stranded assets

What triggers stranded assets? The previous literature mostly focuses on policy changes (e.g., a fossil fuel subsidy reform) and technological changes (e.g., the advancement of renewable energy technology). Meanwhile, Bos and Gupta (2019) explain four additional factors causing stranded assets – market condition changes, societal norm changes, new financial contexts, and increasing environmental risks (Bos and Gupta 2019, 3).

More specifically, new policy measures pricing carbon, such as a carbon tax, or supporting renewable energy sectors, can lead to the devaluation of fossil fuel assets and make these assets stranded. Technological innovation in clean energy would facilitate this phenomenon due to the decline of fossil fuel demand. As market factors, the decrease-

ing price of renewable energy sources and the increase of fossil fuel energy price turn fossil-fuel investments into stranded assets. In the new political economic contexts, actors prefer to invest in or consume clean energy resources instead of fossil fuels. This normative shift has a contagion effect among market actors transnationally (van der Ploeg and Rezai 2020, 289).

In addition, carbon lock-in can escalate the scale of stranded assets despite a lack of proactive climate policy (Unruh 2019, 399). Carbon lock-in is a self-reinforcing cycle based on a rigid fossil-fuel economic system. For instance, such climate hazards as climate change's physical risks create many different types of stranded assets beyond fossil fuel assets (Caldecott et al. 2021). For instance, Unruh (2019) introduces the electric utility PG&E's case in Northern California. The growing risk of massive wildfires in the region, particularly after 2017, made the company's energy-grid assets stranded and the company ended up declaring bankruptcy (Unruh 2019, 400).

Effects of stranded assets

Stranded assets have a direct economic impact on market actors, particularly investors. There are several mechanisms of how stranded assets affect those actors and how they react to the stranded asset risks commonly or differently.

Market risks and investors' risk aversion

Stranded assets lead to market actors' economic losses, such as the price drop of companies' stock or damages to corporate bonds, particularly fossil fuel companies and their asset owners. The financial risk can be exacerbated through ownership networks: e.g., drastic stock market losses can harm balance sheets of listed companies' owners (Semieniuk et al. 2022). Semieniuk et al. estimate that the economic losses of oil and gas companies and financial sector owners in OECD countries can be up to US\$728 billion and US\$438 billion respectively (Semieniuk et al. 2022, 534).

Therefore, the rising risks of climate-related stranded assets make more market actors consider the risks in their decision-making and attempt to use multiple strategies to avoid financial damages. As natural hedges,

investors diversify their portfolio, and private and public institutions issue green bonds. Recently, more pension funds started engaging with the fossil fuel divestment movement and dropping their fossil fuel investment. In addition, insurance companies are more exposed to climate-related physical risks and might not be willing to cover potential stranded assets.

The green paradox

Not every market actor will divest their fossil fuel stranded assets, due to carbon lock-in effects. The green paradox refers to the opposite phenomenon. Future climate policies could generate a race among fossil fuel producers selling their reserves rapidly before the regulations take effect, especially when the market is competitive and policies are uncertain (Caldecott et al. 2021, 433). This competition can bring an oversupply of fossil fuel assets with lower prices while reducing market demand (Bos and Gupta 2019, 9) and can escalate the risk of stranded assets. In addition, Silver (2017) argues that most institutional investors are blind of "forward-looking" risk culturally, so they are reluctant to consider the risk of stranded assets in their investment decision.

Liability risk

Economic losses from stranded assets increase liability risk imposed on financial supervisors and investors. They have fiduciary duties for managing such assets, fitting into their clients' best interests. Fiduciary duty is a legal obligation of those who manage other people's money. They should act in good faith in their beneficiaries' interests and manage assets with diligence. When climate-related stranded assets cause economic losses, asset managers could get sued for a violation of their fiduciary duty. On the other hand, fiduciary duty can be a reason why some of them remain investing in fossil fuel assets to achieve a high financial performance in the short term. Litigation can be both a result and a cause of stranded assets (Caldecott et al. 2021, 423).

In the case of *Abrahams v. the Commonwealth Bank of Australia* (CBA), the CBA was sued by its shareholders owing to inadequate information disclosure of climate-related business activities, such as the bank's investment in a coal

mine (Caldecott et al. 2021, 427). In another example, ClientEarth, an NGO and shareholder, sued Enea (a utility company) because the company constructed a coal-fired power plant in Poland. The plaintiff's legal claim was that the climate-related financial risks of the project (e.g., increasing carbon prices and the EU fossil fuel subsidy reform) damaged the economic interests of the company and shareholders. Accepting the claim, the court decided that Enea's project was not legally valid (ClientEarth 2019).

Stranded assets and global equity

Understanding the distributional effects of stranded assets is significant for a just transition, but only limited previous studies shed light on the topic. It relates to the question of who pays costs and gain benefits from stranded assets (Caldecott et al. 2021). There are several significant equity issues domestically and internationally.

First, society would pay a high cost by phasing-out industries exposed to the risk of stranded assets. Notably, local workers in the fossil fuel industries take the burden first by losing their jobs (Semieniuk et al. 2022). Approximately 100,000 oilfield service jobs have disappeared in the US as of September 2020 (Rempel and Gupta 2021, 7). This labor market shock can lead to social instability, such as local violence and protests (Bos and Gupta 2019).

Second, the risks and costs of assets stranding are allocated asymmetrically across regions. Several previous studies show that developing countries take on unequal burdens. Bos and Gupta (2019) raise a question of who can burn the remaining carbon regarding the limited global carbon budget. Climate mitigation policies generate higher risks of stranded assets in resource-rich developing countries because those countries rely on fossil fuel resources for their governmental revenues. In addition, these states lack financial and technological capacities for low-carbon industrial transformations. From a development studies perspective, fossil fuel resources and assets stranded in the Global South can exacerbate poverty and hinder development (Ansari and Holz 2020).

Bos and Gupta (2019) explain several unique challenges the developing countries cope with regarding globally growing stranded assets. First, developing countries

tend to seek alternative opportunities to invest in riskier and cheaper fossil fuel resources such as China's investment in Iranian oil. The green paradox can facilitate this transnational race-to-bottom effect of carbon leakage. Second, the Global North countries trigger more carbon leakages by transferring carbon-intensive technologies via their aid and trade agencies. It can expand the scale of stranded assets in the Global South in the long term.

Third, international society will not compensate for not using fossil fuel resources in the Global South, as shown in the failure of the Yasuni-ITT initiative in Ecuador. In 2007, the Ecuadorian government attempted to obtain US\$3.5 billion from international society for its sustainable development as a return for keeping their oil reserves in the ground under the Yasuni National Park, but this idea ended up rejected. It shows that "nobody" wants to pay for stranded assets (Sovacool and Scarpaci 2016, 169).

Fourth, resource-rich developing countries would take legal risks if they decided to stop producing fossil fuels for environmental reasons. Those countries often have legally binding investment partnerships with companies from the Global North. Therefore, domestic policies phasing out fossil fuel sectors can lead to a lawsuit by their investment partners (Bos and Gupta 2019, 8). Consequently, these challenges hinder developing countries' sustainable development.

How to manage stranded assets

How can policymakers manage the different economic and social risks of increasing climate-related stranded assets? The dominant response seems to be taken by financial institutions, mainly by central banks. Some central banks provide companies with guidelines on how to manage climate-related risks and increasingly recommend disclosing the risks based on the Task Force on Climate-Related Financial Disclosures (TCFD), a global framework to evaluate climate-related risks and opportunities that was created by the Financial Stability Board. Some countries such as France and the UK started implementing a mandatory disclosure policy. In addition to broad forms of macro-prudential supervision, more banks and financial supervisors conduct climate stress tests or limit a bank's exposure to

carbon-intensive assets (Caldecott et al. 2021, 438).

Another significant issue is when and how to implement policies phasing out fossil fuel sectors and phasing in green industries through, for instance, carbon taxes and subsidies for low-carbon sectors. Van der Ploeg and Rezai (2020) explain that if policy implementation is delayed (e.g., by the fossil fuel lobby), it enlarges the market risk and uncertainty that affects stranded asset owners. Asset owners may not act to reduce the asset risk when the climate policies are less credible and inconsistent. On the other hand, stranded asset owners often expect compensation for their losses from climate regulations. A lack of compensation can lead to strong resistance against the policies (Caldecott et al. 2021; Sen and von Schickfus 2020).

Lastly, policymakers should consider the distributional impacts of their policies regarding stranded assets. As explained in the previous section, climate policies phasing out fossil fuel sectors can induce massive unemployment of local workers. The COVID-19 pandemic has accelerated this labor market shock. The labor market in the developing countries has faced much bigger impacts because of insufficient governmental supports, such as fossil fuel bailout policies used in the Global North. In this sense, “equitable and inclusive” policies dealing with stranded assets are urgent (Rempel and Gupta 2021).

Meanwhile, fossil fuel bailouts since the pandemic have created more stranded assets and increased stranded asset risks. Considering all the political economic challenges, Rempel and Gupta (2021) claim that the Global North countries should write off stranded assets, divest fossil fuel businesses, and compensate vulnerable governments in the Global South for their stranded fossil fuel assets (Rempel and Gupta 2021, 9). At the same time, they emphasize that divestment cannot be the only measure because carbon leakages could move financial flows from developed countries to resource-rich developing countries (Rempel and Gupta 2021, 10).

Policy and research issues

Increasingly, scholars point out that most literature focuses on investor risks and sheds less light on the stranded asset risks imposed on developing countries (Bos and Gupta

2018, 437). This issue is about “distributional impacts” of policies regarding stranded assets across national borders. In this sense, the first item on the research agenda could be the transnational effects of climate policies, specifically exploring who takes the burdens from stranded asset risks and what policies could stimulate a just transition on the global scale. As another equity issue, future research is needed to find innovative policy solutions for phasing out fossil fuel assets and reducing labor market risks (e.g., unemployment of workers in the coal sector) simultaneously.

Second, stranded assets need to be examined in the context of unexpected geopolitical challenges. For instance, the Russo–Ukraine War has transformed the policy debates on fossil fuel assets in many regions in terms of energy security. In some countries, the increasing uncertainty of global energy supply has triggered rapid policy changes to cut fossil fuel energy (i.e., the increase of the fossil-fuel related asset risk). But some other states have delayed their decision to phase out their fossil fuel production. These policy choices will lead to different policy outcomes in the long-term. What policy measures can guarantee energy security and achieve net-zero goals effectively? Future research would contribute to answering the question.

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