

## **Towards risk-opportunity assessment in climate-friendly finance**

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### **Summary**

Fossil fuel divestment may not offer the climate change solution many are hoping for, as it merely re-brands financial assets with higher risks but does not make them disappear. Making climate policy decisions by assessing financial risks and business opportunities could improve our ability to govern a smooth sustainability transition.

### **Main text**

#### **Introduction**

Climate scientists<sup>1</sup> dropped a bombshell in the climate policy community when they showed that the amount of fossil fuel reserves exceeded the carbon budget as inferred from climate models, suggesting that substantial financial value could be lost. McGlade and Ekins<sup>2</sup> followed this new line of enquiry and reported where the 'unburnable carbon' could be distributed around the World, implying that important new geopolitics could develop alongside climate policy. Mercure *et al.*, (2018)<sup>3</sup> determined that unburnable carbon could arise even with the current explosion of renewable electricity, electric vehicles and low-carbon heating, lending support to the existence of a growing carbon bubble, of magnitude \$1-4tn (discounted). This could burst in the 2020s-2030s, and have important distributional economic implications across the world. These studies imply, however, an even broader and fundamental uncomfortable truth: substantial financial value relies on operating long-lived equipment and infrastructure (pipelines, industrial plants, buildings, houses, vehicles, etc) that may not be compliant with the regulations and laws of a future low-carbon world, and thus may have to be abandoned or be expensive to adapt. This would incur substantial losses to their owners, and to the owners of their owners, and so on, ultimately affecting everyone.

The prospect of stranded fossil fuel assets (SFFA) could and may already be generating substantial geopolitical tensions across the globe. Figure 1 shows the reported<sup>3</sup> geographical distribution of SFFA by country alongside the reported economic impacts of shutting down fossil fuel production, consumption and trade worldwide, in a situation in which investors expect a scenario of rising fossil fuel demand while demand peaks as the low-carbon transition takes place instead. Economic impacts include loss of aggregate demand in resource extraction sectors and upstream in their supply chains (manufacturing, engineering, transport etc) as well as through changes in trade and in government spending as public finances are affected by loss of royalty and tax revenues.

Losses are not the same for different countries depending on their role in fossil fuel markets. A new type of political play emerges, in which actors are either exporter or importer countries, and high-cost or low-cost fossil fuel producer countries. Producers operating in unconventional fossil-fuel resource types (oil sands, shale oil, heavy oil) typically produce at costs much higher than those operating in conventional types. Fossil fuel importers (e.g. Europe, China) gain economically from reducing energy imports and replacing these by domestic spending, causing economic damage to exporters. High-cost fossil fuel commodity exporters (e.g. US, Canada, Russia) lose out from declining lucrative exports, undercut by the low-cost exporters (e.g. Saudi Arabia, Middle-East, Africa, who can produce at much lower costs), and from a worsening trade balance. Low-cost producers suffer from lower prices but may decide to maintain market share while demand declines, gradually pushing high-cost exporters out of the market. In a situation of peak demand for oil, all producers are likely to fight over remaining demand and an oil reserve fire sale could ensue. High-cost producers may have incentive to initiate trade wars in an attempt to protect domestic production and jobs. Low-cost producers may gain disproportionate economic and financial leverage over other producers. The balance of power however remains with importers, who determine the pace of the transition and the amount of economic damage done to producers.

## The tragedy of the Horizon

In 2018 the Intergovernmental Panel on Climate Change released its report on the 1.5C target<sup>4</sup> as requested by the United Nations Framework Convention on Climate Change (UNFCCC), in which the rapidity at which emissions must decline to reach that target was emphasised. This highly influential report contributed to European governments setting more ambitious targets, notably with the UK becoming the first major economy to pass a net zero emissions law for 2050, and the European Union's new 'strategic long-term vision' setting a similar target across all member states. These roadmaps for ultra-rapid decarbonisation intend to enshrine in law a process in which a fast recycling of capital takes place.

However, physical capital is not easily recycled, and to quote Joseph Schumpeter,<sup>5</sup> *"That the theorist's teaching, according to which capital "migrates" from declining to rising industries, is unrealistic is obvious: the capital "invested" in railroads does not migrate into trucking and air transportation but will perish in and with the railroads"*. Capital unsuitable for the transition is likely to be truly stranded. The financial question at stake is thus one that interrogates the rapidity at which the economy can go 'around the bend' without losing too much value through the destruction of long-lived assets upon which wealth creation sits.

A new related discussion has emerged in the financial world initiated by the Bank of England, entitled 'The Tragedy of the Horizon'<sup>6,7</sup>, in which the spotlight is turned towards an ongoing accumulation of financial risk related to climate change: physical risks (from extreme climate events), liability risks (from parties seeking reparations for climate damages) and transition risks (from rapid structural change in the economy). Stranded fossil fuel assets (SFFA) make an important component of transition risks<sup>8</sup>, but so do assets situated upstream of value chains<sup>9</sup>, and sum up to a much greater total financial value that remains under investigation. SFFA on their own make a wealth loss (\$1-4tn) that, if incurred suddenly through a change of expectations, may be sufficient to trigger financial instability, when compared to the value of mortgage-related assets that triggered the 2007 crash (\$0.25tn)<sup>10</sup>. Whether this happens depends on whether and how large financial institutions are exposed to such losses as they were in 2007.

Observing the makeup of pension fund investment positions suggests that fossil-fuel-related companies are highly prominent in their portfolios. Pension funds are 'tracker funds', investing according to the makeup of the most highly valued companies in financial markets. Fossil fuel companies are normally an important part of this, and if their risks of default increase during the low-carbon transition, people's pensions could be at stake.

### Assessing policy decisions: risks and opportunities

The new framing of climate policy suggested by the Bank of England takes the form of a formal risk assessment, instead of cost-benefit analysis. A risk assessment is an exploration of worse-case scenarios, which lends itself better to the needs for information of policy-makers in situations featuring substantial uncertainty, such as with the prospects of impacts of climate change,<sup>11</sup> and financial crises. Meanwhile, to inform how to go forward, assessments of the whole range of conceivable opportunities for business, innovation and jobs, generated by new industries as a result of possible strategies to achieve a rapid low-carbon transition are also sought after<sup>12</sup>. Instead of an analysis optimising the allocation of scarce resources (e.g. finding the optimal amount of spending on low-carbon investment against spending on damages from climate change), informing climate policy-making may need to involve an analysis of what lies under deep and fundamental uncertainty: risks (financial and physical) and opportunities (business and innovation).

The traditional analysis used in IPCC reports, produced by the world's collection of Integrated Assessment Models (IAMs), is a cost-benefit analysis in various forms, optimising the space of normative possibilities for the allocation of fixed scarce resources. They have been criticised mostly in relation to their degree of realism – the extent to which they accurately reflect the world's bio-physical and economic constraints<sup>13</sup>. However, the true unease for policy-makers is that, since they use a methodology that is prescriptive (searching to identify what individuals should do) rather than descriptive (describing how individuals actually behave in order to predict the outcome of policy choices), IAMs cannot by their own definition identify risks and opportunities. Indeed, if in a model, people are hypothesised to work collectively towards maintaining a globally optimal economy under changing normative preferences (e.g. going green), and that for this to take place, a 'social planner'

who can foresee the future with 'rational expectations' is hypothesised to coordinate optimally the work of everyone, then real risks and business opportunities do not exist as they can be perfectly predicted. Thus IAMs, for all their criticisms, face the challenge that they portray a world of certainty and of choice between opposing ethical stances and values. However, policy-makers would often prefer interrogating IAMs for answers that lie within the deep uncertainty that they face in the real world, and increasingly as they fear we may be headed into a 'perfect storm' of social, economic and political turbulence. Cost-benefit analysis simply cannot be done when the likelihood of high impact destructive events is not sufficiently low<sup>14</sup>.

The Church of England, various universities and even the Norwegian Sovereign Wealth fund all announced plans to divest partly or completely from fossil-fuel assets gradually over the coming decade. A long debate, demonstrations and even occupations at the University of Cambridge have made the headlines over the divestment issue. Arguments put forward involved predominantly ethics and intergenerational justice. While such decisions based on philosophy are natural for ecclesiastical and educational institutions, this is not normally how investment funds are mandated to operate, with rules that protect them from the forces of politics (and potentially, ideology). Fiduciary duty – the duty of investment managers to maximise benefit to the beneficial owners of invested funds – normally requires to make investment choices that maximise return under a stated risk preference, itself determined by the type of clients one has. Making investment funds invest green for normative ethical reasons is not likely to be possible.

However, following new recommendations from the Task Force on Climate-related Financial Disclosures (TCFD)<sup>15</sup>, investors are now seriously considering the risks that climate change and the low-carbon transition pose to their portfolios, and how to re-balance their compositions to manage climate and transition-related risks. In that sense, new research identifying physical and transition risks holds much more potential to make banks, investment funds and pension funds change direction than ethical theorising. And it may already be working: fund managers now increasingly request academics and researchers for climate-related data and for economic projections that can help them re-formulate their expectations of returns and losses and estimations of portfolio risk. And indeed, if the price to pay for either or both climate change and the low-carbon transition is everyone's pensions and not just the wealth of rich people, there is something enormous at stake. New methods that can estimate these risks are however not yet available nor used by fund managers, and this is perhaps one of the most important risks that the sector faces at the moment: an information crisis.

Climate change and the low-carbon transition may together form one of the strongest drivers, directly or indirectly, of uncertainty and instability that the global economy could face for the coming decades. Analysis tools for climate policy and investment strategy, formulated 3-4 decades ago, are seriously outdated and desperately require change. What the analysis of climate policy and investment strategy must become is a *risk-opportunity impact assessment*. IAMs could take on this new role, beyond the IPCC, to inform the development of detailed climate policy nationally, as well as financial risk. They are best placed for this since they possess a veritable wealth of physical and socio-economic data characterising every aspect of the world. However, to be scientifically consistent, they would also be required to move away from prescriptive resource allocation optimisation, away from equilibrium economics, and towards integrating the complex dynamics and feedbacks that are observed in the economic, physical and financial system.

### **Assets continue to be stranded**

Notwithstanding the above, what fund managers and financial regulators in fact say is that divestment cannot replace climate policy to achieve emissions reductions and actually avoid climate change. All major institutions divesting from fossil fuel assets would only trigger a downgrading of these assets into junk status (since fossil fuel assets do generate high returns), but these risky assets would not disappear. Some investors with an appetite towards risk do thrive on junk assets, and the systemic risk posed by these assets remains and accumulates. For example, the Saudi government will begin selling shares of its nationally owned Saudi Aramco, the world's largest oil company, on public markets (divesting from oil, in effect), in a drive to diversify the country's investments and income streams. Due to excellent expected short term performance, shares in Saudi Aramco are likely to make their way into every pension fund, spreading what used to be Saudi-only risk worldwide. Divestment does not solve the problem for financial regulators, whose mandate is to

maintain the price stability of the whole financial sector. Divestment may well just be a red herring rather than a solution.

There is a very good reason why divestment cannot replace leadership from public authorities to inspire and make the transition happen. The Government, normally the largest legal and financial institution in any nation, is, simultaneously, the *spender of last resort* (notably with automatic counter-cyclical spending), the *lender of last resort* (where only the central bank remains able to lend during a credit crunch) and the *innovator of last resort* (in that it absorbs risk and funds research, development and deployment of knowledge and new technology where no-one else will). For those reasons, only governments can realistically plan for and trigger every component of an orderly low-carbon transition, not the financial sector on its own, and it needs to be well planned if it is to be smooth.

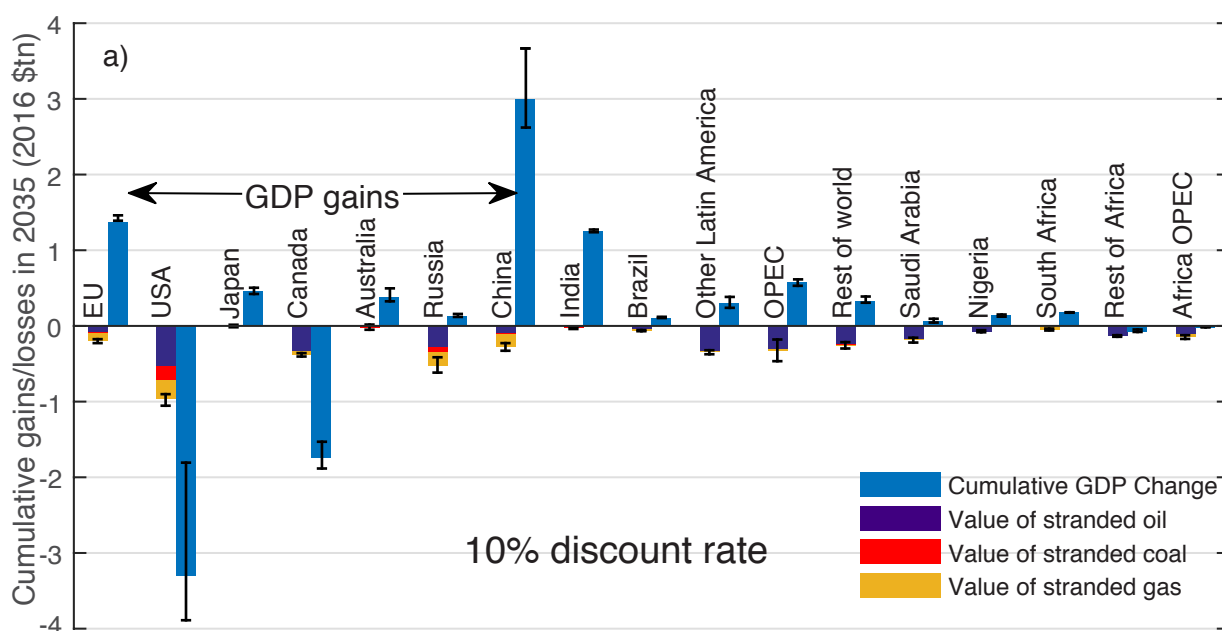


Figure 1: Possible gains and losses from stranded fossil fuel assets during a low-carbon transition, on GDP and stocks of wealth worldwide, cumulated between 2016 and 2035 with a discount rate of 10% applied. Calculated using the E3ME-FTT-GENIE energy-economy-environment simulation model<sup>3</sup>. Error bars represent maximum uncertainty on total SFFA generated by varying all technology parameters within their uncertainty ranges.

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