Climate-KIC

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ALIGNING FINANCE FOR THE NET-ZERO ECONOMY:

new ideas from leading thinkers

#3 INNOVATION AND TRANSFORMATION: WHAT IT WILL TAKE TO FINANCE NET ZERO

Richard Roberts and John Elkington

in partnership with

UNEP FINANCE INITIATIVE

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Foreword

Eric Usher, Head of UNEP FI &
Dr. Kirsten Dunlop, CEO of Climate-KIC

Since the 2015 Paris Agreement, conditional pledges have fallen well short of the target of holding the global temperature increase to well below 1.5°C above pre-industrial levels. To reach the aim of decreasing global greenhouse gas emissions annually by 7.6% up to 2030[1], we need to increase collective ambition by more than fivefold over the next ten years.

The low-carbon transition will require the integration of climate action into the economic, social and environmental dimensions of development: a distinguishing feature of the 2015 UN Sustainable Development Goals (SDGs). Interlinkages within and across the goals have been created to build on lessons from the past that sustained systemic change cannot be achieved through single-sector goals and approaches. Investing in climate-resilient infrastructure and the transition to a zero-carbon future can drive job creation while increasing economic, social and environmental resilience. Investing in innovation will further reduce the costs of climate change and generate options for alternative business models and ways of living that contribute to economic stability and to a smooth transition.

Short-term thinking in investment cycles and in ideas of economic value are acting to prevent the 1.5°C transition we need, and this will require transformation and innovations in the financial system. Financial institutions play a leading role in allocating and pricing the investment necessary for business development and economic growth. Our financial systems cannot afford to view investments in economic recovery as separate from the sustainability agenda. Therefore, financial actors need to embrace new concepts of value, monetization and externalities, and to address underlying behaviours and mindsets, including short-termism, that govern choices and decisions. Above all, the financial system needs to redefine what it is in service of.

Reviews of the effectiveness of research and innovation activities funded by Europe's Horizon 2020 programme have led to calls for more systemic and cross-sectoral approaches, breakthrough thinking

1 United Nations Environment Programme (2019) Emissions Gap Report 2019. Nairobi, Kenya. Available at: unenvironment.org/resources/emissions-gap-report-2019

and solutions, deep demonstration projects and social inclusion through citizen engagement and participation. The final Report from the High Level Panel of the European Pathways to Decarbonisation initiative, released in November 2018, specifically calls for a focus on: "system-level innovation, promoting sector-coupling so that the individual elements of decarbonisation fit together in a coherent whole" and recommends the establishment of large mission-oriented programmes of a cross-cutting nature for the deployment of system-level transdisciplinary innovation.[2]

In the meantime, the coronavirus pandemic has triggered a major global public health and economic shock. We can draw comparisons between pandemics and the climate emergency: as systemic, non-stationary, non-linear, risk-multiplying and regressive shocks. Many countries have been unprepared for a global shock of this scale and it is clear that we must collectively build a more coherent response to the potentially more disruptive climate emergency and build an anti-fragile capability for resilience and renewal.

The pandemic has also shown that business-as-usual cannot deliver the necessary emissions reductions. Despite international travel plummeting, factories scaling down production, and employees working from home, the annual drop in emissions has only been around 8% and unemployment has soared. Emergence from lockdown in China, for example, has shown that emissions quickly reach or even exceed pre-COVID levels,[3] while government stimulus packages have only partially delivered transition-oriented funding and, in some cases, thrown a lifeline to high emissions industries.

Leading banks and investors have recognised that there is no alternative to a low-emissions, sustainable economy. Convened by UNEP FI and partners, the Net-Zero Asset Owners Alliance and the Collective Commitment to Climate Action by banks worldwide, have brought together over 70 financial institutions, committed to working with governments and other stakeholders, to support the financial and economic transformation needed to help deliver the Paris Agreement by aligning financial portfolios with the corresponding emissions pathways – a step that was hitherto unheard of – and deliver what the IPCC report calls, "rapid, far-reaching and unprecedented changes in all aspects of society".[4]

However, the climate emergency will require current thinking and paradigms to be challenged and questioned. This is why EIT Climate KIC, in partnership with UNEP Finance Initiative, is convening leading thinkers to present their ideas for sustainable financial and economic transformation. We hope that this inspires financial actors to work across the field to draw up a financial system that enables the low emission societies of the future.

Eric Usher
Head of UNEP FI

Dr. Kirsten Dunlop
CEO of Climate-KIC

2 European Commission (2018) Final Report, High Level Panel of the European Pathways to Decarbonisation. Brussels, Belgium. Available at: op.europa.eu/en/publication-detail/-/publication/226dea40-04d3-11e9-adde-01aa75ed71a1

3 World Economic Forum (2020) China's air pollution has overshot pre-pandemic levels as life begins to return to normal. Geneva, Switzerland. Available at: weforum.org/agenda/2020/07/pollution-co2-economy-china/

4 IPCC (2018) Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C. WMO, Geneva, Switzerland. Available at: ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/


THERE IS
NO
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Aligning Finance to the new carbon economy: new ideas from leading thinkers

Series Introduction

The IPCC Special Report, released in late 2018, highlighted the urgency of minimising global temperature rise to 1.5°C and emphasised the need for systems transitions that can be enabled by investments in climate change mitigation and adaptation, policy and acceleration of technological innovation and behavioural changes (IPCC; 2018). Amongst the emissions pathways scenarios, it proposed, for the first time, a limited or no overshoot scenario – the P1 low energy demand (LED) scenario, where future energy demand could be met through low-emission energy sources and enhanced energy efficiency. This scenario presupposes that system changes are more rapid and pronounced over the next two decades.

Five years after the Paris Agreement, and with calls by the IPCC for urgent action in the coming decade to prevent climate change catastrophe, 2020 was billed as a key year for climate action. The COVID-19 crisis that has accompanied this year marks a point of transformation for the economy and society: it has demonstrated how remarkable and rapid systems change can be. The global pandemic has given us a clear opportunity to pave the way for building back better and establishing new norms, as well as lessons that can inform how we might face the unabated climate crisis and future climate shocks.

A paradigm shift is needed if we are to move towards a limited or no-overshoot climate scenario. Stakeholders in financial markets, capital and investment represent important levers of change, as they have a key allocative role in society, and can enable investment into a net-zero low-energy future. Financial intermediaries can effectively support and enable societies to mobilise the investment required for the systems change needed to transition economy and society onto a net-zero pathway that is compatible with 1.5°C by 2100.

EIT Climate KIC has been working over the past decade to catalyse systemic transformative change through innovation and has supported the development and uptake of innovations that could help financial markets scale up investment in green technologies and transformative alignment. Action has to move beyond disclosure of climate-related financial risks towards proactive interventions, from engaging the world's emitters to set GHG reduction targets that are sufficiently ambitious, credible and science-based to investing in, financ-

ing and helping enable the breakthrough technologies and business models of the future. Moreover, a focus on the role of regulators, fiduciary duty and other fiscal incentives is imperative to understand how we might reset the rules to develop a more regenerative and resilient economy.

The United Nations Environment Finance Initiative (UNEP FI) is a partnership between UNEP and the global financial sector to mobilise private sector finance for sustainable development. UNEP FI has been leading two initiatives, which aim to move beyond a passive risk disclosure perspective to a more active engagement of private sector actors in committing to meet the objectives of the Paris Agreement and support the low-carbon transition. 38 banks have committed to align their portfolios with Article 2.1c of the Paris Agreement under the aegis of the Principles for Responsible Banking, while UNEP FI has partnered with PRI, WWF, and Mission 2020 to launch the Net Zero Asset Owner Initiative, bringing together 29 institutional investors as of September 2020 to commit to net zero emissions by 2050.

EIT Climate-KIC has therefore partnered together with UNEP FI to produce this thought leadership series that aims to inspire financial actors worldwide to move from risk to alignment, challenge current assumptions around climate alignment and develop ideas and concepts on how alignment can best be achieved. We hope to encourage stakeholders that a proactive climate response is not only about disclosing risks, but also about investing in green opportunities that can enable the low emissions societies of the future. This series convenes innovators and industry experts to provoke discussion, challenge the status quo and guide the transformation of business and finance towards a sustainable future.

THE PAPERS IN THIS SERIES WILL RESPOND TO A NUMBER OF KEY QUESTIONS :

- What economic system transformation is actually required to deliver the Paris Agreement?
- How do financial institutions achieve alignment with the Paris Agreement and how does it differ from transition risk transparency as captured in the TCFD?
- What is the future of financial institutions as a result of these changes?
- What are the various strategies and action tracks through which financial institutions can enhance and achieve full portfolio alignment?
- What are the pathways and choices needed for financial institutions and the financial system to drive an active transition to a net zero-carbon economy?

Richard Roberts

Richard Roberts is Inquiry Lead at Volans, a research and advisory firm focused on sustainability, innovation and market transformation. Richard is responsible for much of Volans' research, thought leadership and foresight work, while also contributing to selected corporate advisory projects. Over the last decade, he has worked on strategy development and corporate transformation projects with companies in a range of sectors – from finance to heavy industry. Since 2018, he has led Volans' work on Tomorrow's Capitalism – examining the role of business and finance in shaping tomorrow's markets in ways that foster resilience and regeneration.

Richard is part of the delivery team for the Bankers for NetZero initiative, which is bringing together leaders from banks, business and policy to accelerate progress towards the UK's net zero target in the lead-up to COP26. He is the lead author of several recent reports – including *Reinventing Capitalism: A Transformation Agenda* (November 2020) with the World Business Council for Sustainable Development, and *Responsible Retail Banking in the 2020s* (September 2020) with Business in the Community.

John Elkington

John Elkington is Co-Founder & Chief Pollinator at Volans. John is one of the founders of the global sustainability movement, an experienced advisor to business, and a highly regarded keynote speaker and contributor, from conferences to advisory boards. In 2008, *The Evening Standard* named John among the '1000 Most Influential People' in London, describing him as "a true green business guru", and as "an evangelist for corporate social and environmental responsibility long before it was fashionable". In 2009, a CSR International survey of the Top 100 CSR leaders placed John fourth: after Al Gore, Barack Obama and the late Anita Roddick of the Body Shop, and alongside Muhammad Yunus of the Grameen Bank.

John has addressed over 1,000 conferences around the world. He was a faculty member of the World Economic Forum from 2002-2008. He has served on over 70 boards and advisory boards. John has won numerous awards and is the author or co-author of 20 books. His most recent book – *Green Swans: The Coming Boom in Regenerative Capitalism* – was published by Fast Company Press in April 2020.

Contents

Introduction

This paper looks at what it really means to align global finance to the Paris Agreement – specifically the Low Energy Demand (LED) Scenario outlined in the IPCC's 2018 special report on 1.5°C.[1]

Every so often, something that looks impossible in one reality, or set of circumstances, becomes possible and then even inevitable in a new one. At the moment, a global transition to a net zero economy looks almost impossible in any meaningful timescale, even for many advanced economies, and totally impossible for the majority of the world's national and regional economies. The carbon paradigm may be shifting, but the necessary transitions and transformations will not be driven by hope alone.

The scale of the transformation required is immense: the IPCC's LED scenario would require a 50% drop in GHG emissions globally by 2030 and 82% by 2050 (compared with 2010 levels). It also requires a 15% drop in final energy demand by 2030 and 32% by 2050 (vs 2010 baseline again). There is no precedent in the history of capitalism for such a dramatic and sustained drop in both emissions and energy demand. This makes it highly implausible that incremental changes alone can deliver the LED scenario. Instead, what's called for is systems transformation.

As a previous paper in this series[2] noted, if the last 30 years have taught us anything, it is that three decades is long enough for some pretty seismic shifts to take place. 1990 was one year after Tim Berners-Lee invented the World Wide Web. It was the year the first web browser was created. Kodak was in its pomp. Of the US FAANG (Facebook, Amazon, Apple, Netflix, Google) and Chinese BAT (Baidu, Alibaba, Tencent) companies that now dominate global markets, only one—Apple—even existed.

In other words, unimaginable creative destruction can happen within a 30-year period. The challenge we face, therefore, is to ensure: a) that the next 30 years are characterized by at least as much disruptive innovation as the last; and b) that the next wave

1 ipcc.ch/sr15/

2 climate-kic.org/wp-content/uploads/2020/09/200902_J932-CKIC-UNEP-ThoughtLeadershipSeries-DennisPamlin-1.pdf

of disruptive innovation—the next generation of FAANGs and BATs—is actively directed towards the goal of reducing emissions and energy demand, in line with the LED scenario. Climate needs to become to the next 30 years what digital has been to the past 30 years: the organising principle for a social, cultural and industrial revolution.

This is not as far-fetched as it may sound. As we explore in part 1 of this paper, a paradigm shift that puts climate outcomes at the heart of how our economies operate is already well underway—with roots dating back half a century. Over the next 10–15 years, we expect to see a convergence of societal and technological trends (many of which have exponential characteristics) that help drive this political, economic and cultural paradigm shift—fifty years in the making—to its logical conclusion.

The remainder of the paper explores what this shift will mean for finance and key actors—both public and private—within the financial system. In part 2, we outline four "inconvenient truths" for finance about the transition, before moving in part 3 to a set of recommendations for how the financial industry, financial regulators and economic policy-makers can and should respond.

We argue that what is called for to align with the IPCC's LED Scenario goes significantly beyond an incremental "greening" of finance-as-usual: a fundamental shift in the purpose and practice of finance—as well as the policies that determine the "rules of the game"—is required. Above all, finance is not and cannot be neutral about climate outcomes: the type of innovation we get is in large part a result of what public and private finance values. In order to align with the IPCC's LED Scenario, finance needs to act as though limiting global warming to 1.5°C is an important goal in its own right. The idea that a net zero economy might flourish without that intentionality is a dangerous fallacy.

Part 1:

Finance in an Age of Exponential Change

Since the 1960s, a series of cumulatively building societal pressure waves have impacted governments, business and financial markets—gradually driving a growing range of environmental, social and governance issues into the mainstream. Each pressure wave follows a broadly similar pattern, with ideas and concerns that originate among those directly impacted by the relevant challenges picked up by thought leaders in the scientific community, and amplified by NGOs, activists and the media. These ideas and concerns then spread to politics, business and finance—often picked up initially by small, marginal organizations before finding their way into the mainstream.

Since 1994, SustainAbility—and then, since 2008, Volans—have been tracking these waves, back to the 1960s and forward to the present day, identifying five distinct waves to date. We refer to them as waves because there are discernible peaks and troughs, but these occur against the backdrop of steadily rising awareness, concern and engagement. Over the coming decade(s), we expect this background rate of awareness, concern and engagement to be super-charged as the symptoms and costs of climate breakdown—including floods, fires, droughts, storms—become more extreme. As climate change goes exponential, the societal response to it will too.

To give a sense of where all of this may take us, we will briefly summarise the waves to date—and then look forward to potential future waves and their possible impact on business and financial markets. Significantly, past experience suggests that the really useful work tends to get done not in the frothy peak periods, but in the subsequent downwaves.

1.1

SOCIETAL PRESSURE WAVES: 1970–2030

- The first societal pressure wave (**Wave 1**, keyword: *environment*) built through the 1960s, and peaked between 1969 and 1972. The first Earth Day in 1970 was a key milestone. **Downwave 1**, running through to 1987, saw a massive secondary wave of regulation across the OECD world, with business largely on the defensive, forced to comply.

- **Wave 2** (keyword: *green*), peaking between 1988 and 1991, saw a new focus on moving business "beyond compliance". One result was the launch through the subsequent **Downwave 2** (1992–1998) of a range of voluntary market standards such as AA1000, the Global Reporting Initiative, ISO 14000 and SA8000. Business analysis embraced total quality management, triple (and then double) bottom lines, and environmental (and then sustainability) reporting.

- The **Wave 3** agenda (keyword: *globalisation*) included many Wave 1 and 2 agenda issues but increasingly in the context of intensifying globalisation, liberalisation and privatisation. As markets and supply chains globalised ahead of global governance systems, the spotlight was increasingly on multinational corporations, particularly their stumbles: think Shell, Nike, Monsanto. Then, after Wave 3 was cut short by the events of 9/11, **Downwave 3** (2002–2006) focused on much narrower definitions of security.

- **Wave 4** (keyword: *sustainability*), beginning in 2007 and peaking around 2010-2012, saw a growing use of the "S" word, with many business leaders announcing they had already "embedded" the agenda. Meanwhile, we saw the beginning of a generational handover as the boomers began to retire, and Gen X and Y made their priorities felt. New forms of social media and social networks began to transform not only business (eg, Amazon, iTunes) but also activism (eg, 350.org, Avaaz, 38 Degrees). With governments distracted by the "great recession", we saw the emergence of multiple theories of change during **Downwave 4** (2012–2014), including a growing emphasis on the role of entrepreneurs (eg, cleantech, social), plus a growing interest in the rise of the BRICS[3] and (later) MINT[4] economies. Business analysis increasingly embraced concepts like integrated reporting and shared value, and financial regulators became increasingly concerned with systemic risks – including climate change.

- **Wave 5** (keyword: *climate*) kicked off in 2015 with COP21 in Paris and the launch of the UN Sustainable Development Goals and may have peaked in 2018–19 with youth climate strikes sweeping across the globe and Greta Thunberg appearing on the cover of Time magazine as 2019's Person of the Year. In the financial sector, wave 5 has seen massive uptake of ESG, a proliferation of "green" financial products (eg., green bonds) and a mainstreaming of concern about climate risk amongst financial institutions and regulators. It is too early to say whether wave 5 has definitely peaked, but it may be no bad thing if it has. **Downwave 5** may yet come to be known as a breakthrough era for political action on climate, with the EU Green Deal and, plausibly, a US Green New Deal and Chinese Net Zero by 2060 strategy, as key achievements.

3 Brazil, Russia, India, China, South Africa
4 Mexico, Indonesia, Nigeria, Turkey

Looking ahead, we anticipate two potential future waves—both of which will see finance increasingly in the spotlight:

- The early ripples of **Wave 6** (keyword: *impact*) are already discernible, as ideas and practices pioneered in the impact investing space start to filter into the mainstream via initiatives ranging from Harvard Business School's Impact-Weighted Accounts Project[5] to the Make My Money Matter campaign.[6] This wave is likely to be accentuated by a generational handover of wealth and influence from Baby Boomers to Gens X, Y and Z. For large parts of the financial industry, wave 6 may involve a moment of reckoning as a broader public becomes cognisant of the fact that climate risk management and alignment with climate outcomes are not the same thing.[7] Institutions that have developed credible strategies for the former but not the latter can expect to come under increased pressure.

- Likewise, **Wave 7** (keyword: *regeneration*) is already starting to build in places (see, for example, Walmart's recently announced ambition to become a regenerative company[8]), but may take several years to mainstream – given the complexity of the challenges. As recognition grows that many of our natural and social systems (including the climate) are damaged and degraded beyond the point where simply lessening our negative impact will enable them to recover, regeneration will become imperative. We expect this to lead to a rebooting of the sustainability agenda with regeneration—economic, social, environmental and political—as the new paradigm.

Given current trends, we expect the downwaves to be increasingly concertinaed as the pressure builds for systemic action, so it's possible waves 6 and 7 will converge to form a single—and much larger—pressure wave.

1.2

TECHNOLOGY-DRIVEN ECONOMIC CYCLES

These societal pressure waves are, in effect, layered on top of another set of waves that are driven by technological progress—often referred to as Kondratiev Waves,[9] after the Russian economist who first posited the existence of long-wave economic cycles in the 1920s. Although long contested in terms of causation and duration, the broad pattern of these cycles is pretty clear.

Today, there are echoes of Kondratiev's thinking in the World Economic Forum's argument that we are entering a Fourth Industrial Revolution,[10] whilst our own analysis (which draws on recent work by, among others, the British-Venezuelan economist Carlota Perez[11]) suggests there have in fact been five long-wave cycles to date since the start of the Industrial Revolution (see figure 1).

5 hbs.edu/impact-weighted-accounts/Pages/default.aspx
6 makemymoneymatter.co.uk/
7 See climate-kic.org/wp-content/uploads/2020/09/200902_J932-CKIC-UNEP-ThoughtLeadershipSeries-DrBenCaldecott-1.pdf
8 corporate.walmart.com/newsroom/2020/09/21/walmart-sets-goal-to-become-a-regenerative-company
9 investopedia.com/terms/k/kondratieff-wave.asp
10 weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/
11 beyondthetechrevolution.com/wp-content/uploads/2014/10/BTTR_WP_2016-1.pdf

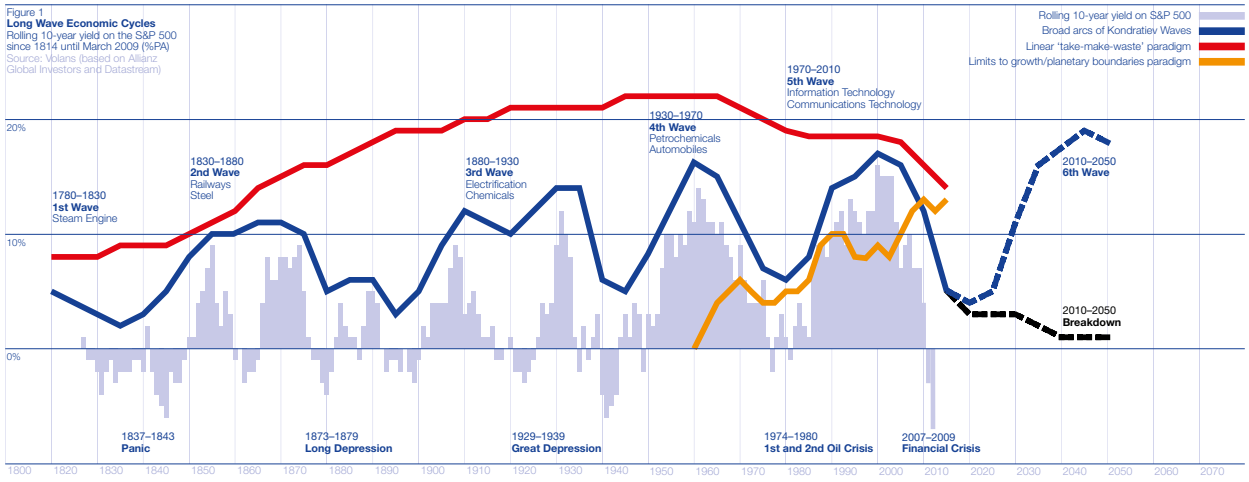


FIGURE 1: Long-wave economic cycles since the Industrial Revolution

Source: Volans 2016[12]

Regardless of how you count and map the waves to date, the conclusion different analyses have in common is that we are on the brink of an extraordinary period of technology-driven creative destruction, in which the rate of change in many industries is likely to go exponential. According to Tony Seba and James Arbib, co-founders of RethinkX, a think tank that specialises in analysis of technology-driven disruption:

> 'In the next 10 years, key technologies will converge to completely disrupt the five foundational sectors—information, energy, food, transportation, and materials—that underpin our global economy, and with them every major industry in the world today. Costs will fall by 10 times or more, while production processes become an order of magnitude (10x) more efficient, using 90% fewer natural resources and producing 10 times to 100 times less waste.'[13]

Even if you discount RethinkX's projections for the speed and scale of the disruption that lies ahead by 50% or more, these are astonishing—and profoundly consequential—numbers. From a climate perspective, these projections are potentially good news: this type of exponential systems transformation is precisely what will be required to align with the IPCC's LED Scenario. From a social, economic, financial and geopolitical perspective, however, this level of disruption will create both winners and losers.

The consequences of stranded assets, stranded communities and even stranded generations will have to be carefully managed. But the potential gains for some investors that are able to maximise their exposure to the new value creation involved in these transformations, while minimising their exposure to the value destruction that is an inevitable by-product of disruption, are significant.

12 volans.com/wp-content/uploads/2016/09/Volans_Breakthrough-Business-Models_Report_Sep2016.pdf
13 fastcompany.com/90559711/we-are-approaching-the-fastest-deepest-most-consequential-technological-disruption-in-history

By way of an indication of the scale of financial opportunity involved, RethinkX reports on the performance, since 2005, of a virtual stock portfolio of 15 companies inventing and implementing disruptive products, platforms, and business models:

'As of February 2020, the portfolio had risen by 2,500%, or 25% a year, massively outperforming the market – over the same period, the Dow Jones Industrial Average rose 296% (10% a year) while the Nasdaq rose 437% (12% a year). The average U.S. equity fund returned 180% (7% a year).'[14]

14. rethinkx.com/humanity-download

1.3

CONVERGING SOCIETAL AND TECHNOLOGICAL WAVES

To understand the full potential of our current moment (and the peril for those unable to adapt), it is necessary to consider the two stories we have sketched out in this section—one about society and one about technology—together. What we are now seeing is the convergence of these two stories, with reinforcing feedback loops between the two starting to emerge. This convergence creates an exponential change dynamic that brings off-the-scale risks and opportunities for the financial system.

Whatever the outcome of the COP26 global climate summit in November 2021, the global economy is headed toward a radical transformation to low-carbon, net zero carbon and carbon-negative technologies, business models and market mechanisms. This will be driven by technology trends, but it will also become inevitable because of market trends—including policy shifts, new carbon pricing systems and growing pressure from young people. We lay out the implications of all this for finance in parts 2 and 3 of this paper.

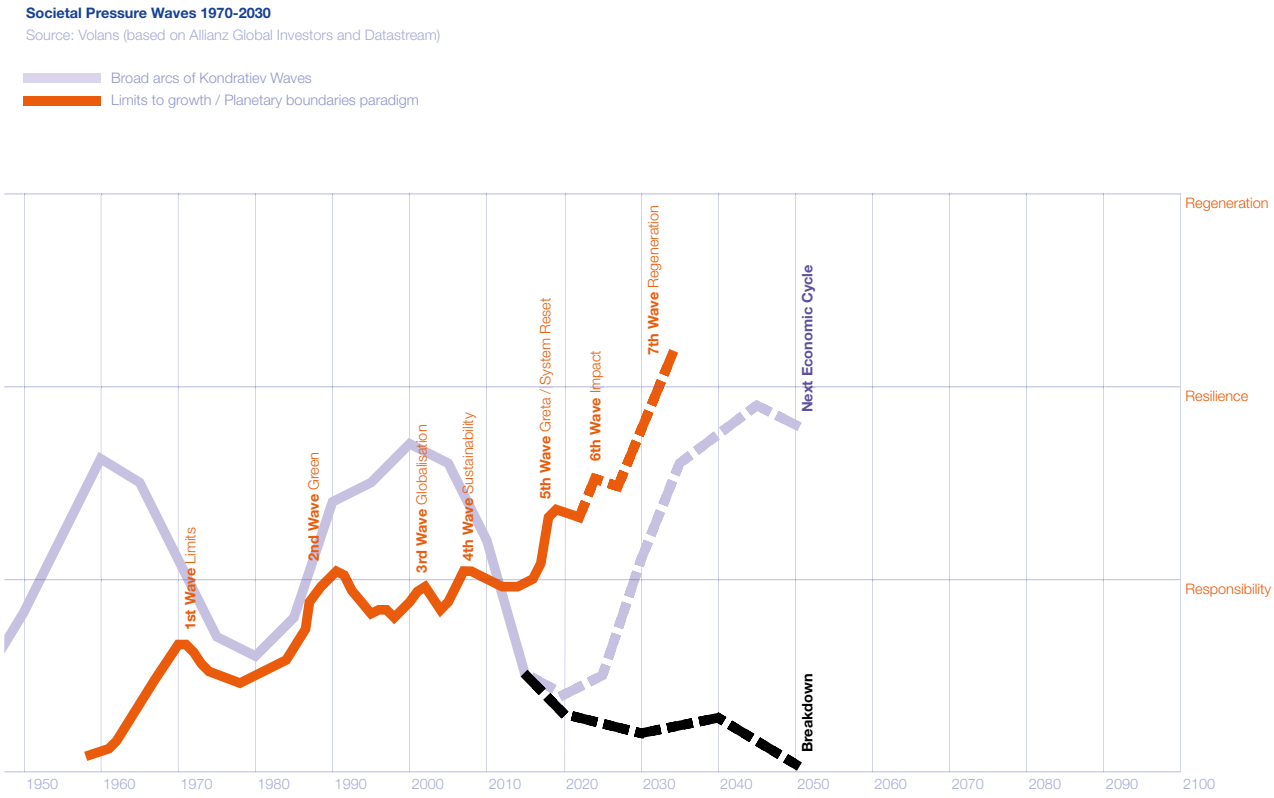


FIGURE 2: Societal Pressure Waves and Economic Cycles, 1950–2050

Source: Volans 2020

Part 2:

Inconvenient Truths for Finance

Let's be clear: the IPCC's Low Energy Demand (LED) Scenario is not an enticing prospect for the financial industry as a whole. Yes, there could be significant upsides for investors and finance providers that play their cards right, but this will be accompanied by value destruction on an unprecedented scale as whole industries are decommissioned, or made obsolete, on an accelerated timescale. Many of the investments required to transform our energy, mobility, food and industrial systems are likely to have a risk-return profile that, at least in todays' terms, looks unattractive – often highly so.

What's more, some of the financial industry's most basic assumptions and tools of analysis—from Discounted Cash Flow analysis to Modern Portfolio Theory—may be fundamentally unfit for purpose in what lies ahead. And, if we succeed in meeting our climate goals, there is a good chance that the global financial industry of 2050 will be both radically smaller and less profitable than it is today. Together, these represent a quartet of deeply inconvenient truths for the financial industry.

2.1

INCONVENIENT TRUTH 1: STRANDED ASSETS & VALUE DESTRUCTION

At present, a large proportion of the long-term costs and liabilities resulting from climate change are not (adequately) priced into asset valuations. As these "externalities" are internalised, a great deal of financial value is likely to be lost. Estimates of the size of the 'carbon bubble'[15] financial markets are currently carrying vary, but certainly it is measured in the trillions of dollars, if not the tens of trillions.[16] Recent analysis

15 carbontracker.org/terms/carbon-bubble/

16 John Fullerton of the Capital Institute estimates that we are looking at $20–25 trillion of stranded assets in the fossil fuel sector, once you factor in the three-quarters of fossil fuel assets that are state-owned. Recent write-downs of fossil fuel asset valuations by BP and Shell indicate that some of these losses are starting to be recognised, but alignment with the IPCC's LED scenario implies that a lot more of the financial value currently sitting on the balance sheets of petrostates and oil majors will need to be written off over the next 30 years.

from Ceres on US banks' exposure to climate risks found that, when all 'climate-relevant' sectors are taken into account, average loss estimates on banks' syndicated loan portfolios are as high as 18%.[17] These are huge sums at any time, but even more so when the world will be stretched to the financial limit by COVID-19 and the economic aftermath.

Value destruction is also an essential part of disruptive innovation (see Panel 1). As whole sectors of the economy are upended, new value will be created in the process, but there is no guarantee that new value creation will outweigh value destruction over the next three decades. In fact, and this is a critical point, alignment with the IPCC's LED scenario—particularly the reductions in total energy demand required (15% by 2030; 32% by 2050)—makes it all but impossible for growth in aggregate financial value to continue unabated. Since the dawn of the industrial revolution, energy demand and economic growth have increased virtually in lockstep. Efficiency gains have consistently been more than offset by increased energy demand elsewhere in the system—a "paradox" first observed more than 150 years ago by the English economist William Stanley Jevons.[18]

Analysis from McKinsey, published in 2019, suggests that we may be starting to see a decoupling between the rates of economic growth and energy demand, but even in the relatively optimistic decoupling scenario outlined by McKinsey, global energy demand increases by 14% between 2016 and 2050.[19] Absolute decoupling of energy demand from economic growth may be achievable eventually—but not on a timescale that is relevant for a 1.5°C world.

17 ceres.org/resources/reports/financing-net-zero-economy-measuring-and-addressing-climate-risk-banks
18 en.wikipedia.org/wiki/Jevons_paradox
19 mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-decoupling-of-gdp-and-energy-growth-a-ceo-guide

PANEL 1:

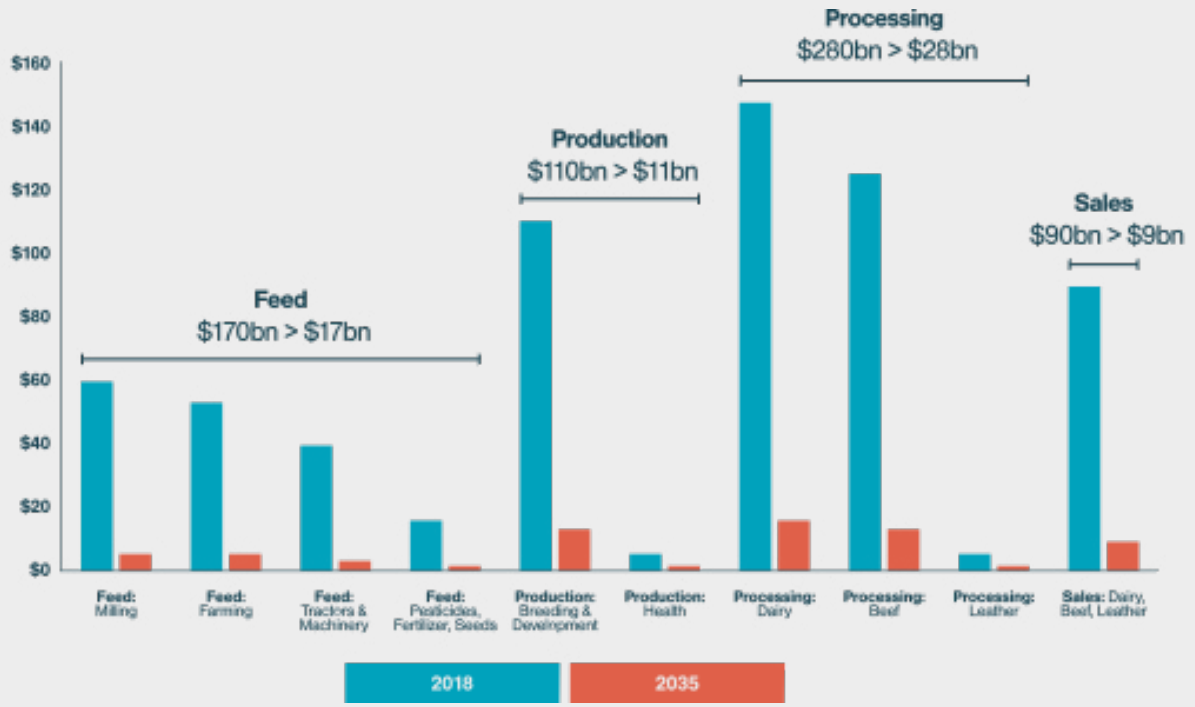
Systems transformation and value destruction – Illustrative Example

In 2019, RethinkX, a think tank, published a report on the future of the food industry that forecast an exponential disruption to business-as-usual in US beef and dairy markets as a result of the declining cost of precision fermentation, a process for creating "lab-grown" alternatives to milk and beef from cows.[20]

The report predicts that this disruption could lead to a reduction in net GHG emissions from the sector as a whole of 45% by 2030, and 65% by 2035. This is precisely the kind of scale and speed of transformation that will be required to align with the IPCC's LED Scenario.

Then comes the inconvenient part. RethinkX forecasts that revenues of the U.S. beef and dairy industries and their suppliers, which together exceed $400bn today, will decline by at least 50% by 2030, and by nearly 90% by 2035. Other livestock and commercial fisheries can expect to follow a similar trajectory. And the value destruction won't stop there: it will ripple up and down the value chain, disrupting the market for feed, fertilizers, pesticides, seeds and more.

Of course, this is only half the story: it doesn't capture the new value created as a result of this disruption to the food industry. Nonetheless, even if these forecasts are out by a decade or two, these are market-shaking prospects.



20 static1.squarespace.com/static/585c3439be65942f022bbf9b/t/5d7fe0e83d119516bfc0017e/1568661791363/RethinkX+Food+and+Agriculture+Report.pdf

2.2

INCONVENIENT TRUTH 2: HIGH RISKS, LOW RETURNS

Disruptive innovation, which is a necessary condition for the economic transition, is inherently high risk. Transforming existing businesses—for example in carbon-intensive industries like cement, steel, aviation, shipping and plastics—often means accepting lower rates of return on investment, at least for a period. To align with the LED scenario, we are going to need to channel vast amounts of capital into both of these things. But we will have to do so at a time when, due to ageing populations, demand for low-risk, high-return investments is increasing.[21]

To compound the challenge, we currently have a financial system in which the vast majority of capital is deployed in secondary markets where many seemingly low-risk, high-return investments are available—not least because, since 2008 (and especially during 2020) policymakers and central bankers have effectively taken it upon themselves to underwrite financial asset prices. When financial markets start to go down, the policy response is rapid and liquidity is pumped into the system to sustain asset prices; when markets start to rise again, there is no equivalent symmetrical policy response.

There are clearly good reasons for this market intervention, but inevitably it creates distortions—and some of those distortions may be counterproductive in terms of climate impact. Artificially inflated asset prices in secondary markets may have little direct impact on the net zero transition one way or another, but to the extent that they make it harder to raise capital for high-risk, low-return real economy innovation and transformation, they are a problem. After all, why invest in the risky business of transforming a carbon-intensive company into a zero-carbon one, or in an unproven start-up that may develop a breakthrough climate solution, when you can put your money into an index fund, safe in the knowledge that the Federal Reserve and its counterparts around the world will prop up the market if needed?

2.3

INCONVENIENT TRUTH 3: FAULTY TOOLS AND ASSUMPTIONS

One critical reason why an incremental approach to greening finance is unlikely to be sufficient is because of the way in which faulty assumptions are hardwired into the tools that mainstream capital markets actors use to make investment decisions and allocate capital. Feeding better data into existing tools and models will have limited impact on outcomes, so long as those tools and models continue to systematically discount systemic risk and long-term performance.

For example, Discounted Cash Flow (DCF) analysis, which sits at the heart of how capital is allocated in today's financial markets, is, according to Steve Waygood, Chief Responsible Investment Officer at Aviva Investors, a serious threat to sustainability:

21 As pension fund beneficiaries approach retirement age, their savings are generally shifted from riskier assets to safer ones. And with the percentage of the population that is above retirement age growing in many countries, pension funds will be required to focus on high, stable returns to ensure they can meet their growing liabilities. Neither of these trends is likely to work in favour of net zero alignment.

'DCF ignores social capital as it is external to the corporate profit and loss statement. DCF ignores future generations with its discount rates. And it assumes away the need to preserve natural capital by assuming all investments can grow infinitely with its Terminal Value. We are left with millions of professional investors managing trillions of assets on our behalf, all of which largely ignore the one planet boundary condition.'[22]

Roman Krznaric, author of *The Good Ancestor: How To Think Long Term In A Short-Term World*, puts it more bluntly: 'Discounting is a weapon of intergenerational oppression disguised as a rational economic methodology.'[23]

Another near-ubiquitous financial industry tool that appears to have a major blindspot when it comes to sustainability is Modern Portfolio Theory (MPT). As a recent report from B Lab and The Shareholder Commons notes:

'Under MPT, financial intermediaries consider overall market performance to be outside their control, even though market performance is simply the sum of the performance of all of the companies that their clients collectively own, and even though overall market performance is responsible for at least 80% of the performance of a properly diversified equity portfolio. In other words, they have adopted an investing model that rejects the very idea of common sustainability guardrails, which are needed to manage overall market performance, the dominant determinant of an institution's return on stocks…

The net result is that asset managers pursue profit at a single company even when that single-minded focus is costing investors much more in loss of portfolio interests alone, not to mention… citizen and community interests.'[24]

2.4

INCONVENIENT TRUTH 4: TOO BIG, TOO DISCONNECTED

The most inconvenient truth of all for contemporary finance is that it is currently too big, too powerful and too profitable to support a net zero transition in line with the IPCC's LED Scenario. Getting to net zero requires, first and foremost, transformation in the real economy – of energy, mobility, food and industrial systems. Finance's role is to enable those real economy transformations. Yet, as economist Mariana Mazzucato notes, at present 'most of the financial sector's profits are reinvested back into

22 medium.com/volans/capitalism-with-green-swan-characteristics-5e774d2f7ff4
23 Roman Krznaric, The Good Ancestor, p. 73
24 pardot.bcorporation.net/l/39792/2020-09-24/9kx4pb

finance—banks, insurance companies, and real estate—rather than put toward productive uses such as infrastructure or innovation.'[25]

This creates a disconnect between finance and the real economy – something that has been brought into sharp relief during 2020 by the often dramatic divergence between buoyant financial markets and grim underlying economic realities during the COVID-19 crisis. This disconnect has profound implications for the financial industry's ability to help steer the global economy towards net zero. As Duncan Austin, a former partner at Generation IM, notes, it is as if 'the ESG community has reached for the steering wheel of the global economy to turn it in a greener direction, only to find that the steering wheel is poorly connected to the main wheels and that inputs on the steering wheel may or may not be turning the vehicle in the desired direction.'[26]

The situation is exacerbated by the shift from active to passive fund management, as passive funds are, in effect, designed to be on autopilot, rather than to allow investors to play the role of engaged owners. Not only is the steering wheel poorly connected to the main wheels, but the investment industry is asleep at the wheel—by design.

Ultimately, as John Fullerton, Founder and President of the Capital Institute puts it, the finance sector 'must be understood as a subsystem in service to a healthy real economy.'[27] Its size relative to the real economy should reflect this servant-master relationship. Fullerton estimates that current trading activity levels would need to be curtailed by more than 50% in order to return finance to its proper role as servant to the real economy.[28]

Finance's scale problem is not only about the aggregate size of the sector, but also about the dominance of individual institutions. Fullerton again: 'effective circulatory systems are designed in fractal patterns that repeat across scales, like the root and branch system of a tree.'[29] To finance the net zero transition, we need a diversity of different types and sizes of financial institutions—a diversity that decades of increasing concentration has, in many cases, undermined. Much of the innovation that needs financing today is relatively small-scale. A thriving ecosystem of small- and medium-sized financial intermediaries with a strong connection to place is vital.

25 foreignaffairs.com/articles/united-states/2020-10-02/capitalism-after-covid-19-pandemic
26 responsible-investor.com/articles/ri-long-read-esg-s-relationship-to-sustainability-is-a-quicksand-problem
27 John Fullerton, 'Finance for a Regenerative World, Act II' (2019), p. 8
28 Ibid., p. 26
29 Fullerton, 'Finance for a Regenerative World, Act IV' (2020), p. 22

Part 3:

Elements of a Transformative Agenda for Finance

It is increasingly clear that achieving an emissions pathway in line with the IPCC's LED Scenario for 1.5°C will require a profound shift in both the purpose and practice of finance. Currently, mainstream finance is geared to be agnostic about climate outcomes, except insofar as these outcomes coincide with financiers' existing mandate to optimise risk-adjusted returns and regulators' mandate to preserve financial stability. This institutionalised neutrality about climate outcomes is no longer tenable.

Instead, optimising climate outcomes must now become one of the financial industry's core functions – and be baked into both private and public institutions' mandates. This, in turn, will necessitate a profound shift in practice: investment and loan portfolios will need to be optimised not just for risk and return, but also for systemic impact; investors will need to (re-)learn how to act as responsible owners and stewards of the companies they invest in; and innovative products, including collaborative/blended finance offerings, will be required to match different pools of capital with the real economy's finance and investment needs.

Finance can achieve a lot, but there are limits to the role that financial institutions (including financial regulators) can play in reshaping the economy. Policy action to make business activities that undermine the goal of Paris alignment less profitable—and those that contribute to meeting it more profitable—is also necessary. Where companies are currently able to generate profits and cash flows by causing environmental harm that is unpriced—or by extracting 'economic rents'[30] at the expense of other actors in the economy—then this 'false' profitability needs to be tackled at source by policymakers and regulators.

While, in principle, there may be no shortage of capital to finance the innovation needed to get us to net zero and beyond, companies do have to compete for access to that capital – and, too often in today's world, the playing field is skewed in favour of value extractors, rather than genuine sustainable value

30 Defined as 'the return on an activity beyond what is needed to attract the workers, finance and enterprise on which it depends.' See Paul Collier, *The Future of Capitalism* (2018), p. 91.

creators. Fixing this imbalance—even 'tilting the playing field'[31] in favour of those building the new solutions and infrastructure we need—must be a top priority for economic policymakers.

3.1

RETHINKING PURPOSE

From risk & return to risk, return & impact

Today's financial industry operates largely on the assumption that the best—indeed only—way to serve clients' and beneficiaries' interests is to maximise financial returns, irrespective of the non-financial outcomes generated in the process. This assumption is increasingly indefensible, particularly in relation to climate change, which does materially impact clients' and beneficiaries' wellbeing and quality of life—now and in the future. We therefore need, urgently, to rethink the fiduciary duties that financial intermediaries owe to their clients and beneficiaries—moving away from the narrow definition that has prevailed over the last 50 years towards a new definition that incorporates the non-financial preferences and interests of clients and beneficiaries.

> During the 2010s, significant effort went into incrementally shifting the interpretation of fiduciary duties with regard to material ESG factors. This is an important, but limited, step in the right direction. As UNEP FI and PRI's 2019 report on 'Fiduciary Duty in the 21st Century' makes clear, the increasingly widespread acceptance that material ESG factors should be incorporated into investment decisions means that 'fiduciary duties require consideration of how sustainability issues affect the investment decision, but not how the investment decision affects sustainability.'[32]

The next—and potentially more transformative—step is to establish that fiduciaries have a duty to 'understand and incorporate into their decision making the sustainability preferences of beneficiaries/clients, regardless of whether these preferences are financially material.'[33] This can be thought of as a "double materiality"[34] perspective that gives fiduciaries a duty to optimise not only financial returns, but also the social and environmental outcomes generated as a result of how capital is deployed.

For this to have the desired effect, financial institutions will need to go to much greater lengths than is currently the norm to find out about the sustainability preferences of their clients/beneficiaries. At the same time, the default assumptions about what constitutes a client's/beneficiary's best interests that are encoded in law and regulation will need to be updated to reflect a "double materiality" perspective. Oren Cass, Executive Director of American Compass, makes the case succinctly:

31 See marianamazzucato.com/research/mission-oriented-innovation-policy/
32 unpri.org/download?ac=9792
33 fiduciaryduty21.org/
34 See un.org/development/desa/financing/sites/un.org.development.desa.financing/files/2020-08/Renewed%2C%20Recharged%20and%20Reinforced%20%28GISD%202020%29_vF.pdf

'[Shareholders'] preferences are notoriously difficult to discern. That does not argue for "make as much money as possible" as the default instruction to managers. Why not "operate as you believe a responsible member of the community would"? We could at least as easily say that is what owners generally want.'[35]

This evolution of fiduciary duty should also be mirrored by an expansion of financial regulators' mandate. Under Article 2(c) of the Paris Agreement, the world's governments committed to 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.'[36] Five years on, though many central banks have begun to incorporate climate risk into their approach to micro- and macro-prudential regulation, we are not aware of any financial regulator anywhere in the world whose mandate has been updated to reflect Article 2(c). Given how profoundly important finance is to the net zero transition, it is surely high time that those responsible for supervising the financial system were given an explicit mandate to target climate stability as well as financial stability.

3.2

RETHINKING PRACTICE

Translating this redefinition of the purpose of finance into practice will involve several dimensions: a renewed focus on the concept of stewardship; a shift in focus from individual assets to whole systems; and a highly collaborative approach to de-risking the investments needed to align our economies with the IPCC's LED Scenario. Underpinning these three priorities is a requirement for both banks and asset managers to (re-)focus on lending to, and investing in, the real economy.

1: From speculation to stewardship

Today's financial system is, in effect, a model of "capitalism without capitalists".[37] Those providing financial capital to businesses do not, for the most part, take real responsibility or exercise real control over the companies that they invest in. As John Fullerton notes, in recent decades we have blurred the distinction between investment and financial speculation, in the process degrading 'the potential of a long-term relationship between owners and creditors on one hand, and enterprise on the other, to the level of an abstract transaction in pursuit of only short-term satisfaction… Without a critical mass of investors in long-term relationship with large, multinational organizations, who will accept the responsibility to govern when it's so much easier (and cheaper) to simply buy and sell?'[38]

This is problematic for many reasons, but for the purposes of this paper we are primarily concerned with the opportunity that exists to leverage the influence of investors on corporate strategy as a tool for accelerating decarbonisation in sectors like cement, steel and plastics that are both carbon-intensive and indispensable. At present, that opportunity is largely being squandered because too few financial firms are actively engaging with management teams on climate issues – and those that are engaging mostly limit their engagement to a relatively narrow set of issues related to risk and disclosure.

35 nytimes.com/2020/09/11/business/dealbook/milton-friedman-doctrine-social-responsibility-of-business.html
36 unfccc.int/sites/default/files/english_paris_agreement.pdf
37 americanaffairsjournal.org/2017/08/capitalism-without-capitalists/
38 Fullerton, 'Finance for a Regenerative World, Act II', pp. 15-16

Initiatives like Climate Action 100+[39] and the Net-Zero Asset Owner Alliance[40] have the potential to play a major role in enabling a step change in stewardship practices. Fulfilling that potential, however, will require member institutions to commit serious resources to the hard work of engaging with companies on an ongoing basis.

SPOTLIGHT:

Federated Hermes

One firm that takes stewardship seriously is Federated Hermes, whose CEO, Saker Nusseibeh, wrote in 2017 that 'the traditional concept that the purpose of investing is only to create additional wealth is flawed... it should be redefined as a method for owners to control the companies that control their destiny.'[41]

Federated Hermes—which has more than $600 billion of assets under management and a further $1.1 trillion of assets under advice[42]—has been active not only in applying this principle within its own business, but also in calling on the investment industry as a whole to embrace active stewardship as part of its social licence to operate:

"We argue that the principal role of investment management is to ensure that investors' capital is deployed to deliver sustainable wealth creation. Active stewardship is the best way to achieve this, but today it only commands a small proportion of the resources available within investment management firms. This needs to change.

When we look back in 2030, we should ask ourselves whether the investment management industry has evolved. Today, in many respects its impact can be likened to one that encourages the farmer to chop down the trees in the orchard because the value of the wood is worth more than the value of this year's apple harvest.

In 2030, the investment management industry must have transformed into one that has successfully encouraged the farmer to plant more trees, to invest in better-tasting apples, to conserve the land and to create better jobs by investing in more efficient growing and harvesting techniques."[43]

39 climateaction100.org/
40 unepfi.org/net-zero-alliance/
41 hermes-investment.com/uki/insight/outcomes/the-why-question/
42 federatedhermes.com/about/
43 hermes-investment.com/uki/insight/stewardship/stewardship-the-2020-vision/

2: From single assets to whole systems

In his contribution to this series, Dennis Pamlin makes the case that the kind of systems transformation needed in order to align with the IPCC's LED scenario requires a shift of focus away from individual companies to innovation clusters built around meeting societal needs.[44] For example, a focus on societal needs around mobility and access, rather than simply on 'greening' existing modes of transport, brings into view a much wider field of innovations—many of them significantly more disruptive than simply taking the transport system as it is today and replacing all ICE vehicles with EVs or hydrogen-powered vehicles (though these technologies clearly have a role to play).

At the same time, leading investors are coming to the conclusion that they need to apply a systemic lens to their investment strategies. For example, former CIO of Japan's Government Pension Investment Fund, Hiro Mizuno, argues that 'large institutional investors… are effectively universal owners, because their portfolios are highly diverse—they have taken a slice through the whole economy and market. The environmental costs incurred by some companies in their portfolios will have an impact on companies elsewhere in the portfolio. This means that asset managers must develop investment strategies that contribute to making the whole system more sustainable.'[45]

Clearly, there are important implications here for the way that financial portfolios are constructed. Modern Portfolio Theory was developed almost 70 years ago to help investors optimise two dimensions: risk and return. Now the time has come for Modern Portfolio Theory 2.0 to help them incorporate a third dimension: systemic impact.

In fact, work has already begun on both the theory and practice of constructing portfolios to maximise systemic impact. As Dominic Hofstetter, Director of Capital & Investments at Climate-KIC, notes in a recent report, *Transformation Capital: Systemic Investing for Sustainability*:

> 'The benefits of building strategic portfolios are increasingly being recognised by some of the most progressive mission-driven investors. For instance, under the label "ecosystem investing," a growing number of impact investors have started to pursue an approach that emphasises the engagement of a multitude of players who drive outcomes within a social system of interest. And researchers at University College London have developed an integrated portfolio composition method that produces greater non-financial impact compared with the single-asset approach, while making a wider set of projects investable based on given financial risk/return criteria.'[46]

44 unepfi.org/wordpress/wp-content/uploads/2020/09/200915_J932-CKIC-UNEP-ThoughtLeadershipSeries-DennisPamlin-2.pdf
45 sbs.ox.ac.uk/news/hiro-mizuno-investors-have-pay-attention-whole-system
46 climate-kic.org/wp-content/uploads/2020/08/Transformation-Capital-Systemic-Investing-for-Sustainability.pdf

Hofstetter goes on to conclude that 'the next generation of mission-driven investors should pay attention to how individual assets relate to each other, what synergies they can unlock, and how positive correlation can be converted from a risk to avoid to an opportunity for driving change while generating financial returns.'

The Transformation Capital Initiative (which Hofstetter leads) is, itself, an attempt to put these ideas into practice: 'at the core of the Transformation Capital logic sit strategic portfolios—collections of investments deliberately composed and governed to unlock combinatorial effects.

SPOTLIGHT:

Generation Investment Management

Generation IM, the sustainable investing pioneer founded in 2004 by Al Gore and David Blood, which today has $24 billion of assets under management,[1] recently published a methodology for assessing whether companies are 'system positive'.[2]

Generation's approach to 'system positive' investing is based around five simple questions investors should ask:

1. What are the systemic shifts required to make the sector truly sustainable?
2. Does the company stand to benefit from a sustainable transition?
3. Does the business and management team have a long-term orientation?
4. Does the company have levers available to catalyse a system-level change?
5. Is the company mobilising effective coalitions for systems change?

Generation IM is now using this style of assessment as an additional lens to apply to its investment decisions, alongside more standard ESG-style analytics.

1 generationim.com/firm-overview/
2 generationim.com/research-centre/insights/system-positive/

3: From risk offsetting to collaborative de-risking

As discussed in part 2, there is a potential mismatch between the risk appetite of mainstream capital markets actors, which appears to be waning as populations age, and the risk profile of many of the investments required for a rapid net zero transition. In this context, how public and private financial institutions approach the task of de-risking net zero-aligned finance is of vital importance.

To date, the financial industry's approach to de-risking has largely been a negative one. In a climate context, this has often meant screening out those companies most exposed to climate risk by divesting. More broadly, financial institutions have tended to focus on strategies that involve either transferring risk onto somebody else's balance sheet (think credit default swaps), or offsetting it through hedging strategies or insurance.

While such negative de-risking strategies clearly have a role to play—not least in managing stranded assets—what's needed now is positive de-risking: collaborative models for risk and reward sharing, designed to activate diverse pools of capital in pursuit of a shared outcome. The basic idea of creating financial mechanisms that can tap on different sources of capital and which are structured to include separate layers of risk and return is not new, but it now needs to be applied at scale to climate finance.

Among other things, this means using public investment (such as EU Green Deal funding) to "crowd in" private finance and create new markets. It is also likely to require collaboration between private financial institutions and regulators to create new asset classes that match the risk and return appetites of different investors. For example, Tony Seba and James Arbib of RethinkX advocate creating new asset classes 'to allow individuals to invest directly in small cash-generating projects such as local community solar, battery power plants, transportation-as-a-service vehicles, and precision fermentation hubs. The fixed return profile of these investments will closely match the liability profile of pension schemes (much more than traditional pension portfolios) and are a good proxy for the ultimate needs which pensions are designed to meet (such as food, housing, energy, and transportation).'[47]

3.3

RETHINKING POLICY

To get to 1.5°C, transforming finance will need to be accompanied by a shift in financial and economic policymaking. Finance is undoubtedly a powerful lever in the net zero transition—but it is not the only one we need. To align finance to a net zero economy, policymakers must play a market-shaping role to ensure alignment is more profitable than non-alignment.

Rethinking the purpose and practice of finance along the lines set out above can lead to better corporate governance and pressure "from above" on firms to articulate clear, science-based strategies and targets. It can ensure that firms' cost of capital and market valuations start to reflect their climate impact and progress towards net zero. But it cannot change the underlying profitability (or otherwise) of business models—either in the financial sector or the real economy. Here, policy action is needed—not only to level the playing field (by, for example, removing fossil fuel subsidies), but also to tilt the playing field in favour of businesses and business models that are aligned with the IPCC's LED scenario.

47 fastcompany.com/90559711/we-are-approaching-the-fastest-deepest-most-consequential-technological-disruption-in-history

While, in principle, there may be no shortage of capital to finance all of the innovation needed to get us to net zero and beyond, companies do have to compete for access to that capital – and currently they have to do so in a highly distorted marketplace. Three types of distortion stand out:

1. The absence of an adequate price on 99% of global GHG emissions distorts the market in favour of heavy emitters—especially when combined with yet-to-be-eliminated fossil fuel subsidies.

2. Excessive market concentration in many industries allows some companies to extract artificially high profits (or 'rents') based on their market power.

3. In the financial industry itself, the extreme profitability of certain forms of financial engineering and speculation make it harder to attract capital towards the less profitable real economy investments needed for a net zero transition.

Though only the first of these would normally be regarded as a climate issue, all three are critical in order to create the conditions for financial flows to align with net zero. These market distortions prohibit markets from "telling the truth" (to borrow a phrase used by Lester Brown)[48], and without markets that tell something resembling the truth—both economically and ecologically—aligning finance to a net zero economy is likely an impossible task.

Detailed economic policy recommendations are beyond the scope of this paper, but below we set out some basic principles that should guide economic policymaking with regard to these issues. These principles draw on work by a wide range of academics, economists and thought leaders. The basic ideas are not new, but the urgency of acting on them is increasing. And the widespread calls for a "reset" in the wake of COVID-19 may provide a window of opportunity for serious policy shifts that have been resisted, or have simply failed to gain sufficient political momentum, for decades.

1: Ensure emissions are adequately priced

The High Level Commission on Carbon Prices concluded in 2017 that the explicit carbon-price level consistent with achieving the Paris temperature target is at least US$40–80/tCO2 by 2020 (increasing to US$50–100/tCO2 by 2030).[49] Today, less than 20% of global CO2 emissions are priced at all—and less than 1% at a level consistent with the High-Level Commission's recommendation.[50] Meanwhile, fossil fuels are still subsidised to the tune of $500 billion a year.[51]

To enable markets to tell the ecological truth, all fossil fuel subsidies should be abolished as soon as possible—and certainly no later than the 2025 deadline previously set by the G7.[52] In addition, higher and more comprehensive carbon pricing is essential so that markets start to internalise the full social cost of emitting greenhouse gases. Critically, carbon pricing policy needs to be designed to ensure that those whose jobs and livelihoods may be adversely impacted by a carbon price are adequately compensated. And mechanisms need to be in place to prevent 'carbon leakage',[53]

48 earth-policy.org/book_bytes/2008/pb3ch13_ss1
49 carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices
50 carbonpricingdashboard.worldbank.org/
51 imf.org/en/Publications/WP/Issues/2019/05/02/Global-Fossil-Fuel-Subsidies-Remain-Large-An-Update-Based-on-Country-Level-Estimates-46509
52 theguardian.com/environment/2016/may/27/g7-nations-pledge-to-end-fossil-fuel-subsidies-by-2025
53 Carbon leakage refers to the displacement of polluting activities from countries that set a high carbon price to those with low or no carbon price.

for example through the imposition of border adjustments (as has been mooted at EU level).[54]

2: Ensure markets are genuinely competitive

In recent decades, many industries have become increasingly dominated by a small number of very large firms. In the US, between 1997 and 2012, the four largest firms in every sector increased their share of their sector's revenues from 26% to 32%.[55] Some firms are now so powerful relative to their competitors, suppliers, customers and regulators that, in the words of economist Jeffrey Sachs, 'it's all too easy [for these firms] to raise corporate valuations by harming others rather than by producing quality products at competitive prices.'[56] Big Tech firms are the ones currently in regulators' crosshairs—notably in the US and EU—but excessive market concentration is an issue that goes well beyond the tech industry.

From a climate perspective, the problem here is not that monopolies and other dominant firms are necessarily heavy emitters—it's that they stifle innovation, both within their own sectors and beyond. Their ability to offer highly attractive financial returns to investors makes it harder for other firms requiring capital in order to transition to net zero to attract that capital on competitive terms. This paper is not the place for a detailed discussion of strategies for effective antitrust regulation: our purpose here is merely to emphasise that tackling market concentration is necessary and that competition policy and climate policy are more intimately linked than most people have so far appreciated.

3: Curtail speculation in the financial industry

As discussed throughout this paper, the vital function of finance in the context of a net zero economy is to enable innovation and transformation in the real economy. At present, though, only a small fraction of global financial flows can be fairly described as performing this function. The vast majority of finance is engaged in speculative trading in secondary markets. Such trading has its functions too: for example, enabling price discovery and market efficiency. But the balance between the two activities—real economy investment and lending on the one hand, speculative trading in secondary markets on the other—is dangerously out of whack. As John Maynard Keynes put it: 'Speculators may do no harm as bubbles on a steady stream of enterprise. But the situation is serious when enterprise becomes the bubble on a whirlpool of speculation.'[57]

Meaningful disincentives to speculation would "crowd in" capital to the real economy, argues John Fullerton.[58] In other words, making financial speculation less profitable will reduce the cost of capital for net zero-aligned innovation and transformation projects in the real economy. So how can speculation be disincentivised? The simplest proposal—espoused by Fullerton and many others—is for a financial transactions tax.[59] Another option is capital gains tax reform to introduce a variable rate that penalises short holding periods, thereby incentivising longer-term commitment from shareholders, which, as discussed, is essential if capital markets are to play an effective stewardship role in the net zero transition.

54 argusmedia.com/en/news/2118909-eu-leaders-to-consider-carbon-border-tax
55 economist.com/briefing/2016/03/26/too-much-of-a-good-thing
56 ft.com/content/d0077d5f-e5bc-4c57-a3bf-a3f408e7659e
57 Quoted in Fullerton, 'Finance for a Regenerative World, Act IV', p. 18.
58 Ibid, pp. 19-20.
59 ourfinancialsecurity.org/wp-content/uploads/2011/11/Fullerton-Capital-Institute-FTT.pdf

Summary table:

Elements of a Transformative Agenda for Finance

1: Rethinking Purpose

Optimising climate outcomes should become one of the financial system's core functions – and be baked into both private and public institutions' mandates.	For private finance: update fiduciary duties to incorporate the non-financial preferences and interests of clients and beneficiaries, as recommended by the 'Fiduciary Duty in the 21st Century' project. For regulators: incorporate Article 2(c) of the Paris Agreement into financial regulators' and central banks' mandates, so that those supervising the financial system have a clear mandate to target climate stability as well as financial stability.

2: Rethinking Practice

From Speculation to Stewardship	Investors should act as engaged owners of companies and enter into long-term partnerships with corporate Boards and C-Suites to a) encourage the development of net zero transition strategies and b) hold companies accountable for fulfilment of those strategies. Ideally, platforms like Climate Action 100+ and the Net-Zero Asset Owner Alliance should be leveraged to do this at scale.

From single assets to whole systems

Investment strategies should be designed with the goal of systems change in mind. This requires new tools of analysis – such as a 'system positive' lens for assessing companies (as being trialled by Generation IM) – and new approaches to portfolio construction designed to optimise combinatorial effects that deliver directional impact.

From risk offsetting to collaborative de-risking

New collaborative financing models, spanning public and private finance, are needed to overcome the danger that insufficient capital flows into financing the transition because of the riskiness of many of the investments needed. Public investment should be used to "crowd in" private finance, accompanied by robust mechanisms for sharing risk and reward.

3: Rethinking Policy

Economic policy should focus on ensuring markets "tell the truth" by pricing in externalities and actively correcting market distortions that enable some firms to extract artificially high rates of return that do not reflect underlying value creation.

Economic policymakers around the world should prioritise three simple imperatives:

1. Price Carbon
2. Police Competition
3. Curtail Speculation

Conclusion

We are at an inflection point for markets, economies, finance and politics. The precursors of a massive political rethink could already be in place. Societal and technological change are accelerating and converging. As Demis Hassabis, founder and CEO of DeepMind, recently put it: 'We're almost at the point where we have powerful enough algorithms to accelerate scientific discovery itself. And I think in the next ten years there are going to be a lot of major, perhaps Nobel-Prize level type, breakthroughs, in all sorts of domains.'[60]

It is eminently possible to see a path out of the mess, but the question is whether the world—not just a few thoughtful businesses and governments—chooses to take it. The clear and present danger is that we are herd animals, and the longer we leave action the more likely it is that, when the changes do come, they will come in the form of some sort of global Carbon Panic. The shock to our economies and to the interests of citizens will be dire, with huge percentages of people's pension pots potentially wiped out.

Despite the recent proliferation of net zero commitments from banks, institutional investors and other financial institutions, the financial system as a whole has scarcely begun to grapple with the full implications of what "Paris alignment" means for finance. As we have argued throughout this paper, there is nothing remotely incremental about the change that global finance now needs to undergo to align with the IPCC's LED Scenario—or indeed any credible scenario for keeping global temperature rises below 2°C above pre-industrial levels. Though the term is over-used, Paris alignment really does represent a paradigm shift for finance.

Core to that paradigm shift is the recognition that Paris alignment cannot be achieved through the traditional lenses of financial risk and return alone: alignment with climate outcomes must be baked into the core purpose of finance and financial regulation. Such a shift in the goal of the system will necessitate complementary adjustments—some of them painful for those involved—at all levels of policy and practice. This does not mean starting from scratch: there is already a great deal of experi-

60 link.chtbl.com/demis-hassabis-ev

mentation with new approaches around the fringes of the financial system. But old paradigms rarely give way easily—as Galileo famously found out to his cost.

Climate science is what makes a paradigm shift for finance necessary, but it is the societal, technological and economic backdrop sketched out in Part 1 of this paper that, in our view, makes that paradigm shift achievable—inevitable even, in the long run. The choice now for those operating within the financial system is to surf the waves of societal and technological transformation that will reshape our economies during the 2020s, or be drowned by them.

About EIT Climate-KIC

EIT Climate-KIC is Europe's largest climate innovation initiative, leveraging the power of innovation in pursuit of a zero-carbon, climate-resilient, just, and inclusive society. Established in 2010 and headquartered in Amsterdam, EIT Climate-KIC orchestrates a community of more than 400 organisations including large corporations and SMEs, municipal and regional governments, universities and research institutes, as well as non-governmental organisations and uncommon actors. The organisation uses a portfolio approach for developing and deploying innovation to achieve systemic change in those human systems that matter for long-term prosperity, combining activities and innovation outputs from applied research, education, start-up incubation, and innovation ecosystem building. EIT Climate-KIC is supported by the European Institute of Innovation and Technology (EIT), a body of the European Union.

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About UNEP FI

United Nations Environment Programme Finance Initiative (UNEP FI) is a partnership between UNEP and the global financial sector to mobilize private sector finance for sustainable development. UNEP FI works with more than 350 members—banks, insurers, and investors—and over 100 supporting institutions—to help create a financial sector that serves people and planet while delivering positive impacts. We aim to inspire, inform and enable financial institutions to improve people's quality of life without compromising that of future generations. By leveraging the UN's role, UNEP FI accelerates sustainable finance.

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