

Decarbonizing Finance – Recent Developments and the Challenge Ahead

Abstract

Societies around the world are faced with a multitude of social and environmental challenges as the negative effects of human activity on the Earth's ecosystem are becoming increasingly evident. At COP21 in Paris, 195 countries agreed to work together to limit global warming to 2°C and aim for net zero carbon emissions by the second half of the 21st century. This will require large-scale investment in renewable energy, energy efficient buildings, protection of forests, sustainable production processes and materials, and innovative solutions to social problems. Niche finance and public sector funds alone will not be sufficient to address this challenge. Thus, mainstream investment must be aligned with sustainable development – a process already under way, although hobbled by challenges such as carbon-locked legacy infrastructure, technological path dependence, financialization, lack of patient capital for innovation, and underdeveloped policy frameworks and markets for mainstreaming impact-driven investment. While the financial sector has been grappling with the environmental and social implications of climate change for at least a decade, the Paris Agreement could represent a tipping point for Sustainable Finance. However, a systemic response has been left so late that even with increased mitigation action, warming of 2°C can still be expected, leading to climate migration and growing social and political tensions. This article maps the current landscape of Sustainable Finance and key challenges that lay ahead.

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1. Introduction

In 1972, a landmark study commissioned by the Club of Rome titled *The Limits to Growth*¹, opened up a global debate on the idea that economic development is ultimately constrained by ecological limits and that continued growth may lead to serious environmental problems. More than forty years later, there is substantial evidence² that parts of the Earth’s ecosystem are indeed in decline, posing a legitimate threat to human health and well-being. These alarming trends are driven by economic activities which in turn are driven by investment decisions. Growth can continue, but only if it’s based on socially responsible investment and clean innovation.³ Aligning investment with sustainable development, i.e. mainstreaming Sustainable Finance (SF), has thus become a dominant theme in global policy debates.

Experts and practitioners in SF can be proud of their achievements. In a little over twenty years, they have created a global movement encompassing thousands of initiatives. The most important of these have been described in the anthology *Responsible Investment Banking*⁴, but many more are proliferating across the financial sector, often launched in collaboration with the world’s most prestigious organizations such as the United Nations

¹ Meadows et al. 1972

² IPCC 2014; Steffen et al. 2014

³ Fanhauser & Stern 2016

⁴ RIB 2015

Environment Programme¹ (UNEP), the World Bank Group², the Financial Stability Board³, and the University of Cambridge⁴. Multiple academic journals⁵ have been dedicated to the subject, while the Boston Consulting Group⁶ and McKinsey⁷ have both released reports discussing SF from a practitioner's perspective. The financial sector has contributed by adopting new risk management frameworks, e.g. the Equator Principles⁸, and by helping launch initiatives such as the Divest-Invest⁹ movement. A 2015 report by UNEP¹⁰ went as far as to proclaim that there is a “quiet revolution” taking place around the world in which the concept of sustainability is being integrated into the fabric of the financial system.

In September 2015, investors met with the Club of Rome in Berlin to engage in a dialogue about the “next forty years”. Jørgen Randers, co-author of the original *Limits to Growth* and author of *2052: A Global Forecast for the Next Forty Years*¹¹ gave the keynote speech. He was shockingly pessimistic. In his view, no relevant progress had been made over the past 43 years. When he was criticized for neglecting the tremendous achievements in SF, his answer was blunt: he didn't care. The only thing he was interested in was the bottom line: humankind is using more resources and causing more emissions than ever before. Our current resource usage is twice what the planet can sustain, and the atmospheric capacity to digest emissions without dangerous warming has already been passed. To make things worse, climate change combined with the mismanagement of public goods such as water and fisheries is expected to increase migration which is more than likely to lead to social and political tensions.¹² The former advisor of the British Government John Beddington has called the combination of climate change and mass migration “the perfect storm” – a genuine threat to global peace and stability.

At COP21 in Paris in December 2015, 195 countries agreed¹³ to work together to limit global warming to 2°C and aim for net zero emissions by the second half of the 21st century. After being ratified by the majority of signees, the Paris Agreement went into effect in November

¹ See <http://www.unepfi.org>

² IFC 2012

³ See <https://www.fsb-tcfd.org>

⁴ See <http://www.cisl.cam.ac.uk/business-action/sustainable-finance/banking-environment-initiative>

⁵ Haigh 2012

⁶ See <http://sloanreview.mit.edu/projects/investing-for-a-sustainable-future/>

⁷ McKinsey 2016

⁸ See <http://www.equator-principles.com>

⁹ See <http://divestinvest.org>

¹⁰ UNEP 2015

¹¹ Randers 2012

¹² Raleigh & Jordan 2010

¹³ UNFCCC 2015

2016, followed by COP22 in Marrakech to discuss implementation.¹ Critics maintain that reaching the agreement was really the easiest part of the challenge, and that few countries understand the full financial and economic ramifications of realizing their pledges. Many believe that falling back into the comfort of business as usual is not particularly difficult given that the agreement reached in Paris is more about “promises” than “binding commitments” or “enforcement mechanisms”.² Nonetheless, COP21 could represent a tipping point for SF.³ The momentum is growing, and a similar effect may be in the cards for impact investing which has made it to the agenda of the World Economic Forum⁴ and the G8⁵.

From an investment perspective, a lot remains to be done. For example, the International Energy Agency (IEA) estimates⁶ that by 2035 we need USD 53 trillion in cumulative energy investment to get the world on a 2°C trajectory. However, a systemic response has been left so late that even with increased mitigation action, warming of 2°C can still be expected. Countries therefore need to not only reduce emissions, but address adaptation risks such as rising sea levels and climate migration. This will require trillions in additional finance. Niche investments and public sector funds alone will not be enough to address the challenge. To put the global economy on a low-carbon trajectory respective of planetary boundaries, SF must become mainstream finance. The following chapters provide a broad snapshot of the current state of the field and identify some key challenges that lay ahead.

2. Recent Developments in Sustainable Finance

2.1 Policy and legal landscape

There exist a large number of policy measures aimed at aligning financial incentives with positive social and environmental outcomes. As shown in Figure 1, they generally fall into one of three categories: supply development, directing capital, and demand development, each of which allows for indirect public influence on private sector activities, as well as direct government participation in sustainable investment. In 2015, UNEP⁷ identified more than 100 examples of such policy measures from around the world, noting however that although

¹ C2ES 2016

² See e.g. Milman 2015

³ Dasgupta et al. 2016

⁴ WEF 2013

⁵ See <http://www.socialimpactinvestment.org>

⁶ IEA 2014

⁷ UNEP 2015

policy plays a key enabling role for SF, it alone will not be enough to trigger the low-carbon transition. Policy design is highly context-driven and can easily lead to increased complexity and unintended consequences. Still, there are numerous examples of successful policies aimed at mobilizing SF¹, and in light of commitments made at COP21, policy support will be crucial for moving forward, both in developed and developing countries.

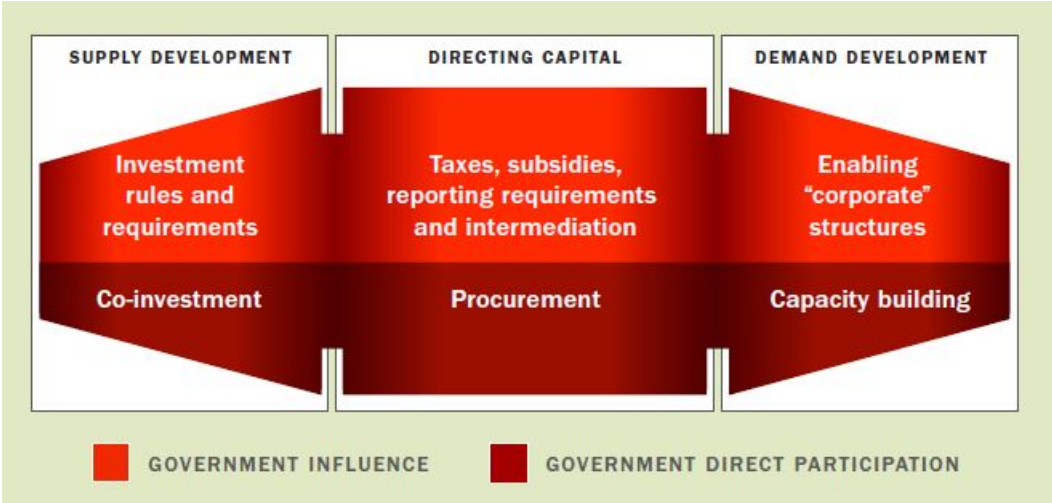


Figure 1: Policy framework for Sustainable Finance²

Official government policies have been complemented by quasi-legal initiatives such as the Principles for Responsible Investment (PRI)³, Carbon Disclosure Project (CDP)⁴ and the Equator Principles referred to above, all of which have played an important role in increasing awareness of climate and social issues inside the investment community. However, given their aspirational and voluntary nature, they are limited in their ability to trigger a more fundamental reorientation of mainstream finance. Most importantly, they fail to create new financial incentives and don't necessarily bring about additional large-scale investments that are needed for long-term sustainable development. Still, such initiatives have been crucial in creating responsible investor networks and they continue to help limit the negative social and environmental externalities of traditional investment practices.

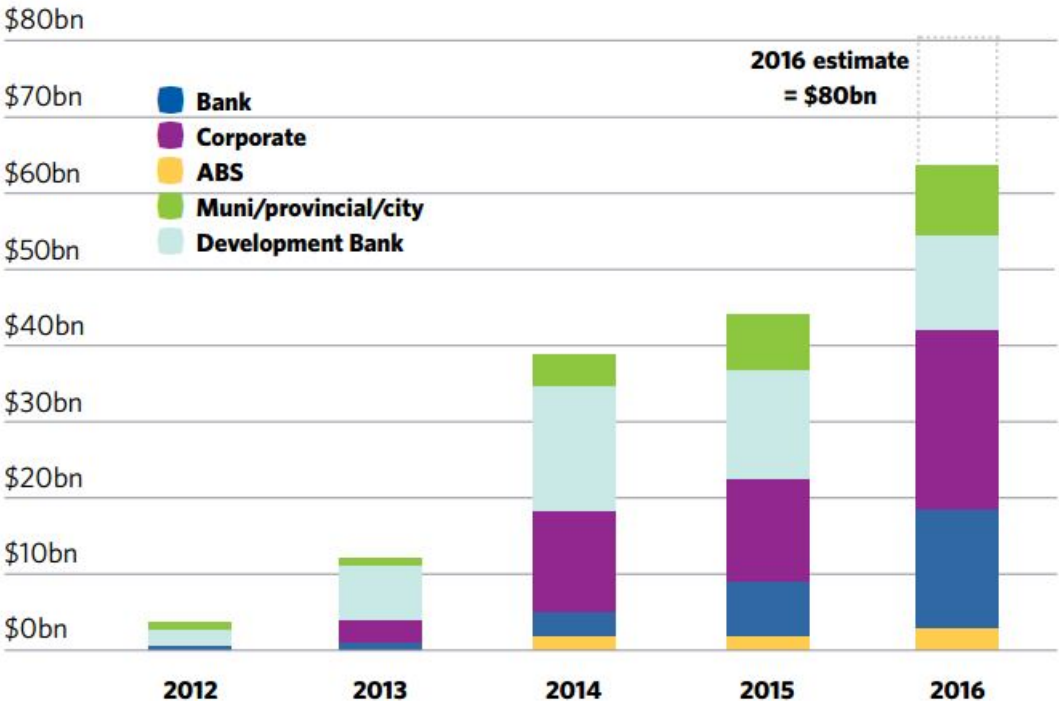
Finally, perhaps the most urgent policy challenge from a purely financial perspective is the urgent need to establish global disclosure standards for carbon assets. This has profound implications for the global economy as many of the biggest companies in the world are faced with potentially stranding what have historically been their most profitable assets (see also

¹ See e.g. IIPC 2014
² Source: IIPC 2011
³ See <https://www.unpri.org>
⁴ See <https://www.cdp.net/en>

3.2 below). As of now, this risk is not included in the official valuations of these companies. It has therefore been suggested that policy-makers should take action to introduce disclosure standards that would make available data required to factor in material risks relating to a possible mass write-off of carbon-loaded assets.¹

2.2 Climate-aligned bond universe

Climate bonds, also referred to as green bonds, represent an important new instrument for mobilizing capital for climate mitigation and adaptation projects. Strong support from development and investment banks combined with strong advocacy and standardization efforts by the UK-based Climate Bonds Initiative (CBI) have allowed this market to grow and mature rapidly (see Figure 2).² CBI reports that as of July 2016 the total amount of climate-aligned bonds outstanding was USD 694 billion, over 60% of which were issued by government entities.³ In recent years, a growing number of private actors have also started issuing green bonds, e.g. the Bank of America and Apple Inc. in the U.S., Toyota Motor Company in Japan, and numerous renewable energy companies in Europe.⁴



¹ Zenghelis & Stern 2016

² Dalal et al. 2015

³ CBI 2016a

⁴ Venugopal 2015; CBI 2016b

Figure 2: Annual issuance of labelled green bonds by issuer type¹

The potential of green bonds is illustrated by the success of the offshore wind sector in Europe which raised a total of EUR 1.5 billion through project bonds in 2015. Importantly, offshore wind energy developers have benefited from credit enhancement through the Europe 2020 Project Bond Initiative introduced by the European Commission and the European Investment Bank² - a good example of how the public sector can play a key enabling role in speeding up the energy transition. Growth of this sector has also been boosted by the general easing of loan terms driven by low interest rates, high liquidity in the financial markets, and a decade of experience in developing utility scale wind farms.³

Although most bonds included in CBI's climate bond definition are not formally labelled as "green", they are nonetheless used to finance projects contributing directly to transitioning to a green economy. Renewable energy and low-carbon transport are the dominant investment themes in this universe, accounting for about 85% of projects. Other themes include agriculture and forestry, water, waste and pollution control, and buildings and industry. There are also new and emerging themes such as industrial energy efficiency, information, communication and technology (ICT), and marine-related areas such as shipping and sustainable fishing. Figure 3 provides a comprehensive taxonomy of areas in which green bonds are either already being issued or in which they could be used in the future. CBI predicts considerable growth for green bond markets, primarily due to commitments made at COP21 and a growing demand from institutional investors.⁴

¹ Source: CBI 2016b

² Venugopal 2015

³ EWEA 2016

⁴ CBI 2016a

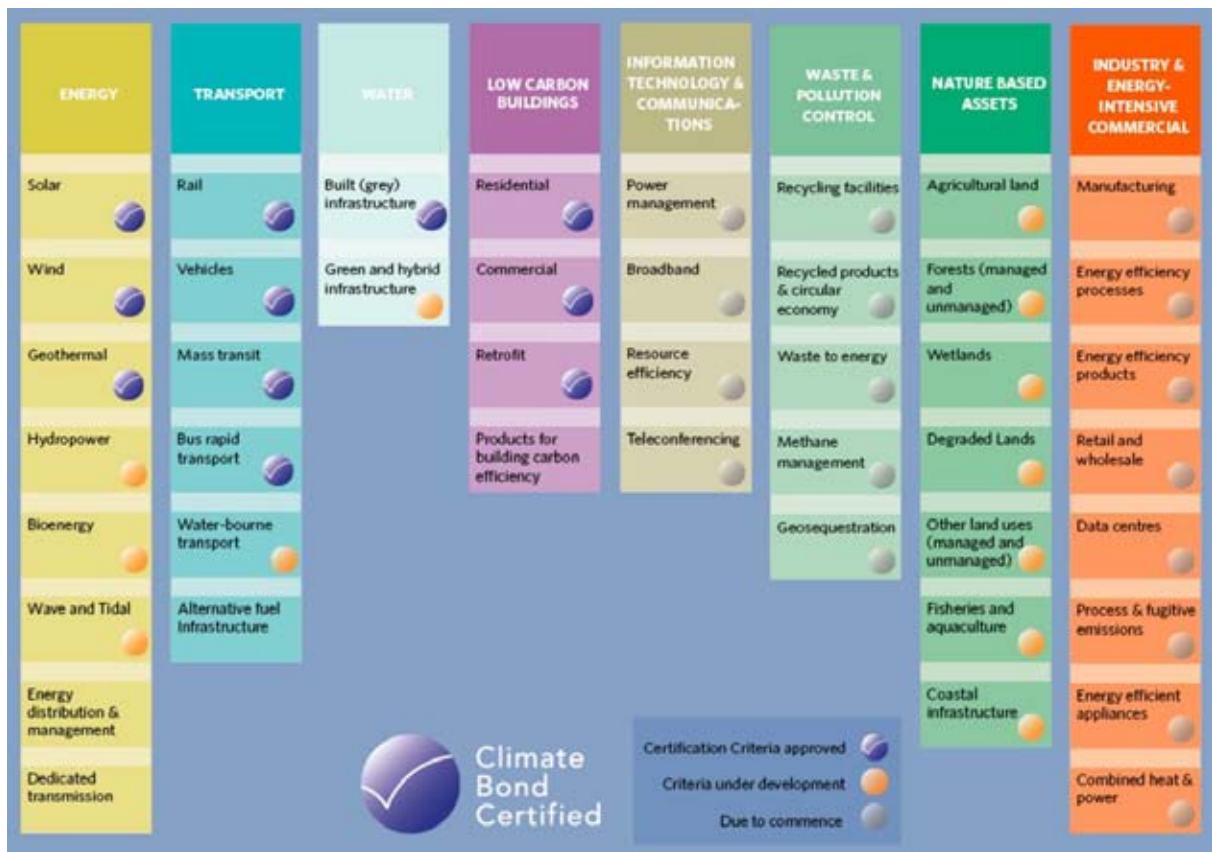


Figure 3: Taxonomy of the climate-aligned bond universe¹

2.3 Divest-Invest movement and the business case for sustainability

One of the most remarkable success stories in SF is the Divest-Invest movement which started in 2011 when students of a few universities in the U.S. demanded that their college endowments pull out from fossil fuel companies and invest in clean energy instead. Since then, the movement has grown rapidly, attracting not just universities but also local governments, pension funds, faith groups, charity organizations, private investment funds, and corporations, including some of the biggest players in finance, such as the Norwegian Pension Fund² and Allianz SE³. In just five years, hundreds of institutions and tens of thousands of individuals, representing USD 3.4 trillion in assets, have joined the movement and pledged to divest from fossil fuels – an impressive feat indeed given that the industry has historically been a leading source of return for investors around the world.⁴

¹ Source: CBI 2016c

² Agence France-Presse 2016

³ Allianz 2015

⁴ See <http://gofossilfree.org/commitments/>

The case for divestment is multifaceted. First, it puts a negative stigma on companies whose activities constitute a leading cause of climate change. Second, assuming that the funds divested are redirected primarily towards ecologically and socially responsible enterprises, it helps align the financial sector with sustainable development. Third, given the recent growth in renewable energy¹, the overvaluation of existing carbon assets (see also 3.2 below), and long-term risks posed by climate change, divesting from the fossil fuel industry makes sense from a long-term business perspective, as shown by recent empirical evidence discussed below. Fourth, by bringing together different organizations, the movement creates broad-based visibility for climate issues, attracting new collaborators and encouraging policy action. Fifth, from the perspective of intergenerational equity, divestment carries a strong moral imperative.² And finally, just as PRI and CDP discussed above, the movement has helped popularize environmental and social concerns among the investment community.

Of course, at the end of the day, what matters most for mainstream investors is the financial bottom line. From the very beginning, green finance has been haunted by the challenge of combining traditional measures of profitability with the effective attainment of environmental goals. But the Divest-Invest movement has shown that allowing environmental concerns to influence capital allocation does not necessarily translate into lower returns. Not only can a strong business case be made for sustainability³, but there is now evidence that fossil-free portfolios can outperform their counterparts still invested in high emission and socially irresponsible industries. For example, as shown in Figure 4, the widely accepted MSCI ACWI global stock market index earned on average a 1.2% higher return between 2010 and 2016 when fossil fuel companies were excluded from the index. Generation Investment Management (GIM), a private investment firm founded by Al Gore and David Blood in 2004, combines traditional equity analysis with a focus on environmental, social and corporate governance (ESG) risk, investing only in companies with a strong ESG profile. According to a London-based analytical firm Mercer, between 2005 and 2015, GIM outperformed the MSCI World Index by more than 5%, making it the second best performing global equity manager among the more than 200 funds included in Mercer's survey.⁴

¹ FS-UNEP 2016

² Divest-Invest 2015

³ See e.g. Whelan & Fink 2016

⁴ Browne 2015

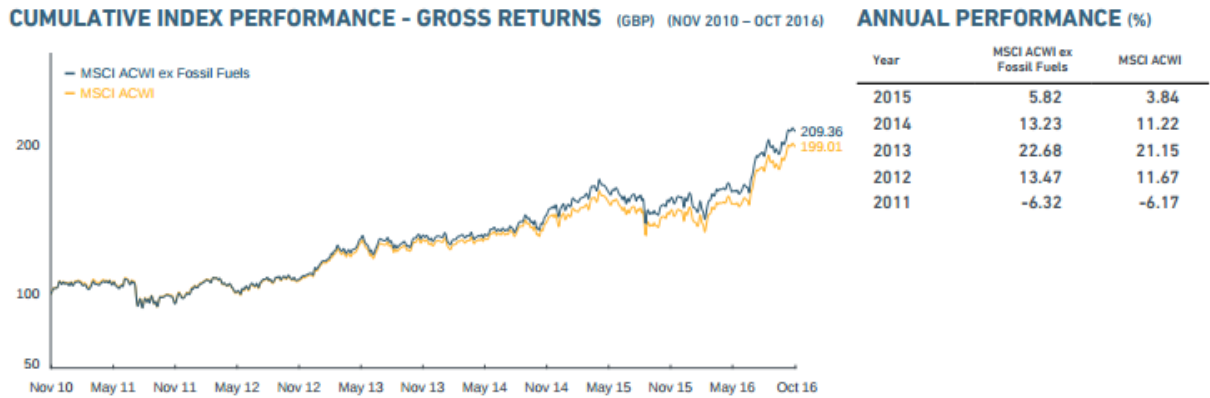


Figure 4: MSCI ACWI vs. MSCI ACWI excluding fossil fuels, 2010-2016¹

In 2015, Oxford University in collaboration with Arabesque Investment Management released a comprehensive report on SF, reviewing more than 200 academic studies, industry reports, books, and other sources on the topic. Contrary to conventional opinion, 90% of the studies reviewed concluded that companies with high sustainability standards enjoy a lower cost of capital, and 80% established a positive correlation between sustainability and stock market performance.² These results are partially confirmed by Morgan Stanley’s 2015 report, which compared the performance of more than 10,000 mutual funds between 2008 and 2014, finding that sustainability-oriented funds were on par with or exceeded the median return 64% of the time period examined.³ Altogether, these examples contradict the supposedly inevitable trade-off between environmental sustainability and profitability.

2.4 Social Impact Bonds and pay-for-performance schemes

Another recent SF innovation are bonds structured around a measurable impact criteria, known as Social Impact Bonds (SIBs). Repayment of SIBs, often financed by a public sector partner, is based on achieving a predefined social outcome – a principle often referred to as “pay-for-success” or “pay-for-performance”. SIBs were successfully pioneered in the United Kingdom in 2010 by social enterprises aimed at reducing drug abuse and high re-offending rates among discharged prisoners.⁴ For example, a SIB-financed landscaping business Blue Sky that only employs ex-offenders has been able to reduce re-offending rates from a national average of 60% to only 15%. Providing ex-offenders with stable employment

¹ Source: MSCI 2016

² Clark et al. 2015

³ Morgan Stanley 2015

⁴ Social Finance 2010

immediately on release from prison has led to a variety of economic benefits such as reduced prison costs and an increase in productive members of society.¹

Similarly, in 2012, a USD 9.6 million SIB was used in New York City when Goldman Sachs entered into an agreement with a social services provider MDRC to implement a cognitive therapy programme at the Rikers Island prison complex. The structure of the agreement is visualized in Figure 5. The City of New York took on the obligation to make payments to MDRC based on programme results, thereby allowing MDRC to repay Goldman Sachs. The actual service-delivery was outsourced to Osborne Association and Friends of Island Academy, while the outcomes were measured and verified by another outside organization, Vera Institute of Justice. The investor break-even point was to be reached when the re-offending rate among 16-18 year old offenders at Rikers decreased by 10%, while a higher than 10% reduction would have led to a profit for Goldman. The agreement also included a USD 7.2 million guarantee grant financed by Bloomberg Philanthropies which meant that in case of failure, Goldman’s losses were capped at USD 2.4 million.²

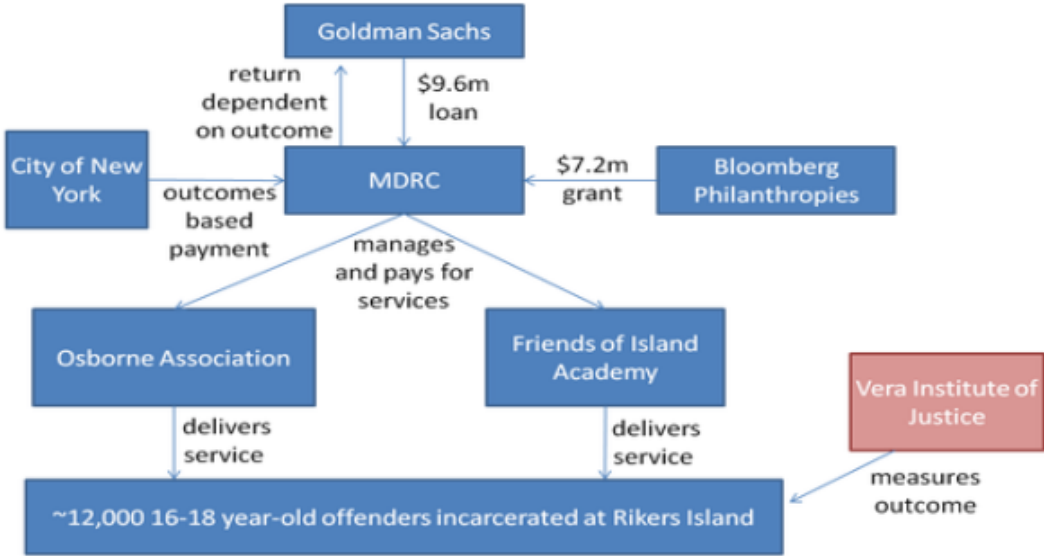


Figure 5: Structure of the Goldman-MDRC Social Impact Bond³

Unfortunately, MDRC failed to achieve its goal, leading critics to question the potential of SIBs to solve social problems.⁴ However, the success of Blue Sky indicates that this is not necessarily the case, and a similar model could potentially be used to tackle environmental issues. For example, private sector contractors in developing countries could compete for

¹ Jervis 2013
² Venugopal 2015
³ Source: Tomkinson 2012
⁴ Cohen & Zelnick 2015

loans from developed countries or private investors to design and implement climate mitigation projects, including the development of low-carbon infrastructure. Repayment could be financed by local or national governments based on a predefined success criteria. The risk of failure would be assumed by the private sector, but the obligation to repay the loan upon successful completion of the project would fall on the public sector who obviously has an incentive to do so if the project leads to socially or environmentally beneficial outcomes, often accompanied by cost-reductions and efficiency gains for the government.¹

2.5 Financing and securitizing new green assets

The growth in renewable energy investment², climate-related debt markets³, and funds committed by multilateral development banks⁴ (MDBs) all indicate a positive trend for SF. Similarly, shifts in public perceptions of climate change, technological advancement, and policy signals have all boosted investor confidence to create and securitize new green assets, leading to a variety of innovative financial products. Some of these have received broad support, such as green bonds discussed above, while others have attracted criticism, such as debt-for-nature swaps and payments for ecosystem services (PES).

Debt-for-nature swap means that debt is erased in return for investments in local natural resources or conservation measures. This is often followed by the introduction of monetary payments for ecosystem services, many of which are under increasing pressure from climate change, often in regions with underdeveloped markets or inadequate infrastructure. Broadly defined PES mechanisms are expected to grow to USD 670 billion by 2020.⁵ Such conservation measures, usually initiated as public-private partnerships and in collaboration with the banking sector, can certainly result in positive environmental outcomes. However, critics have pointed out that not enough attention has been given to the fact that such projects are often accompanied by so-called “green grabs”, i.e. transfers of ownership over land or resources from indigenous public control to international financial institutions.⁶ Using climate change as a pretext for natural resource allocation and management schemes does not automatically guarantee that such arrangements are set up in an inclusive and equitable

¹ Venugopal 2015

² FS-UNEP 2016

³ CBI 2016a

⁴ MDB 2015

⁵ Dalal et al. 2015

⁶ Fairhead et al. 2012

manner. Thus, finding a balance between environmental aims and the rights of local people presents a fundamental challenge for the future conservation finance.

There are other less widely used alternatives to increase the volume of private investment in climate change mitigation and adaptation projects. For example, it has been suggested that the public sector could provide refinancing guarantees and other similar support measures for the creation of green asset-backed securities or tradable put and call options.¹ In addition, to attract a wider range of investors, loans could be pooled and structured into customized financial products with multiple tranches of risk. As was done in the case the Goldman-MDRC pay-for-performance bond, a partial cushion against possible losses could be provided by a philanthropist organization. Although such securitization of green assets is considered novel in the context of developing countries, it has been successfully used elsewhere. An early example of this was a solar photovoltaic security issued by a U.S. company SolarCity, raising more than USD 54 million through a placement led by Credit Suisse in 2013. Designing and securitizing such assets may be challenging in the context of less developed markets and legal systems, but assuming increased private sector awareness, improved access to public finance, appropriate monitoring and evaluation systems, as well as robust institutional frameworks, they do offer an additional mechanism for mobilizing SF.²

3. The Challenge Ahead

3.1 Path dependence and low-carbon infrastructure

Countries and companies around the world have invested heavily in existing carbon-intensive infrastructure. The economic life expectancy of fossil fuel production facilities and power plants is many decades, provided regular servicing and upgrades. This shows how technological development is characterized by path dependence which means that future innovation trajectories are strongly influenced by decisions and investments made in the past, even though circumstances and needs may have changed radically. In other words, continuing to build fossil fuel infrastructure creates a strong lock-in effect³ which serves as a major obstacle for transitioning to low-carbon alternatives. Given economic and technological

¹ Venugopal 2015

² Venugopal 2015

³ Foxon 2013

uncertainty, exact estimates are difficult to arrive at, but based on IEA and OECD data, it has been suggested that more than USD 90 trillion is required in global infrastructure investment over the next 15 years to put the world a low-emission development trajectory (Figure 6).¹

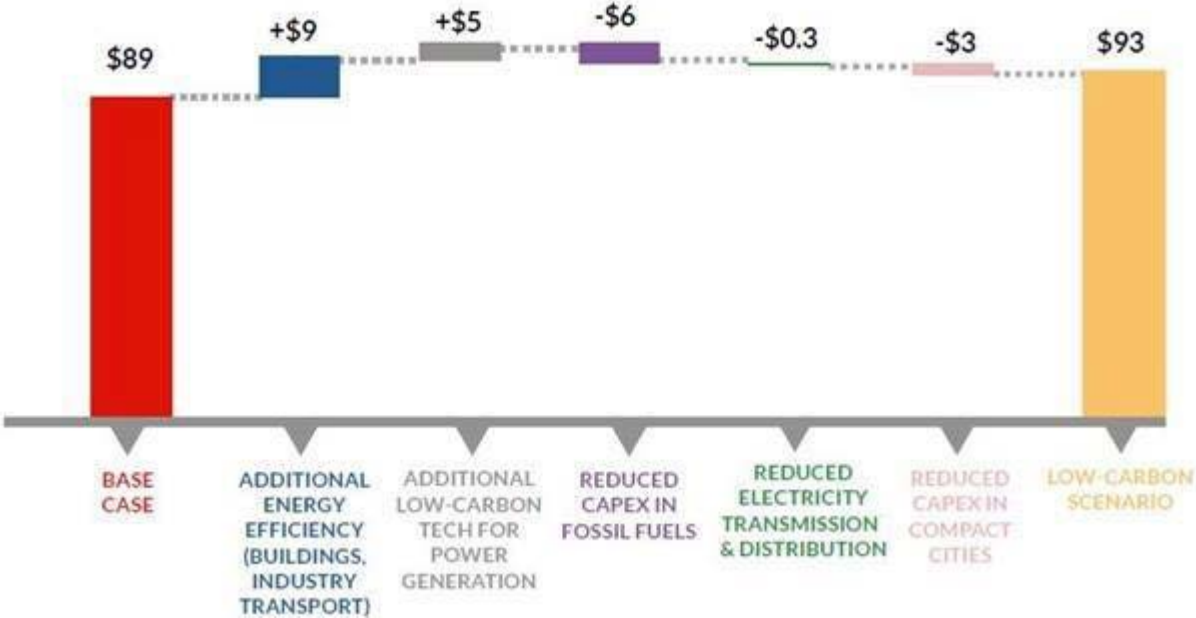


Figure 6: Global investment requirements, 2015-2030 (USD trillion, 2010 constant dollars)²

But perhaps even more important than the scale of investment needed is the time constraint under which the world is operating. It has been calculated that the “2°C capital stock”, i.e. the maximum stock of fossil fuel electricity infrastructure still compatible with a 2°C scenario, will be reached as early as 2017.³ From then onwards, all new infrastructure should be built around zero-carbon sources. For many, given our continued dependence on cheap and abundant fossil energy, this may sound like an impediment to development. But the positive environmental effects of building a green infrastructure would be accompanied by long-term economic benefits, as it would most certainly establish new incentive structures and path dependencies, and eventually a new productive direction for the economy as a whole.

This is especially relevant for developing countries, many of whom are still in the process of industrializing, hoping to modernize their cities, transportation and energy systems in the next couple of decades.⁴ Theoretically, some of these countries could skip carbon-intensive infrastructure altogether. Supported by the international development community, they could

¹ NCE 2014
² Source: NCE 2014
³ Pfeiffer et al. 2016
⁴ Fankhauser & Stern 2016

benefit immensely from sustainable investment and technology transfer. The build-up of green infrastructure complemented by appropriate industrial and economic policies could serve as a solid foundation for the development of domestic innovative capabilities – a precondition for stable socio-economic progress in the future.

3.2 Stranded asset risk

Another crucial challenge, especially from a financial perspective, is that the majority of existing fossil fuel reserves may end up staying in the ground. According to Carbon Tracker Initiative, between 60-80% of known fossil fuel reserves cannot be realized if emissions are to stay within the 2°C limit (see Figure 7).¹ In other words, fossil fuel companies are faced with the prospect of their carbon assets becoming stranded. Currently, this is not factored in when calculating company valuations which means that major fossil fuel companies, many of which have been highly profitable in the past, will be unable to sustain these profit levels in the future and are therefore overvalued.

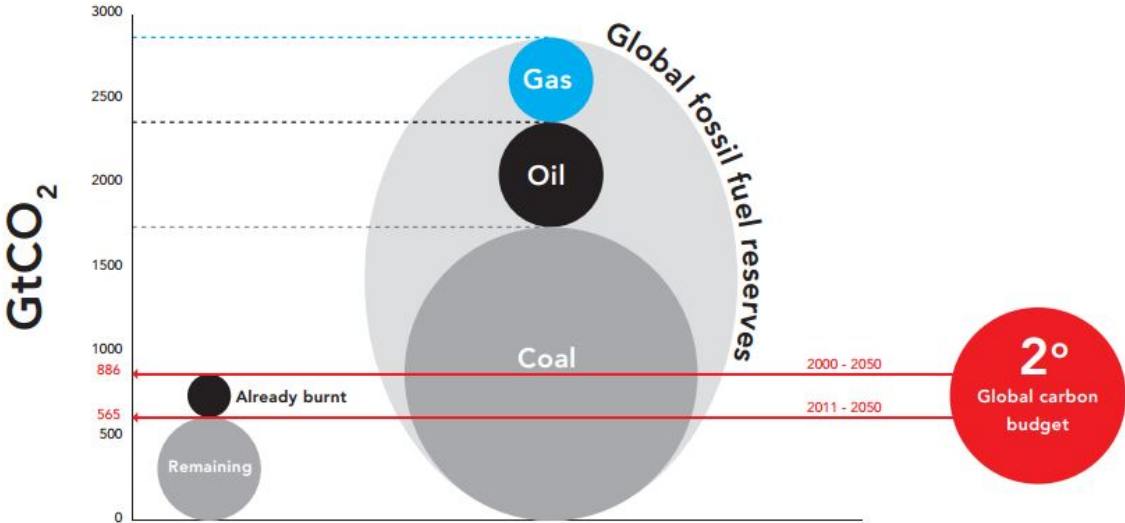


Figure 7: Global 2°C carbon budget vs. CO₂ emission potential of fossil fuel reserves²

Although there are some signs of decline, capital expenditure to further develop existing reserves as well as find additional ones is still relatively high.³ It seems safe to assume that energy companies understand that their ability to exploit fossil fuel resources may become seriously constrained by future market dynamics and policy interventions. They thus have an

¹ CTI 2013
² Source: CTI 2011
³ CTI 2015

incentive to accelerate production, trying to squeeze out as much last minute profit as possible. However, this will inevitably result in more global warming – a paradox given the simultaneous growth of renewable energy and other low-carbon technologies. Without aggressive policies aimed at limiting the supply of fossil energy, this so-called “green paradox” will be difficult to avoid even if sustainable alternatives continue to expand.¹

3.3 Secondary markets and financialization

In recent decades, and especially after the Global Financial Crisis, one of the most widely criticized aspects of the modern economic system is the increasingly dominant role assumed by financial markets and institutions – a process known as financialization. Large parts of the financial sector have decoupled from the real economy, engaged in purely financial activities with no obvious benefit to the society as a whole. The negative aspects of this development have been extensively documented and analysed.² More recently, an additional concern has emerged – the dangerous interplay between financialization and environmental issues³ which represents a crucial near-term challenge for practitioners of SF.

Climate economy is no longer the marginal playground of environmental enthusiasts, but increasingly seen as a lucrative business opportunity by mainstream finance. On the one hand, this is a positive development, as it attracts new capital to business initiatives with social or environmental benefits. On the other hand, it carries the risk of asset price speculation and increased financial fragility. The creation and securitization of an increasing volume of green assets will inevitably lead to the growth of secondary markets for these securities, creating incentive structures and market dynamics with potentially negative consequences for the economy as a whole. The problem stems from the fact that increased trading volumes in secondary markets don't create new value and can easily lead to the prioritization of short-term trading profits instead of new climate-aligned investments in the real economy. If financial actors become more concerned with nominal prices instead of the real underlying value of their assets, the conditions are ripe for excessive speculation and market manipulation. Large scale share repurchases to boost stock prices and stock-based executive pay, as well as other forms of financial engineering aimed entirely at short-term

¹ Sinn 2015

² See e.g. Epstein 2005; Palley 2013

³ Clark & Hermele 2013

private gains instead of long-term benefits for the society as a whole should serve as reminders of the high social costs accompanied by financialization.¹

3.4 Innovation and the need for patient capital

Transitioning to a low-carbon economy requires innovation. Although the renewable energy sector has grown considerably over recent decades, deployment is nowhere near the scale needed to replace fossil fuels.² This is partly due to a lack of new, cheap, and easily scalable alternatives. Here, important insights from innovation research should help guide finance. For example, because innovation is uncertain, cumulative and collective, it requires long-term commitments from a variety of actors, not just from investors and entrepreneurs, but also from scientists, engineers, and workers.³ Building on the example of railroads, the Internet, biomedical and nanotechnology, energy innovation requires mission-oriented collaboration between finance, industry, and governments, and not only in a few special areas, but across the whole innovation chain.⁴

Unfortunately, in recent decades, many financial institutions and industrial corporations have become overly obsessed with short-term profits and less interested in making long-term financial commitments. The corporate ideology driving this attitude, known as “maximizing shareholder value”, boils down to the idea that the primary objective of management is to enrich the owners of the company, mainly through dividend payments and stock price increases, often leading to resource allocation away from innovation. This is especially true for basic research which has historically been financed mainly by the public sector.⁵ As a result, the renewable energy has grown most in countries where the government has played an active and supporting role. On the other hand, in countries like the U.S., where government support has been inconsistent and the private sector is especially prone to short-termism, the renewable energy sector has seen relatively less success.⁶

The high-risk investment gap could potentially be filled by venture capital. However, venture capital can be a double-edged sword. On the one hand, it is certainly more willing to take risk

¹ Lazonick 2015

² REN 2016

³ Lazonick & Mazzucato 2012; Lazonick 2013

⁴ Mazzucato et al. 2016

⁵ Mazzucato 2013

⁶ Hopkins & Lazonick 2012; Mazzucato 2014; Mazzucato & Semieniuk 2016

and endure uncertainty – an essential requirement for successful innovation. On the other hand, to compensate for risk, venture capitalists are also prone to exit their investments as quickly as possible. This can lead to a premature initial public offering (IPO), in worst cases even before the allegedly innovative product or service of the company is fully developed and commercialized.¹ Still, it is important that sources of finance for innovative enterprises remain varied – retained earnings, public grants, private capital markets, and venture capital all have the capacity to serve the long-term interests of the economy and contribute to innovation.

3.5 Climate change and migration – the “perfect storm”

Perhaps the least talked about, but still crucially important challenge for SF emanates from the link between climate change and migration patterns. Global warming is expected to boost desertification and increase the occurrence of extreme weather events such as droughts, famines, and hurricanes. The resulting physical and economic devastation will almost certainly lead to mass migration, especially in developing countries, primarily as short-term relocations to nearby areas, but also into developed nations. Here, the financial challenge is made more complicated by social and political ramifications, many of which may easily escalate into serious international conflicts. It is therefore crucial that the financial sector consider its role in preventing as well as addressing such scenarios.

Climate-related migration patterns are intricately connected with development policies and governance. The negative impacts of extreme weather events are often exacerbated by the lack of administrative and response mechanisms in the immediate or nearby areas.² On the other hand, as evidenced by the European migrant crisis that started in 2015, even the rich and most developed countries may be relatively unprepared to deal with sudden migration pressures. Hopefully, the widely publicized³ link between climate change and the crisis in Syria⁴ will help trigger more interest in developing skills and capabilities for dealing with such situations, especially in regions most under pressure from climate change.

¹ Mazzucato & Wray 2015

² Raleigh & Jordan, 2010

³ Randall 2016

⁴ Gleick 2014

3.6 Mainstreaming impact investing

In the past, tackling social problems such as homelessness, long-term unemployment, or conservation of natural environments, has been led by government institutions. On the flipside, financial markets and private companies have traditionally been primarily oriented towards producing monetary profit, with social or environmental goals having only secondary priority, if at all. More recently, however, organisations have emerged in which the line between economic and broader societal goals has become blurred, with equal weight being given to both. The financing of such enterprises is known as impact investing.¹ In 2013, the World Economic Forum (WEF) reported market worth estimates for impact investing between USD 450 and 650 billion up until 2018.² But despite its growing popularity, as of today, impact investing remains a niche, a fact reflected in research where core theoretical ideas about impact investing remain underdeveloped and empirical data scattered, although interest in the field is growing.³ In short, bringing impact investing more into the mainstream presents an important near-term challenge for practitioners of SF.

As discussed above, there is a widespread assumption that combining financial success with a positive social or environmental agenda is a hurdle that is difficult if not impossible to cross. Interestingly enough, many impact investors expect to earn market rate returns when they invest in social enterprises. According to a 2015 membership survey by the Global Impact Investing Network (GIIN), less than half of respondents said that they are targeting “below market returns”.⁴ These results are in tune with the findings cited above that sustainability-oriented investment firms are often outperforming their peers. This is a positive sign for the future outlook of impact investing. The state of the market varies considerably across regions and countries, but generally speaking, future growth is challenged by the lack of a well-functioning ecosystem that would attract more specialized investors, entrepreneurs with a proven track record⁵, and participation by larger financial institutions.⁶

How could these and other challenges be addressed? In 2013, the G8 launched a task force aimed at identifying ways to “catalyse a global market in impact investment.”⁷ A year later, a

¹ Clarkin & Cangioni 2016

² WEF 2013

³ SBS 2016

⁴ GIIN 2016

⁵ GIIN 2016

⁶ McKinsey 2016

⁷ SG 2014

report was released, confirming that important developments are already underway in both developed and developing countries, and that in the 21st century, social entrepreneurship financed by impact investing will play a fundamental role in the way societies address social and environmental issues. The report offered eight recommendations for unlocking the global market potential of impact investing: (1) setting measurable impact objectives and tracking mechanisms for investments; (2) integrating not just risk and return, but also impact analysis into mainstream investor practice; (3) clarifying fiduciary duties to include social and environmental responsibility; (4) streamlining SIBs and pay-for-success mechanisms (see also 2.4 above); (5) establishing impact investment wholesalers to drive the development of the sector; (6) boosting the organisational capacity of the social sector, primarily through government and philanthropic grants; (7) providing appropriate legal forms and provisions so that entrepreneurs and investors could easily establish “Profit-with-Purpose” businesses; and (8) supporting the role of impact investment in international development.¹

5. Conclusion

As discussed above, there is a widespread assumption that combining financial success with a positive social or environmental agenda is a hurdle that is difficult if not impossible to cross. Interestingly enough, many impact investors expect to earn market rate returns when they invest in social enterprises. According to a 2015 membership survey by the Global Impact Investing Network (GIIN), less than half of respondents said that they are targeting “below market returns”.² These results are in tune with the findings cited above that sustainability-oriented investment firms are often outperforming their peers. This is a positive sign for the future outlook of impact investing.

Climate economy is no longer the marginal playground of environmental enthusiasts, but increasingly seen as a lucrative business opportunity by mainstream finance. On the one hand, this is a positive development, as it attracts new capital to business initiatives with social or environmental benefits.

Transitioning to a low-carbon economy requires innovation. Although the renewable energy sector has grown considerably over recent decades, deployment is nowhere near the scale needed to replace fossil fuels.³ This is partly due to a lack of new, cheap, and easily scalable alternatives. Here, important insights from innovation research should help guide finance. For

¹ SG 2014

² GIIN 2016

³ REN 2016

example, because innovation is uncertain, cumulative and collective, it requires long-term commitments from a variety of actors, not just from investors and entrepreneurs, but also from scientists, engineers, and workers.¹ Building on the example of railroads, the Internet, biomedical and nanotechnology, energy innovation requires mission-oriented collaboration between finance, industry, and governments, and not only in a few special areas, but across the whole innovation chain.²

Bibliography

Agence France-Presse. (2016). "*Norway's oil-based wealth fund sells out of more fossil fuel companies*". Retrieved November 28, 2016, from The Guardian:
<https://www.theguardian.com/environment/2016/feb/05/norways-wealth-fund-sells-out-of-73-companies-as-fossil-fears-grow>

Allianz. (2015). "*Allianz Statement on Coal-based Investments*". Retrieved November 28, 2016, from Allianz:
https://www.allianz.com/v_1448622620000/media/responsibility/Energy_Guideline_PublicVersion_final.pdf

Brest, P. (2014). "*The G8 Task Force Report: Making Impact or Making Believe?*". Retrieved December 1, 2016, from Stanford Social Innovation Review:
https://ssir.org/articles/entry/the_g8_task_force_report_making_impact_or_making_believe

Browne, C. (2015). "*Al Gore's 'Sustainable' Generation Investment Beats Most Hedge Funds*". Retrieved November 28, 2016, from ValueWalk:
<http://www.valuwalk.com/2015/10/al-gores-sustainable-generation-investment-beats-most-hedge-funds/>

C2ES. (2016). "*Outcomes of the U.N. Climate Change Conference in Marrakech*". Retrieved November 24, 2016, from Center for Climate and Energy Solutions:
<http://www.c2es.org/docUploads/cop-22-marrakech-summary.pdf>

CBI. (2016a). *Bonds and Climate Change. The State of the Market in 2016*. Climate Bonds Initiative.

CBI. (2016b). "*Green Finance: Green Bond Directions COP22*". Retrieved November 29, 2016, from Climate Bonds Initiative:
https://www.climatebonds.net/files/files/COP22_Directions_WEB.pdf

CBI. (2016c). "*Climate Bonds Taxonomy*". Retrieved November 29, 2016, from Climate Bonds Initiative: <https://www.climatebonds.net/standards/taxonomy>

¹ Lazonick & Mazzucato 2012; Lazonick 2013

² Mazzucato et al. 2016

- Clark, E., & Hermele, K. (2013). "Financialization of the environment: A literature review". *FESSUD Working Paper Series No. 32*.
- Clark, G. L., Feiner, A., & Viehs, M. (2015). *From the Stockholder to the Stakeholder: How Sustainability Can Drive Financial Outperformance*. University of Oxford / Arabesque Partners.
- Clarkin, J. E., & Cangioni, C. L. (2016). "Impact Investing: A Primer and Review of the Literature". *Entrepreneurship Research Journal*, 6(2), 135-173.
- Cohen, D., & Zelnick, J. (2015). "What We Learned from the Failure of the Rikers Island Social Impact Bond". *Nonprofit Quarterly*.
- CTI. (2011). *Unburnable Carbon - Are the world's financial markets carrying a carbon bubble?* Retrieved November 30, 2016, from Carbon Tracker Initiative: <http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf>
- CTI. (2013). *Unburnable Carbon 2013: Wasted capital and stranded assets*. Retrieved November 30, 2016, from Carbon Tracker Initiative: <http://carbontracker.live.kiln.digital/Unburnable-Carbon-2-Web-Version.pdf>
- CTI. (2015). *Capex Tracker*. Retrieved November 30, 2016, from Carbon Tracker Initiative: <https://www.carbontracker.org/wp-content/uploads/2015/02/Capex-Tracker-A-Lead-Indicator-of-Carbon-Supply-24.2.15-Final-Copy.pdf>
- Dalal, S. P., Bonham, C., & Silvani, A. (2015). "An Investigation on Ecosystem Services, the Role of Investment Banks, and Investment Products to Foster Conservation". In K. Wendt (Ed.), *Responsible Investment Banking: Risk Management Frameworks, Sustainable Financial Innovation and Softlaw Standards*. Springer.
- Dasgupta, D., Espagne, E., Hourcade, J.-C., Minzer, I., Nafu, S., Perissin-Fabert, B., et al. (2016). "Did the Paris Agreement Plant the Seeds of a Climate Consistent International Financial Regime?". Retrieved November 7, 2016, from Fondazione Eni Enrico Mattei: <http://www.feem.it/userfiles/attach/2016726121204NDL2016-050.pdf>
- Divest-Invest. (2015). *Divest-Invest Philanthropy. Doing Good. Performing Better. Beat your Benchmarks. Beat Climate Change*. Divest-Invest Philanthropy / Europeans for Divest-Invest.
- Epstein, G. A. (2005). *Financialization and the World Economy*. Edward Elgar Publishing.
- EWEA. (2016). *The European offshore wind industry - key trends and statistics 2015*. European Wind Energy Association.
- Fairhead, J., Leach, M., & Scoones, I. (2012). "Green Grabbing: a new appropriation of nature? *Journal of Peasant Studies*, 39(2), 237-261.
- Fankhauser, S., & Stern, N. (2016). "Climate change, development, poverty and economics". Retrieved December 1, 2016, from Centre for Climate Change Economics and Policy: <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2016/10/Working-Paper-253-Fankhauser-and-Stern.pdf>

- Foxon, T. J. (2013). "Technological Lock-In". In J. Shogren (Editor), *Encyclopedia of Energy, Natural Resource, and Environmental Economics* (pp. 123-127). Elsevier Science.
- FS-UNEP. (2016). *Global Trends in Renewable Energy Investment 2016*. Frankfurt School of Finance and Management / United Nations Environment Programme.
- GIIN. (2016). *Annual Impact Investor Survey*. Retrieved November 30, 2016, from Global Impact Investing Network:
https://thegiin.org/assets/2016%20GIIN%20Annual%20Impact%20Investor%20Survey_Web.pdf
- Gleick, P. H. (2014). "Water, Drought, Climate Change, and Conflict in Syria". *Weather, Climate and Society*, 3(6), 331-340.
- Haigh, M. (2012). "Publishing and defining sustainable finance and investment". *Journal of Sustainable Finance & Investment*, 2(2), 88-94.
- Hopkins, M., & Lazonick, W. (2012). *"Soaking Up the Sun and Blowing in the Wind: Clean Tech Needs Patient Capital"*. Retrieved November 16, 2016, from Financial Institutions for Innovation and Development: <http://fiid.org/wp-content/uploads/2012/11/Hopkins-Lazonick-Clean-Tech-20121129.pdf>
- IEA. (2014). *World Energy Investment Outlook*. Retrieved November 7, 2016, from International Energy Agency:
<https://www.iea.org/publications/freepublications/publication/WEIO2014.pdf>
- IFC. (2012). *IFC Performance Standards on Environmental and Social Sustainability*. Retrieved November 8, 2016, from International Finance Corporation:
http://www.ifc.org/wps/wcm/connect/c8f524004a73daeca09afdf998895a12/IFC_Performance_Standards.pdf?MOD=AJPERES
- IIPC. (2011). *Impact Investing: a Framework for Policy Design and Analysis*. Retrieved November 29, 2016, from Pacific Community Ventures:
http://www.pacificcommunityventures.org/wp-content/uploads/sites/6/2015/07/Impact_Investing_Policy_Full_Report.pdf
- IIPC. (2014). *Impact Investing Policy in 2014: A Snapshot of Global Activity*. Retrieved November 14, 2017, from The Hauser Institute for Civil Society:
http://hausercenter.org/iri/wp-content/uploads/2015/03/2014-IIPC.v7_FINAL.pdf
- IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. (R. K. Pachauri, & L. A. Meyer, Editors) Retrieved October 18, 2016, from Intergovernmental Panel on Climate Change: https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full_wcover.pdf
- Jervis, J. (2013). "How social enterprise can help reduce re-offending". *Guardian*.
- Lazonick, W. (2013). *"The Theory of Innovative Enterprise: A Foundation of Economic Analysis"*. Retrieved December 3, 2016, from The Academic-Industry Research Network:
<http://www.theairnet.org/files/research/lazonick/Lazonick%20The%20Theory%20of%20Innovative%20Enterprise%2020130501.pdf>

- Lazonick, W. (2015). *"Stock buybacks: From retain-and-reinvest to downsize-and-distribute"*. Retrieved October 26, 2016, from Brookings Institution: <https://www.brookings.edu/wp-content/uploads/2016/06/lazonick.pdf>
- Lazonick, W., & Mazzucato, M. (2012). *"The Risk-Reward Nexus: Innovation, Finance and Inclusive Growth"*. Retrieved November 21, 2016, from Policy Network: <http://www.policy-network.net/uploads/media/154/8167.pdf>
- Mazzucato, M. (2013). *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. Anthem Press.
- Mazzucato, M. (2014). *"Who will lead the green revolution?"*. Retrieved November 25, 2016, from MakingItMagazine: <http://www.makingitmagazine.net/?p=8583>
- Mazzucato, M., & Semieniuk, G. (2016). *"Financing Renewable Energy: Who is Financing What and Why it matters"*. Retrieved November 30, 2016, from University of Sussex: http://sro.sussex.ac.uk/61966/1/2016_12_SWPS-Mazzucato_et_al.pdf
- Mazzucato, M., & Wray, L. (2015). *"Financing the Capital Development of the Economy: A Keynes-Schumpeter-Minsky Synthesis"*. Retrieved October 27, 2016, from Levy Economics Institute of Bard College: http://www.levyinstitute.org/pubs/wp_837.pdf
- Mazzucato, M., Semieniuk, G., & Watson, J. (2016). *What will it take to get us a Green Revolution?* Retrieved November 22, 2016, from University of Sussex Policy Paper: <https://www.sussex.ac.uk/webteam/gateway/file.php?name=what-will-it-take-to-get-us-a-green-revolution.pdf&site=264>
- McKinsey. (2016). *"Achieving impact for impact investing: A road map for developed countries"*. Retrieved November 30, 2016, from McKinsey & Company: https://www.mckinsey.de/files/report_impact_investment.pdf
- MDB. (2015). *2015 Joint Report on Multilateral Development Banks' Climate Finance*. Retrieved November 15, 2016, from World Bank: <http://pubdocs.worldbank.org/en/740431470757468260/MDB-joint-report-climate-finance-2015.pdf>
- Meadows, D., Meadows, D., Randers, J., & Behrens, W. (1972). *The Limits to Growth. A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.
- Milman, O. (2015). *"James Hansen, father of climate change awareness, calls Paris talks 'a fraud'"*. Retrieved November 7, 2016, from The Guardian: <https://www.theguardian.com/environment/2015/dec/12/james-hansen-climate-change-paris-talks-fraud>
- Morgan Stanley. (2015). *"Sustainable Reality: Understanding the Performance of Sustainable Investment Strategies"*. Retrieved November 29, 2016, from Morgan Stanley: <https://www.morganstanley.com/sustainableinvesting/pdf/sustainable-reality.pdf>
- MSCI. (2016). *"MSCI ACWI Ex Fossil Fuels Index (GBP)"*. Retrieved November 28, 2016, from MSCI: <https://www.msci.com/documents/10199/d6f6d375-cadc-472f-9066-131321681404>

- NCE. (2014). *"Infrastructure investment needs of a low-carbon scenario"*. Retrieved December 1, 2016, from New Climate Economy: <http://newclimateeconomy.report/2014/wp-content/uploads/sites/2/2015/01/Infrastructure-investment-needs-of-a-low-carbon-scenario.pdf>
- Palley, T. (2013). *Financialization: The Economics of Finance Capital Domination*. Palgrave Macmillan.
- Pfeiffer, A., Millar, R., Hepburn, C., & Beinhocker, E. (2016). "The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy". *Applied Energy*, 179, 1395-1408.
- Raleigh, C., & Jordan, L. (2010). "Climate Change and Migration: Emerging Patterns in the Developing World". In R. Mearns, & A. Norton, *Social Dimensions of Climate Change. Equity and Vulnerability in a Warming World* (pp. 103-131). The World Bank.
- Randall, A. (2016). *"Syria and climate change: did the media get it right?"*. Retrieved November 30, 2016, from Atavist: <https://climatemigration.atavist.com/syria-and-climate-change>
- Randers, J. (2012). *2052: A Global Forecast for the Next Forty Years*. Chelsea Green Publishing.
- REN21. (2016). *Renewables 2016 - Global Status Report*. Retrieved October 25, 2016, from Renewable Energy Policy Network for the 21st Century: http://www.ren21.net/wp-content/uploads/2016/10/REN21_GSR2016_KeyFindings_en_10.pdf
- RIB. (2015). *Responsible Investment Banking. Risk Management Frameworks, Sustainable Financial Innovation and Softlaw Standards*. Edited by Karen Wendt. Springer International Publishing.
- SBS. (2016). *The Landscape of Social Impact Investing Research: Trends and Opportunities*. Retrieved December 2, 2016, from Saïd Business School, Oxford University: <http://www.sbs.ox.ac.uk/sites/default/files/research-projects/CRESSI/docs/the-landscape-of-social-impact-investment-research.pdf>
- SG. (2014). *"Impact Investment: the Invisible Heart of Markets"*. Retrieved November 30, 2016, from Global Social Impact Investment Steering Group: [http://www.socialimpactinvestment.org/reports/Impact%20Investment%20Report%20FINAL\[3\].pdf](http://www.socialimpactinvestment.org/reports/Impact%20Investment%20Report%20FINAL[3].pdf)
- Sinn, H.-W. (2015). "The Green Paradox: A Supply-Side View of the Climate Problem". *CESifo Working Paper Series No. 5385*.
- Social Finance. (2010). *Social Impact Bonds: Unlocking investment in rehabilitation*. Social Finance.
- Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., et al. (2014). "Planetary boundaries: Guiding human development on a changing planet". *Science*, 347(6223), 1259855.
- Tomkinson, E. (2012). *"12 points of interest in the New York (Rikers) Social Impact Bond"*. Retrieved December 3, 2016, from Emma Tomkinson:

<https://emmatomkinson.com/2012/08/19/12-points-of-interest-in-the-new-york-social-impact-bond/>

- UNEP. (2015). *The Financial System We Need: Aligning the Financial System with Sustainable Development*. United Nations.
- UNFCCC. (2015). *Adoption of the Paris Agreement*. Retrieved October 18, 2016, from United Nations Framework Convention on Climate Change:
<https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>
- Venugopal, S. (2015). "Mobilising Private Sector Climate Investment: Public-Private Financial Innovations". In K. Wendt (Ed.), *Responsible Investment Banking: Risk Management Frameworks, Sustainable Financial Innovation and Softlaw Standards*. Springer.
- WEF. (2013). *"From the Margins to the Mainstream: Assessment of the Impact Investment Sector and Opportunities to Engage Mainstream Investors"*. Retrieved November 30, 2016, from World Economic Forum:
http://www3.weforum.org/docs/WEF_II_FromMarginsMainstream_Report_2013.pdf
- WEF. (2013). *From the Margins to the Mainstream: Assessment of the Impact Investment Sector and Opportunities to Engage Mainstream Investors*. World Economic Forum.
- Whelan, T., & Fink, C. (2016). *"The Comprehensive Business Case for Sustainability"*. Retrieved November 28, 2016, from Harvard Business Review:
<https://hbr.org/2016/10/the-comprehensive-business-case-for-sustainability>
- Zenghelis, D., & Stern, N. (2016). *"The importance of looking forward to manage risks: submission to the Task Force on Climate-Related Financial Disclosures"*. Retrieved November 30, 2016, from Centre for Climate Change Economics and Policy:
<http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2016/06/Zenghelis-and-Stern-policy-paper-June-2016.pdf>