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Perceived barriers and policy solutions in clean energy infrastructure investment

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ABSTRACT

International political negotiations and national policy for climate change mitigation are increasingly focussed on the mobilisation and scale up of investments in clean energy infrastructure. This paper aims to develop the understanding of how institutional investors in the private sector perceive barriers to scaling up investment into clean energy infrastructure and what policy solutions to those barriers they advocate. This paper adds to existing scientific knowledge through a clear focus on private sector perceptions. Through the analysis of previous public statements from organisations and coalitions in the finance sector a number of investment barriers were identified. These initial barriers fed into a Delphi process. The outputs of the Delphi process were categorized into five sets of barriers and a number of policy solutions associated with investing into clean energy solutions. We conclude that there is a need for better engagement with the institutional investment community to ensure further effort on policy development that underpins investments at scale is effective and efficient.

1. Introduction

The science of climate change (IPCC, 2013) continues to demonstrate an urgent need for action to tackle global greenhouse gas emissions. Mitigation activities (reducing emissions) require the majority of future investment capital if global temperatures are to be kept within proposed targets (UNFCCC, 2009). While climate policy has been implemented in various countries around the world it has not yet delivered investment of sufficient scale.

The International Energy Agency (IEA, 2009) estimate that US$270 trillion will be invested into energy supply and use under a business as usual scenario between 2007 and 2050. To meet the commitments made under the United Nations Framework Convention on Climate Change (UNFCCC) process an additional $46 trillion, or approximately $1 trillion per annum, is required over that timescale. Therefore, policy frameworks that help achieve this scale of capital investment (del Río et al., 2011; UNFCCC, 2011) are required. While work is underway to explore policy requirements in developing countries (Stadelmann et al., 2011a; Hamilton, 2010), the most effective policy, or set of policies, to enable a large scale deployment of private sector capital into clean energy infrastructure and technology deployment globally requires further exploration (Buchner et al., 2013; Caperton, 2010).

This paper explores how private sector institutional investors perceive barriers to clean energy infrastructure investment and outlines recommendations for policy development to ensure the transition to low carbon technology deployment is well managed.

1.1. Terminology

Within this paper institutional investors are defined as large private investment organisations such as pension funds, insurance companies and sovereign wealth funds. The investment community is used to refer to individuals and organisations that are involved in investments into clean energy infrastructure projects from policy developers, think tanks, advisors, lawyers and financial organisations. The investment supply chain refers to the organisations involved in financing and developing clean energy infrastructure and includes (Jones, 2012):

- **Capital providers** (e.g. institutional investors including pension funds, mutual funds, sovereign wealth funds, insurance funds and hedge funds).
- **Capital facilitators** (e.g. banks, asset managers, brokers and advisors).
- **Project developers** (e.g. companies).

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Clean energy infrastructure investments, including renewable energy investments, are assumed to be large capital projects which require significant up-front investment such as wind farms or solar parks. Barriers are a set of issues that lead to decision makers in the finance community not making an investment. As such these barriers can be considered as the perception of risk being too high. Risks, on the other hand, are a set of issues that are more quantifiable and can be balanced against the likely returns for a particular investment in order to decide whether that investment will be profitable or not.

2. Clean energy investing

In 2010 global clean energy investment passed US$200 billion (Frankfurt School-UNEP Centre, 2013; PEW Charitable Trust, 2010; WEF, 2011a). Infrastructure investing accounted for over half of this or $118 billion. The country which attracted most investment was China at $54 billion (mainly on infrastructure). Fig. 1 shows the change in renewable energy investments, by region over the period 2004–2012 (Frankfurt School-UNEP Centre, 2013). Nuclear technology, carbon capture and large scale hydro projects are not included in this figure as the capital requirements for these projects usually lasts over years or decades and involves substantial government intervention such as planning approvals which skews the investment analysis. As can be seen global investments have broadly risen year on year apart from 2009, following the financial crisis, and in 2012 as ongoing uncertainty in the market persists. However, these figures are a quarter of the estimated $1 trillion per annum required.

Over the past two decades there has been a move towards a carbon price in order to underpin a move to low carbon energy sources. A lot of academic literature explores the possible impact of such a price (Denny and O'Malley, 2009; Kumar and Managi, 2009). However, in the absence of a global carbon price, over the past few years different technologies have been supported by specific policy frameworks and public-private partnerships around the world (Varadarajan et al., 2011). Fig. 2 shows that the majority of current investment has been in wind and solar with an increase in solar investment since 2009 (Frankfurt School-UNEP Centre, 2013).

Clean energy investing offers both opportunities and risks requiring a different approach to managing investment portfolios (Mercer, 2011) and policy development (Foxon, 2011; Hildén, 2011; Safarzyńska et al., 2012). Furthermore, it requires investment through diverse channels including venture capital, private equity, bank finance, state agencies, and corporate research and development (PEW Charitable Trust, 2010; Smith and Raven, 2012). These investments are required in both developed and developing countries.

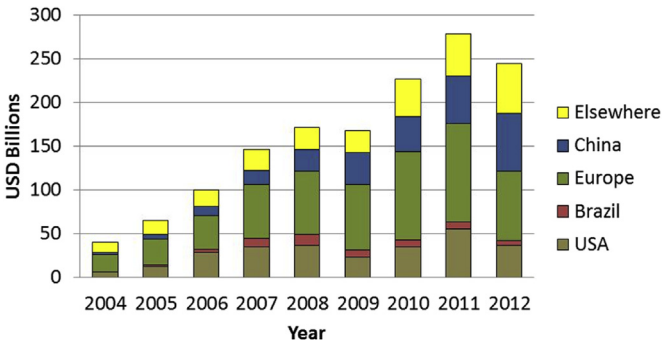

Fig. 1. Total annual investment in renewable energy by region (from Frankfurt School-UNEP Centre, 2013).

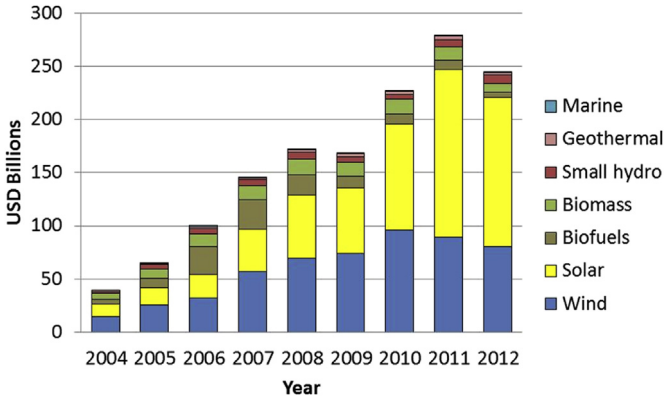

Fig. 2. Total investment in renewable energy technology types from 2004 to 2012 (from Frankfurt School-UNEP Centre, 2013). This does not include carbon capture, large scale hydro or nuclear technology.

Under the UNFCCC process developed country governments have pledged to mobilise substantial capital, both public and private investments, over the short (Stadelmann et al., 2011b) and medium term (Timmons Roberts et al., 2010). By 2020 $100 billion per year should be invested from developed country finance into developing country projects.

It is also important that policy enables a change in process within the investment community so that clean energy investments become normal. Whilst organisational change management of cleaner production processes is well studied (see for example Stone, 2000) change management within financial organisations that provide the investment for large clean energy infrastructure projects is not. It is important that organisations who will need to respond to the policy environment that will help drive these investments are engaged in helping to shape it. This will help reduce at least part of the risk associated with change management as "the management of organisational change currently tends to be reactive, discontinuous and ad hoc with a reported failure rate of around 70 per cent" (By, 2005: 378).

However, investment decisions are made on a project by project basis where each project is often supported by tailored policy interventions. Clean energy infrastructure investments are not seen as a normal investment. There is a need to support a transition from investment grade projects to "investment grade policy" (Hamilton, 2009: 4). Policy support must also take into account the full supply chain within the investment community.

A number of policies and government interventions are now being developed to reduce or manage barriers to investment (for example, Goldman Sachs Global Economics Group, 2007; UNFCCC, 2011). These include the use of regulatory measures as well as public finance mechanisms (PFMs) and public-private partnerships (PPPs). The use of clean energy targets and mandates for certain renewables, such as the European Union's 20% of final energy from renewable sources by 2020 goal, also create a market for such technologies. Several different approaches have been implemented in emerging markets including the use of subsidies and regulation (Varadarajan et al., 2011).

Over the past decade a clear focus for policy has been on subsidies and a number of different subsidy regimes have been implemented including:

- Feed-in-Tariff (FiT)
- Power Purchase Agreements
- Tradable Renewable Certificates
- Auctions

- Tax credit
- Low carbon vehicle subsidies
- Differential tax regimes on carbon content (on buildings, products, cars etc)
- Accelerated depreciation of assets

However, policy changes have contributed to a very volatile investment market. For example, investment into Spanish clean energy projects fell 54% in 2010 due to changes in their Feed-in-Tariffs (EPIA, 2013). The introduction of Feed-in-Tariffs in the United Kingdom (UK) saw domestic solar installations rise 3600% over a 2 year period. Changes to the Feed-in-Tariff then caused a 55% fall in solar photovoltaic installations by April 2012 (OfGem, 2013) as compared to the average over the previous quarter (see Fig. 3). As the cost of solar photovoltaic technology has now fallen it is likely that the solar market will see a recovery over time.

This lack of a coherent and holistic focus across the investment community means scaling up investments in clean energy infrastructure still faces significant barriers. There is also little evidence for real organisational change in the finance sector and climate investment remains siloed.

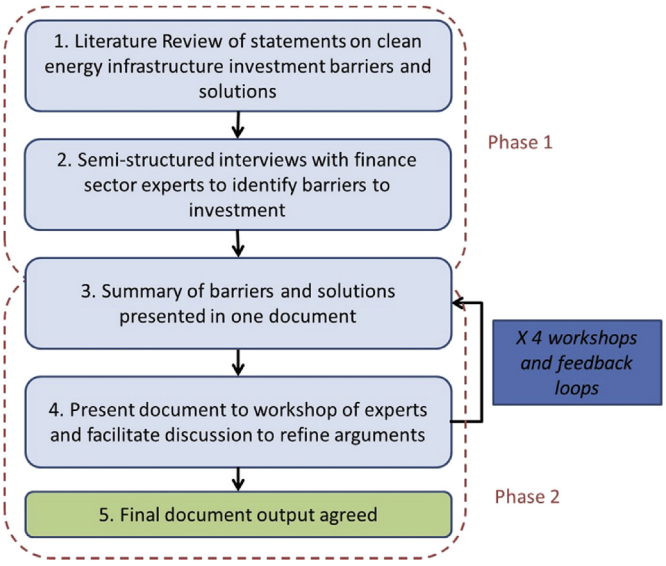

Fig. 4. Research method steps using the Delphi process.

3. Research method

The research presented in this paper identifies how stakeholders in the investment community perceive barriers and opportunities for government intervention in support of a transition to large scale investment in clean energy infrastructure. In particular the paper looks at the role of governments in enabling private sector investment into clean energy infrastructure development. The nature of these barriers, based on the perceptions of individuals, means a social constructionist research paradigm with a qualitative method is appropriate (Guba and Lincoln, 1994).

Given this background a Delphi process was adopted for the research. The Delphi method is a research tool developed to find consensus around a complex problem from a group of experts in a particular field (Okoli and Pawlowski, 2004).

The Delphi process was split into two phases and 5 steps. Fig. 4 summarises the method steps used. The first phase of the Delphi process included a literature review of investment barriers and policy recommendations based on previous public statements (step 1). Subsequently 8 semi-structured interviews, 2 from private sector, 2 from think tanks, 1 investor coalition and 3 from public sector organisations, were undertaken to clarify and review the literature review output (step 2). Semi-structured interviews usually took place at the office of the consultee. Finally a summary document was produced (step 3).

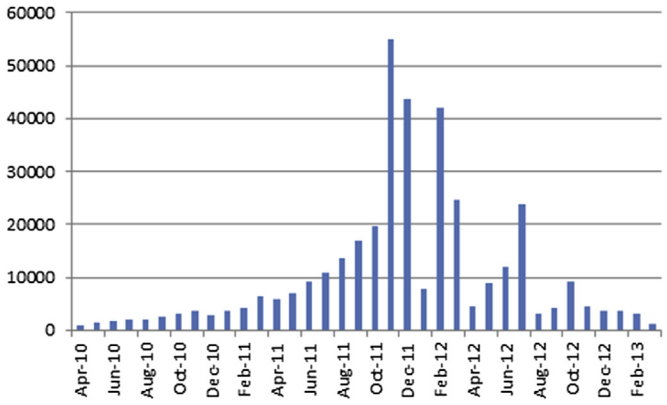

Fig. 3. Total number of installations of solar photovoltaics (PV) each month that qualified for the Feed in Tariff scheme in the UK between April 2010 and March 2013, Source: OfGem (2013).

In the second phase, the summary from the first phase was used in a series of workshops (step 4) to which individuals from the finance community were invited. The summary was re-drafted to reflect feedback and discussion during the workshops. The new summary was presented back to participants at a subsequent workshop (repeat step 3) and a facilitated discussion to further refine and agree on the document took place. Four workshops refined the recommended policy interventions into a set of agreed principles (step 5). Each workshop was facilitated by the author of this paper who provided an unattributed summary of the workshop conclusions after each workshop as input to subsequent workshops.

The four workshops were held in London in 2011 and 2012 (16 May 2011, 1 August 2011, 15 September 2011, 1 March 2012). Workshops were hosted by one of the organisations invited to take part or by the UK Department for Energy and Climate Change (DECC). Each workshop included 20–30 individuals and approximately two thirds of these attended every workshop.

To ensure as many organisations and individuals across the investment community participated in the research an existing networked group of organisations was approached. While a number of investor groups and coalitions represent parts of the investment supply chain, such as the Institutional Investor Group on Climate Change (European pension and insurance funds), few bring together the full supply chain. In addition policy makers are often not a formal part of these groups.

Therefore, for this research the Capital Markets Climate Initiative was used. The Capital Markets Climate Initiative (CMCI) is a United Kingdom (UK) initiative led by the then Minister for Climate Change Greg Barker MP (Member of Parliament) in the Department for Energy and Climate Change (DECC). CMCI was set up to provide a platform for public sector engagement with private sector investors and includes members from across the investment supply chain. Given its location in London members of CMCI also represent financial organisations from across the world. CMCI's aim is to support the scale up of private finance flows to clean energy infrastructure from developed countries into developing countries.

CMCI organisational members[1] include asset management, pension funds, re-insurance, insurance, investment banking, banking, think tanks, brokers, credit rating agency, finance consultancy, finance development agency, international financial institutions and finance markets. Individuals to include in CMCI were identified through initial approaches to the organizational members. The approaches were made by DECC. Individual members were from the following job types:

- Head, Carbon/Renewables/Energy/Climate Change
- Managing Director
- Investment Banker
- Head of Sustainability
- Director, Asset Management
- Head of Policy
- Chief Executive Officer
- Chief Financial Officer
- Chairman
- Head of Research and Strategy
- Fund Manager

Working Group 1 (WG1) of CMCI is one of two work streams initially identified. The objective of WG1 was to develop a set of principles and toolkit to enable the development of 'investment grade' policy and appropriate public finance mechanisms. Working Group 2 (WG2) identified specific opportunities for in-country investment projects. WG2 was chaired by the World Economic Forum. WG1 was used for the research presented in this paper. WG1 was chaired by the author of this paper and therefore this paper represents the research output of participatory action research (Denscombe, 2010) which also produced specific policy guidelines (Jones and Ward, 2012). Action research is particularly suited to exploring the perceptions of investors as the output is seen as potentially having a real impact on future business opportunities as opposed to being a theoretical exercise. Therefore, the participants may be more likely to be honest in their feedback during the research.

Many of the organisations involved in CMCI are, or had been, members of investor coalitions and networks who produced public statements, research or reports focussing on climate investment. Therefore, the stakeholders are viewed as expert in this area with many having pre-defined views of barriers and solutions to climate investment.

4. Results

Through the analysis of previous public statements from organisations and coalitions in the finance sector (IEA, 2008; IIGCC et al., 2011; OECD, 2011; Whitehouse et al., 2011) a number of investment barriers were identified. The first summary drafted most closely followed that presented in (UNEP and Partners, 2009) which identified five different types of barriers in clean energy investing and was a result of a consultation with the main investor coalitions.

Three barriers were directly related to the underlying clean energy assets. These include low carbon policy risk, deal flow problems and evaluation of multiple overlapping risks. The other two barriers are more general risks that impact all investments across geographies notably currency risk and country risk such as breach of contract or civil disturbance.

Low carbon policy risk was associated with the possibility of a change in targeted policy support which in turn results in lower than expected returns on investment. Deal flow problems are associated with a limited availability of projects meaning investors cannot divest of one investment and then immediately invest in another building on their experience in the sector. Multiple overlapping risks captured a range of different issues associated with new and emerging investment markets.

Two consensus policy solutions were identified during the initial review – the need for long term policy and the need for an international carbon price. It was difficult to identify further areas of consensus as public positions on solutions often reflect the particular investment vehicle or asset management strategy of individual organisations.

The Delphi process categorized five sets of barriers associated with investing into clean energy infrastructure. As opposed to the initial literature review output the majority of these barriers are generic barriers for investing into new sectors or countries and more accurately reflect the decision making process that a typical investor would take. A more detailed set of recommendations for government intervention to tackle these barriers was developed although the focus on long term policy and carbon pricing remained.

4.1. Investment barriers

Five categories of barriers were identified:

- Domestic policy barriers
- Domestic market barriers
- General financial barriers
- Clean energy specific barriers
- Physical risks

4.1.1. Domestic policy barriers

There are several domestic policy barriers that increase the risk for investments within a country. This is particularly true for long term infrastructure investment (such as clean energy technologies). Policy certainty (longevity), policy complexity and overall governance in countries all impact the perceived risk of investments. This importance of the long term nature of policy was highlighted during the workshops as the most important barrier to investment. If appropriate policy is in place then the policing and enforcement of these policies is important.

4.1.2. Domestic market barriers

Domestic market barriers may exist within a particular country. For example, lack of human capital (skilled people such as engineers or project developers) to deploy technologies alongside limitations in support infrastructure, such as transport or grid infrastructure, can limit the returns on investment or speed of deployment. In addition there may be limits to the general business infrastructure within certain countries including lack of domestic banking structures or the long term viability of state utilities is uncertain. A key aspect to lowering the risk of any investment is the ability to demonstrate that returns will find their way back to the project or investor. The economic strength of a particular country will be the main driver of any risk assessment.

[1] The Capital Markets Climate Initiative including the following organisations: Merrill Lynch/Bank of America, London Bridge Capital, SwissRe, Jupiter Asset Management, BT Pension Scheme, Climate Change Capital, Morgan Stanley, Sustainable Development Capital, London Stock Exchange AIM, Deutsche Bank, Holden, NEF, Standard and Poors, Innovator Capital, HSBC, Aviva, BNP Paribas, Standard Chartered, Royal Bank of Scotland, Willis Re, Barclays Capital, Goldman Sachs, Lloyds, Clinton Climate Initiative, CDKN, Prince of Wales Sustainability Unit, Brookings Institute, Chatham House, E3G, IIGCC, Climate Bonds, PWC, OECD, EBRD, Infraco, PIDG, IFC, EIB and the World Bank.

4.1.3. General financial barriers

There are several general financial barriers when investing across countries including the possibility of defaults because of general economic risks including inflation or exchange rate volatility between currencies lowering the real returns. In addition changes to financial risk management regulation were highlighted as a potential barrier. Following the recent turmoil in global financial markets caused by bad risk management in the finance sector, governments have naturally reacted to reduce the risks of such events happening again in the future. However, one consequence of new legislation could be a reduced availability of capital for long term clean energy investments.

4.1.4. Clean energy specific barriers

Policy certainty was highlighted as the most important barrier for investment. Even when government intervention in clean energy investment has been made subsequent changes to policy dramatically impacts investor confidence in the market. For example, members of CMCI highlighted the role of subsidies to enable new technologies to reach cost competitiveness with the incumbent (usually high carbon) technologies. Feed-in-Tariffs, a subsidy provided on the sale of electricity supplied from clean energy infrastructure to increase returns on investment, have been seen to attract significant investment into clean energy (PEW Charitable Trust, 2010) and are proposed as a solution for scaling up renewable deployment in developing countries (DB Climate Change Advisors, 2011). However, several members of CMCI identified retrospective changes to Feed-in-Tariffs which have undermined investor confidence in this sector and in clean energy policy in general. This contrasts with existing, and long standing, subsidies for high carbon alternatives making it more difficult to be cost competitive.

Other barriers include the immaturity and lack of track record of clean technologies. This increases the expected returns for these investments as investors are more likely to perceive that some technologies will not work, or will not work as effectively as anticipated. Within clean energy infrastructure investing there is an insufficient number of commercial projects which means large scale investment portfolios cannot divest of one asset at the end of an investment cycle and re-invest into another asset. This lack of deal flow means expertise can be lost between projects increasing the overall risk.

4.1.5. Physical risk

Although not widely included in risk analysis at present and given the lowest priority through the Delphi process, the physical risk from climate change itself will play an increasingly important role. Changes in flooding and drought recurrence will potentially have a significant impact on some infrastructure investments. This barrier to investment was not widely recognized in existing literature and was a lower priority than the other four.

4.2. Investment solutions

As an output of the CMCI the following policy principles for investment solutions (Jones, 2012) were created:

- **Principle 1:** An early and ongoing managed dialogue with institutional investors and local and international private sector should be set up.
- **Principle 2:** A clear, long term and coherent policy and regulatory framework should be implemented.
- **Principle 3:** Price signals in the market should support the deployment of low carbon alternatives ensuring that any social costs associated with a transition are well managed.
- **Principle 4:** Underpinning economic drivers should be realigned to support sustainable growth.
- **Principle 5:** National governments should have active programmes of public (climate) finance to support, underpin and develop investment grade projects that mobilise private capital.

Principle 1 is focussed on stakeholder engagement and ensuring good design of policy (whether at the macro or micro level). This principle was developed in response to the lack of perceived progress following on from numerous public position statements from the investment community and the climate policy negotiation processes that did not seem to align. It therefore addresses a general barrier to progress rather than any of the specific barriers identified.

Principle 2 aims to address barriers associated with the macro level where there is a clear need for long term policy planning (greater than 10 years) and to include methods for measurement and verification of policy goals. The majority of policy statements from the investment community start with a similar call to governments: the need for long term and predictable policy. Predictable policy does not mean non-changing rather a transparent process through which policy reviews and 'stress tests' will occur and the criteria through which these reviews will be judged or a 'sunset' clause when the policy will be removed.

Principle 3 focusses on pricing by removing high carbon subsidies and introducing a price on carbon. Current subsidies for renewable energy worldwide (estimated at $57 billion in 2009, IEA, 2009) compare with the subsidies on fossil fuels ($312 billion in 2009). Additionally there is a need for short term clean energy subsidies to support the development of new technologies. With a long track record and deployment at scale, high carbon alternatives typically have lower capital costs and lower perceived risks than their clean energy equivalents. Putting a price on carbon has featured as a strong call in public statements from investor groups. However, during the Delphi process it was clear that some investors now felt that putting a price on carbon internationally was not possible and therefore other mechanisms should be pursued with higher priority. In particular a carbon price approaching $100 per tonne, which was felt necessary to drive market transformation, is not achievable.

Principle 4 includes both macro level issues such as financial regulation as well as support for particular technology development through instruments such as procurement of clean technology for government owned infrastructure. While not always affecting short term financial returns, regulations and standards within a market can vastly reduce the risks of the long term viability of projects. These include improved building codes, equipment and appliance standards, the use of Japanese 'top-runner' style standards (Osamu, 2012), transportation policies such as low carbon fuel standards and measures to influence consumer behaviour such as labelling and efficiency standards. Such policies ultimately also make high carbon investments less attractive.

Principle 5 focusses on project investment mainly in developing countries. However, generic lessons for best use of public finance to enhance investment grade project development were also drawn during the Delphi process. For example, the use of green investment funds or banks, backed by public finance, to stimulate markets which were not fully 'investment grade' due to industrial or economic policy barriers were discussed. The use of a green bank could be seen as a way to build investor confidence and a track record in a new market.

Within the developing country context investors identified two additional routes for government intervention using international public finance to leverage private capital:

- **Capacity support:** The ability for governments and domestic companies to develop low carbon (investment grade) policies and projects is often not strong. Therefore, support for capacity and technical assistance for policy and project development should be provided.
- **De-risk finance:** To achieve scale in investments it is also important to build early public-private partnerships to demonstrate what is possible. International public finance should be used to underpin and develop early 'investment grade' projects to allow the private sector to move into new markets and help build up the technical capacity (and policy capacity) of a country to further develop solutions at scale.

Public-Private Partnership models (Brown and Jacobs, 2011; Nassiry and Wheeler, 2011; WEF, 2011b) were identified as a key intervention that could lead to early investment in developing countries. For example, the Fund of Funds approach, in partnership with Multilateral Development Banks (MDB) or other international financial institutions (IFI) to anchor the initiative.[2] Under this model, private investors contribute equity to a Fund of Fund and investments are complemented by IFI risk reduction technical and project development assistance. Proponents of this model suggested that the involvement of an IFI, with its networks on the ground in developing countries, coupled with knowledge of the public sector players and complementary risk mitigation capabilities, will provide the comfort needed to institutional investors who do not know the market.

5. Discussion

This paper aimed to explore the perceptions of the investment community on barriers to investments in clean energy infrastructure and potential policy solutions to overcome those barriers. Importantly it focusses on the gap in knowledge represented by perceptions as opposed to studies exploring actual risks to investment. An action based Delphi process was used.

The majority of past literature (IIGCC et al., 2011; UNEP and Partners, 2009), strongly supported by findings from the Delphi process presented in this paper, focus on the need for long term and predictable policy. Whilst this is obvious, research and policy reviews often explore particular barriers rather than this general issue. Those stakeholders involved in the research were clearly of the opinion that current policy associated with clean energy infrastructure is neither long term nor stable. This perception is clearly a barrier to scaling up investment.

Therefore, a clearer and more consistent policy signal is required with clearly stated objectives. This includes addressing all aspects of a policy environment (not just climate change specific policies). For example, without an energy system wide view, regulations in planning, energy and consumer markets may not stand the test of a full risk assessment for investment. An integrated approach to energy, transport and land-use policy is needed. Strong and dedicated institutions with clear responsibilities for implementing and monitoring policies, or large integrated energy projects, are a good way to lower the perception of risk.

A fundamental requirement is to shift the cost-benefit of clean energy infrastructure compared to high carbon alternatives. This can be done in a number of ways but a clear call was to alter the price paid for electricity generated either through a carbon price (Denny and O'Malley, 2009) or a shift in subsidies. However, a clear sentiment expressed during the workshops was that a single international carbon price is no longer possible given the political difficulties in agreeing any type of mechanism that could deliver a price. A carbon price can be delivered through many different policy routes such as a cap-and-trade system or carbon tax. Each different policy framework will work better in different conditions and may be more acceptable to certain industries/stakeholders.

This mix of approaches to a carbon price was viewed as achievable rather than ideal. Indeed multiple carbon prices in different regions could be perceived as an additional barrier. A cap-and-trade system is seen as an efficient market mechanism for uncovering the optimal carbon price for a set emissions cap although the ability for a market to respond to very steep emissions caps has not yet been tested. A carbon tax is much simpler to design but is less flexible. Therefore, a tax is likely to be better for driving carbon accounting across organisations that are not carbon intensive.

The use of subsidies to encourage the deployment of new technologies until they achieve a large enough market penetration to become cost-competitive was felt necessary (IEA, 2009). As far as possible any subsidy should be technology agnostic and should focus on the carbon content. Investors feel it is better to regulate for a generic carbon content mix for fuel than to specifically focus on biofuels for example. Exceptions to this come when technologies are immature and require higher subsidies initially to make them cost competitive. Earlier stage technologies such as solar will need higher levels of support than widely adopted technologies such as wind. In certain circumstances, when investor experience with a particular technology is low, subsidies will be needed to help create the market even if technologies are fully cost-competitive.

There is currently not enough evidence to show whether any particular subsidy regime offers a more effective and efficient use of public money. This was reflected in the divergence of views expressed during the Delphi process.

Again the need for long term and stable policy was highlighted. Changes to subsidy schemes across Europe have undermined investor confidence in clean energy infrastructure investments in general – this view was clearly expressed during the Delphi process.

As investors remain wary of subsidies to support clean energy infrastructure investing they also expressed concern over new financial risk management regulations. The key issue within these regulations is the perception (either real or inferred) that it requires funds to invest in liquid assets that are easy(er) to buy and sell. This reinforces the move to mark-to-market[3] investments which allows for better short term knowledge associated with liabilities and risk exposure, and therefore the perception of better risk management. It also allows for more 'competition' in the market as clients who move their investments between funds require liquidity. However, there is a possibility that it will restrict precisely the type of investments that are intended to be encouraged under climate financing regulations – namely longer term investments into infrastructure.

5.1. Shortcomings of research

It is noted that individuals involved in the Delphi process, and often involved in drafting the public statements on clean energy

[2] The GEF Earth Fund used a variant of this model, but with the funds that it invested in managed by a public entity (like an IFI) instead of a private fund. Lessons can be learned from an independent assessment which supported the model in principle but which was critical of the methods and approach taken in the first phase, calling for more clarity on the funds objectives and the role of the private sector, and for use of competitive processes for the selection of funds.

[3] Mark to market, or fair value accounting, allows for assets to be valued based on their current market value (and therefore values are subject to more frequent changes).

investing, held posts related to climate finance or sustainability within their organisations or were members or leaders of coalitions of organisations working in this space. Therefore, a bias may exist in the analysis which may result in barriers or opportunities for the 'mainstream' finance community not being identified correctly. However, this was alleviated to some extent by a wide range of organisations being involved. Further research is needed to expand the community scope and bring in the 'mainstream' finance community to test this assumption.

While each of the three parts of the investment supply chain outlined was represented within CMCI, it is noted that project development (company) representation was limited. This research should be further expanded by engaging with project developers and in particular medium scale project developers in different geographies.

In addition CMCI was set up to achieve consensus on developed country public support for private sector investment into clean energy infrastructure in developing countries. During the interview process it was made clear that the investment community consider clean energy infrastructure in a similar way regardless of geography and therefore the scope of the research was widened to include investments anywhere in the world. However, investors consulted are only those in developed countries, notably those with representation in London, and therefore views of investment organisations such as those owned by the Chinese government or large sovereign wealth funds in the Middle East into other developing and emerging regions are not captured. The research could be additionally extended to include their views.

6. Conclusions and recommendations

With a significant requirement for new clean energy infrastructure at scale, the market for clean energy infrastructure needs to see the largest growth of any asset class in the next few decades. This paper adds to existing scientific knowledge through a clear focus on investment community perceptions of barriers and policy solutions to enable this growth.

In general the investment community does not engage with literature on clean energy infrastructure investing and often this focusses on developing solutions to real barriers. However, during this research the perception of barriers was clearly the driver behind decisions not to invest regardless of whether these barriers are real. There is a clear need for better dialogue between the private and public sectors in this space.

Long term stable public policy is a fundamental requirement for the clean energy sector as it seeks to attract investment at scale. Policy development has to be clear and long term and sit within a coherent framework where price signals and underlying economic drivers are aligned with the goal of a transformation within the energy system. This paper finds that the investors consulted as part of this study perceive a lack of long term stable policy to support investments into clean energy infrastructure.

While there is no real international commitment to changing the underpinning industrial policy drivers (to institutionalise clean energy as a future driver of economic growth) then incentive based policy will continue to support project investments. However, these incentive based schemes will not create macro level transformation. Subsidy based incentives are currently perceived as higher risk due to past changes in European Feed-in-Tariff schemes and are likely to continue to be higher risk while government finance is constrained following austerity measures and the financial crisis. This is clearly a barrier to investment.

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