Where are the Gaps in Climate Finance?

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1. Introduction

The international climate negotiations and the academic literature treat climate finance primarily as an issue of justice (what level of assistance is owed by high emitters; Stern 2013; Grasso 2010) or strategy (what side-payments would secure a global deal; Barrett 2003, 2007). These issues are important, but as capital begins to flow a third, more practical and much broader question is moving to the forefront: Where is additional funding needed most? This Viewpoint concerns this third question, with a focus on financing gaps in developing countries.

Climate finance needs are often defined simplistically as the additional investment required for mitigation and adaptation (see e.g. Haites 2013). Yet, this is only one side of the coin. As important is the ability of investors to mobilize the required funds. A financing gap – and therefore the need to mobilise additional finance – only exists if for some priority needs the required capital is not available.

The ability to raise funds, in turn, depends on the attractiveness of climate investments relative to competing investment opportunities. The debate has suffered from analysing climate finance too much in isolation, as a bolt-on to an otherwise unchanged capital allocation process. In reality, climate and traditional investment decisions are intertwined. Scarce capital is allocated depending on the risks and return of different investment opportunities. The best way to increase the flow of climate finance, therefore, is to enhance the risk-return profile of mitigation and adaptation investments – or to penalise high-carbon and maladaptive investment. A corollary is that climate finance is not just about new funding, but about adjusting existing investment behaviour (Kennedy and Corfee-Morlot 2013).

Even with basic policies in place (such as a price on carbon) capital may not flow immediately in a climate-compatible direction. There may be deeper market failures and behavioural barriers, or investors may simply be capital-constrained – governments and private companies alike are subject to debt ceilings and borrowing limits.

To obtain a sense of potential gaps in climate finance it is worth comparing mitigation and adaptation needs (at an aggregate, regional level) with the ability of public and private investors to raise capital. Investors in some regions find it harder than those in others to raise capital, and so a rough picture about climate finance gaps is beginning to emerge.

2. Investment needs

The investment needs for both mitigation and adaptation have been reviewed by the IPCC in its fifth assessment report (Gupta et al. 2014 and Chambwera et al 2014). In terms of mitigation, various models have been developed over the years to estimate the costs of greenhouse gas abatement (see e.g. Clarke et al 2009; Luderer et al. 2012). An immediate complication for our purpose is that most studies focus on economic costs, either in total or at the margin (that is, for an additional emission reduction effort). This is relevant to measure the economic burden mitigation imposes on society, but to understand financing needs it is more important to know the upfront capital requirements. Total abatement costs are not the same as investment needs because high-carbon and low-carbon technologies differ not just in their upfront capital needs, but also in their on-going operating costs.

Estimates of the required mitigation investments in developing countries – or more accurately the future incremental investment required to achieve 2^{o}C – vary widely (Gupta et al. 2014), but the main studies suggest a range of USD 180-540 billion per year between 2010 and 2030 (IEA 2011, 2012; McKinsey 2009; UNFCCC 2008; IIASA 2012). The range is unlikely to reflect the full level of uncertainty, but it offers a ballpark figure. Studies differ considerably on important questions such as the assumed role of nuclear energy or carbon capture and storage (CCS). Most studies cover investments in energy supply and high-emitting sectors like transport, buildings and industry. Forestry is included only in some.

The level of uncertainty is larger still when it comes to adaptation (Chambwera et al. 2014, Fankhauser 2010). While some evidence can be obtained from integrated assessment models (Agrawala et al 2011a, b; Bosello et al 2010), the main source of information comes from just two studies: the Economics of Adaptation to Climate Change (EACC) project (World Bank 2010; Narain et al 2011) and a UNFCCC analysis on Investment and Financial Flows (UNFCCC 2007, 2008). They suggest adaptation-related investment needs in the order of

USD 60-100 billion per year by 2030 (Chambwera et al 2014). As in the case of mitigation, this relatively narrow range is unlikely to reflect the true extent of uncertainty.

We can compare these future needs with current climate investment activity in non-OECD countries, which over the past two years has fluctuated betweenUSD 165 billion to USD 180 billion per year (CPI 2014; CPI 2013; OECD 2013). Almost 90 percent of this is dedicated to mitigation. The estimate covers public and (less comprehensively) private investment, with most of the finance coming from private sources. The overwhelming majority originates within developing countries themselves (primarily domestic but also South-Southflows). Climate aid, that is, official financial resources transferred from developed countries is relatively small and accounts for less than 12 per cent of total non-OECD climate investment.

3. Financing gaps

Additional climate investment needs are small compared with total capital investment. Gross capital formation in low and middle income countries was over USD 4 trillion on average over the past five years (World Bank 2013). However, as the previous section shows they amount to a considerable increase in current funding.

The question is to what extent climate change investors in developing countries might be constrained in raising this amount of capital. To offer a high-level answer we consider two indicators, one measuring relative climate investment needs, and the other measuring access to finance. The interplay between them speaks to the likelihood of a financing gap.

The first indicator, on relative investment needs, is based on data from the International Energy Agency (IEA 2012) on mitigation and from the EACC study (World Bank 2010) on adaptation. The two studies were chosen because they represent fairly accurately the current state of knowledge, while also providing the requisite level of regional detail. The IEA study provides information for six regions: China, India, other developing Asia, Latin America, Middle East and Africa, and 'other non-OECD', which we re-label more accurately as 'economies in transition'. The published EACC adaptation data are presented by World Bank regions, but using the source data they can be re-aggregated into the same regions as the IEA study. Combining the two estimates yields total additional investment needs for mitigation and adaptation of USD 630 billion a year on average over the coming decades (Figure 1).

Our second indicator measures access finance. This can be assessed in a number of ways, with financial intermediation, interest rates, credit scores, government debt and government borrowing among the metrics used. We chose an indicator based on country credit ratings from Trading Economics (2013). The TE scores combine the sovereign credit ratings of the main ratings agencies (Moody's, Fitch and S&P) with further economic indicators (e.g. stock market indices) into a single measure of creditworthiness. As such the primary focus of the

indicator is the ability of governments to borrow. This seems appropriate, given that energy and infrastructure spending, where most climate investment is required, is often underwritten by the state. However, the indicator also speaks to the financial health of a country more broadly and is therefore also relevant for private investment.

Figure 1 shows the results. The largest amount of climate investment relative to GDP (x axis) is needed in China, which has however good access to capital markets (y-axis), so a financing gap is unlikely. The risk of a financing gap is also relatively low in Latin America, which has the lowest climate investment needs of all regions, relative to GDP, and access to capital just below the median for all regions. Latin America further benefits from a relatively high share of current climate aid compared with China, although as we have seen above climate aid is a relatively small share of non-OECD climate investment.

India and the Middle East and Africa are potential problem areas. Both combine high investment needs, relative to GDP, with poor access to finance. However, both receive a relatively large share of current climate aid (CPI 2013). Access to finance is also poor in the rest of Asia, while transition economies as a region are close to investment grade.

The trends we describe are indicative only. The underlying data are uncertain and the high level of aggregation is certain to mask large disparities – both in terms of investment needs and access to finance – between regions, sectors and investors. However, they convey, at this level, a fairly clear picture on where potential finance gaps might lie.

4. Conclusions

Climate finance from public sources will remain scarce, which accentuates the need to allocate funds wisely. Traditional allocation criteria tend to focus on efficiency and equity considerations: where would funds have the highest impact and who deserves them most? In this Viewpoint we put forward a further dimension, which can inform the existing two: both for equity and efficiency reasons one needs to understand the extent to which potential recipients are constrained in raising capital for climate investment themselves. And we note that the presence of such financing gaps is not necessarily correlated with high overall investment needs. Many high-investment areas have reasonable access to finance.

However, providing development aid-style climate funding, in the form of international loans or grants, is not the only, and probably not even the most effective, way of closing financing gaps. Thought also needs to be given to the reasons why financing is constrained, and the choice of intervention should be informed by the nature of these constraints. There will be instance where other measures (such as technical assistance) or other vehicles (such as national development banks) are more effective than international climate aid. A better

understanding is needed not just of potential financing gaps – more accurate than was possible here – but also of the underlying causes of these gaps.

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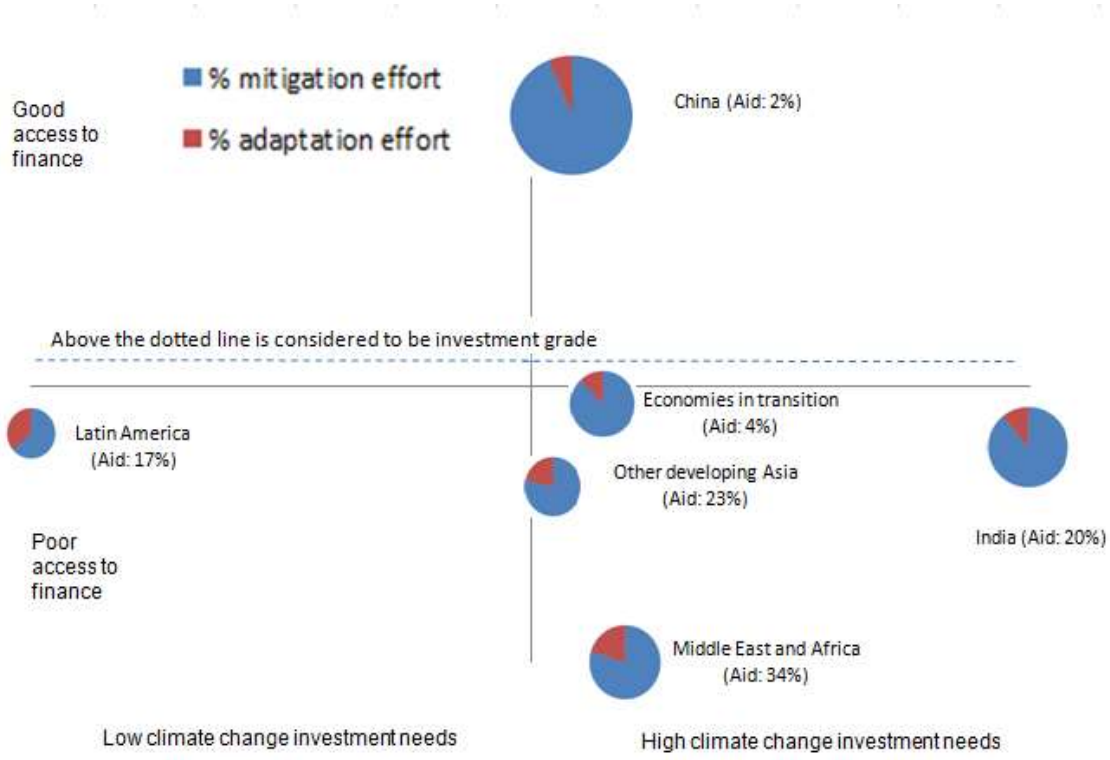
Figure 1. **Climate finance gaps in six world regions**



	Future climate investment needs		TE Credit Scores
	(US$ billion)	(Mitig / Adapt)	(average)
China	205	94% / 6%	79 (≈ A+)
India	110	89% / 11%	47 (≈ BB)
Latin America	59	64% / 36%	49 (≈ BB+)
Other developing Asia	72	78% / 22%	44 (≈ BB)
Middle East and Africa	99	80% / 20%	26 (≈ B-)
Economies in transition	85	88% / 12%	51 (≈ BB+)

Note: The chart is split into four quarters along the median country score for each indicator. The dotted line represents Trading Economics' (TE's) investment grade threshold. Scores above this line indicate good access to finance. Also depicted are absolute investment needs (the size of the bubble), the proportion required for adaptation and mitigation, and each region's current share of bilateral climate aid (i.e., official North-South climate finance; disaggregated data for total climate finance, including South-South flows, are not available). While we do not provide a scale for the axes, the indicators were derived by translating the raw data shown at the bottom of the chart into z-scores and normalising, so that all values reflect how far countries are from the median value for their aggregated regions. Trading Economomics scores range from 0 to 100, where 100 corresponds to a traditional AAA rating. Ratings above 55 (akin to a BBB-) are considered investment grade.