



Climate Change
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Keeping it cool

Financing a 2°C world

Global leaders are aiming to limit temperature rises to 2°C but scientists estimate warming of between 3.7°C and 4.8°C by the end of the century

This report sets out the landscape to finance a 2°C world – the why, what, how and challenges of implementation

Momentum towards 2°C finance is picking up. In our view green bonds are an attractive solution – issuance has been strong and we expect it to continue to grow

By Zoe Knight and Wai-Shin Chan

Play Interview with
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Disclosures and Disclaimer This report must be read with the disclosures and analyst certifications in the Disclosure appendix, and with the Disclaimer, which forms part of it

A note on terminology

Global leaders are aiming to limit temperature rises to 2°C. In this report we use the term “2°C finance” as shorthand for capital allocation that: 1) helps reduce greenhouse gas emissions and/or 2) increases resilience to the consequences of warmer temperatures. See page 12 for more details.

Did you know?

- ▶ Talks are in progress for a universal climate agreement to be signed in Paris in December 2015.
- ▶ In 2010 countries agreed to aim to limit temperature rises to less than 2°C compared with pre-industrial levels (i.e. 1880). So far, 0.8°C of warming has occurred since then.
- ▶ The World Economic Forum (WEF) estimates that USD0.7 trillion, or roughly 1% of world GDP, is required annually to deliver 2°C infrastructure. This is in addition to the USD5 trillion that is already needed for infrastructure such as agriculture, transportation, water, buildings and industry and energy.
- ▶ Green bonds are an important sign that capital is being deployed in the right way to slow warming and tackle its impacts. In the first six months of 2014 green bond issuance reached over USD18bn, more than the USD11bn issued during the whole of 2013.
- ▶ The Intergovernmental Panel on Climate Change (IPCC) estimate that over 2010-2012 some USD343-385bn flowed towards low-carbon activities. Around 95% of this was for reducing emissions (mitigation).
- ▶ Implementing smart climate policies could result in GDP growth. For example, the World Bank estimates that the annual benefits of such policies in just six regions (Brazil, China, EU, India, Mexico, US) would result in GDP growth in 2030 equivalent to USD1.8-2.6 trillion.
- ▶ On an historical cumulative basis, developed countries emitted over 70% of the stock of emissions in the atmosphere. On an annual basis however, developing countries currently emit 60% of annual emissions. This Catch-22 situation on responsibility is a source of friction in global climate negotiations.
- ▶ For a 50% chance of limiting global warming temperature rises to 2°C, the world can only emit around 2.5 trillion tonnes of carbon dioxide. On current emission rates, we will reach this threshold before 2060.
- ▶ At least two-thirds of the global population lives in countries which generate less than USD5,000 income per capita; these are countries most vulnerable to climate change risks but least able to afford them.
- ▶ The sources of pollution and climate change are similar, so tackling climate change through policy and innovation could bring other co-benefits such as reduced health costs.

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Summary

- ▶ Policy signals have been wrong in the past; new drivers are now emerging which will drive momentum towards the 2°C target
- ▶ 2°C finance is hard to define, not correctly labelled and not always disclosed
- ▶ Finance is a sticking point in global negotiations – but demand for 2°C finance is clear, as shown by the growth in green bonds

Keeping it cool

A 2°C target: The 196 Parties to the United Nations Framework on Climate Change (UNFCCC) have agreed to limit temperature rises to 2°C above pre-industrial levels. This can also be expressed as a carbon budget, which means that for a 50% chance of meeting this 2°C target, globally we can only emit 695GtC (i.e. 695bn tonnes of carbon which is equivalent to 2.55 trillion tonnes of carbon dioxide) from now on.

More impacts: The impacts of climate change are already being felt around the world. Failing to meet the 2°C target would mean even more unpalatable implications such as extreme heat waves, lower crop yields and risks to human support systems such as water availability.

Clearer co-benefits: Tackling climate change through policy and innovation could bring other co-benefits such as reduced health costs (since the sources of pollution and climate change are similar).

Financing the negotiations

Universal climate agreement (UCA): Global discussions are underway to reach a UCA which is due to be signed in Paris in December 2015. This agreement would provide the framework for all nations to contribute towards meeting the 2°C target. However, finance is a sticking point for the negotiations as developing nations seek financial support and a safety net to cover the impacts of climate change.

Old policy drivers are waning...

To date, the risk-reward profile of low-carbon projects has been less attractive because:

- 1 pricing mechanisms do not reveal the full cost of carbon pollution from high-carbon projects;
- 2 policy signals (e.g. subsidies) have been encouraging high-carbon and discouraging low-carbon;
- 3 the impacts of climate change are difficult to plan for as the timing of events is unpredictable.

...as new policy drivers emerge

We think that a 2°C world would be “prosperous and resilient” and believe that the transition to a low-carbon world is already underway. The drivers of this change include:

- 1 the real possibility of a climate agreement which would provide the policy signal of clear political commitment;
- 2 the narrowing cost differential between traditional high-carbon and newer low-carbon energy;
- 3 a better understanding of how to price carbon appropriately leads to higher risks for high-carbon but lower risks for low-carbon options.

Defining 2°C finance is difficult

We define 2°C finance to mean the allocation of capital for the development (transition to) and provision (build out) of a low-carbon economy that minimises and is resilient to the impacts of climate change.

Individual emission reductions cannot be ascribed a direct contribution to a low-carbon world because aggregation is near impossible. At the same time, for large-scale infrastructure or construction projects for example, it is difficult to know how much ‘resilience to climate change impacts’ to embed because of the uncertain timing of tail risk events. More resilience costs more money.

Flows of 2°C finance need to grow

Capturing 2°C finance: Aggregating flows of 2°C finance is difficult because of a lack of definitions and a paucity of disclosure. We estimate that billions could be “hidden” in flows such as ODA, FDI, bilateral agreements and other climate-mechanisms like establishing emissions trading schemes. Based in UN numbers, we think around USD400bn is already being spent on 2°C finance annually.

Importance of signalling: The signalling of 2°C finance through labelling and transparency on how capital is deployed is important since it demonstrates that economic systems are moving in the right direction to slow down global warming. It not only provides comfort to investors that the transition is underway, but also signals to policy makers that 2°C finance is possible, is happening and is rewarding.

Incremental spend: The incremental costs of converting traditional finance into 2°C finance are estimated to be in the range of USD700-800bn per year. This amount is on top of the USD5trn which is already required annually for infrastructure to cope with growth.

The green bonds signal

Finance that signals 2°C delivery is important. The instruments are already in place as evidenced by the fixed income markets and the growing issuance of green bonds. In essence, these are identical to traditional bonds except that the proceeds are earmarked for specific purposes (green/2°C). The growing demand for these bonds signals the strong credentials of 2°C finance. For more on green bonds, see [The HSBC Guide to Green Bonds](#) (27 January 2014) and [Green Bonds FAQ](#) (19 February 2014).

2°C finance and the deal

Make or break: The specific challenges that could result in stalemate for the universal climate agreement can be summarised as: taking responsibility for the past and acknowledging responsibility for the future, and the term ‘Climate Finance’ most commonly refers to the flow of capital from developed countries towards developing countries in order to help with climate change mitigation and adaptation. A signal of political commitment would translate into policies that hasten the transition to a 2°C world. The finance issue may be a sticking point but at the same time, a successful agreement could further trigger stronger 2°C finance flows.

Catalysing 2°C

- ▶ There is global buy-in that keeping temperature rises in check is a sensible strategy to maintain geo-political and economic stability
- ▶ Uncertainty and markets have provided the wrong signals for a long time, but the transition to a 2°C world is gaining momentum
- ▶ Now, more data on warming impacts, improving economics in low-carbon and leadership commitment on climate give better signals

Consensus is for a global deal

A long time in the making

The climate community has been working hard since 1992 (the inception of the UN Framework Convention on Climate Change – UNFCCC) to come up with a solution to reduce Greenhouse Gas (GHG) emissions. The UNFCCC currently has 196 Parties (195 States; 1 regional economic integration organization).

The aim of the convention, set out then and maintained today, is to “stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”. To achieve this goal, the target of limiting temperature rises to within 2°C above pre-industrial levels was set, and formally accepted by the UNFCCC in 2010.

In the two decades since 1992, longer time-series of satellite observations and increased computer processing power provide more robust data and modelling on climate science, but understanding of the entire climate system remains relatively immature, giving rise to differences in opinion on the right levels of GHG concentration to aim for. In 2010, the 2°C goal was expressed as limiting

atmospheric GHG concentrations to 450ppm CO₂e, which equated to a 50% chance of meeting the 2°C target. Now, communication around the linkages between the levels of CO₂ consistent with the 2°C goal has evolved so that the notion of a carbon budget is becoming the norm.

Table 1: Remaining carbon budget to limit warming to 2°C

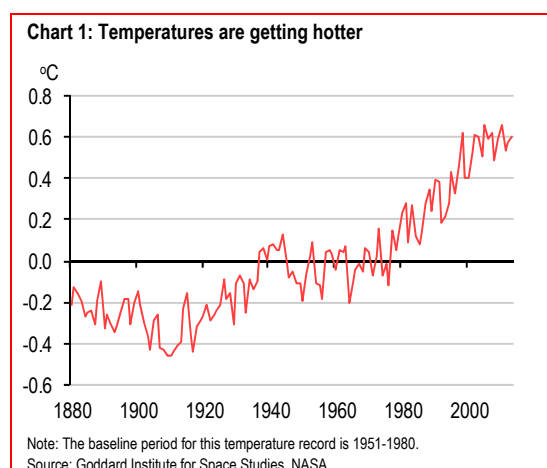
Probability of limiting warming to 2°C	GtC	GtCO ₂
>33%	1,055	3,870
>50%	695	2,550
>66%	485	1,780

Note: 1tC = 3.67tCO₂. Source: WG1 (SPM) IPCC AR5.

Table 1 shows the remaining carbon budget (i.e. carbon that can be emitted into the atmosphere) for a given chance of limiting warming to 2°C. So, for a greater than two-thirds chance, we can only emit 485tC. The more that is emitted, the less chance of keeping within 2°C. For example, we calculate that at a rate of 2% CO₂ growth per year, the carbon budget for a 66% chance will be exceeded before 2050; aiming for a lower (e.g. 50%) chance adds only about 10 years to the budget. Extending the carbon budget means efficiency gains and decarbonisation. The universal climate agreement or UCA (see Box 6 on page 29) should help to provide the necessary impetus.

In 2013, *Environmental Research Letters* published a study by Cook et al which looked at the scientific consensus on global warming. It found that most (97%) climate scientists agree that humans are causing global warming. However, translating that agreement into how to fix the problem is more challenging.

So far, the data shows that 0.8°C of warming is already in the system, and temperatures are biased towards getting hotter (Chart 1).



Universal climate agreement is next

The IPCC provides valuable updates on the status of climate change, and the conclusions of the trilogy of fifth assessment reports are being used by policy makers in the run up to a universal climate agreement, to be signed in Paris 2015.

Over the past year, the reports have covered science, vulnerability and mitigation (see [IPCC: Science, Impact, Forecasts](#), 27 September 2013; [IPCC: Impacts, Vulnerability and Adaptation](#), 31 March 2014, [IPCC: Mitigation, Pathways and Policies](#) 15 April 2014). Essentially, the reports confirm that natural systems changes previously anticipated in relation to warmer temperatures are playing out, that human-related GHG emissions were the highest in the 2000-2010 decade, and that without additional effort the planet is on track for warming of between 3.7°-4.8°C. by the end of the

century. For a list of regional impacts according to the IPCC, see Appendix 1 on page 33.

The implications of a 4°C world are unpalatable and include extreme heat waves, lower crop yields in aggregate, and risk to human support systems like water availability. In 2013, the World Bank commissioned research to investigate the potential impacts of a 4°C temperature rise. The result was “a dramatic picture of a world of climate and weather extremes causing devastation and human suffering. In many cases, multiple threats of increasing extreme heat waves, sea-level rise, more severe storms, droughts and floods will have severe negative implications for the poorest and most vulnerable.”

Despite global acceptance that the consequences of warming will be mostly negative and more expensive to fix the longer they are left, financing economic growth has been high carbon biased for three main reasons:

- ▶ Unfavourable economics for low-carbon
- ▶ Weak policy signals
- ▶ Uncertain timing of high CO₂ impacts

In an ideal world, where everyone operated within the carbon budget, the budget limit would mean market mechanisms could determine the price and volume of emissions, based on supply-demand. Steps are in place to build emission trading schemes, as demonstrated in Box 1 overleaf. We expect a global market for carbon to eventually operate, but not in time for the universal climate agreement in 2015.

Box 1

Carbon pricing

Carbon pricing has long been identified as a way to tip the risk-reward balance more in favour of a low-carbon economy. In theory emitters should emit less when it costs more to do so. A price for carbon can be derived in three main ways: taxes, trading and credits, but so far these have been implemented across countries with varying degrees of success.

Carbon taxes

How does it work? A jurisdiction (e.g. a country or city or region) imposes a fixed price for every tonne of carbon emitted.

How does it reduce emissions? The higher the price, the greater the incentive to be more carbon efficient (i.e. emit less carbon by installing more efficient equipment etc.)

Examples: The province of British Columbia in Canada implemented a carbon tax in 2008 that is designed to “encourage low-carbon economic development”.

Problems: Industry and governments fear that setting the tax too high could hurt competitiveness and feed back into the economy through inflation etc. A carbon tax is often a precursor for a carbon trading scheme.

Carbon trading

How does it work? A defined boundary (such as a country or an industry) sets a limit on future emissions over a time period (e.g. a year). It then distributes these emissions amongst participants (e.g. companies or facilities). Participants that emit more than their quota need to buy from participants who have emitted less (i.e. trade).

How does it reduce emissions? The emissions limit should be reduced (either absolutely or relative to projected business growth) each year so that it becomes harder to comply with. This drives up the carbon price and encourages participants to become more carbon efficient.

Examples: The EU ETS (Emissions Trading Scheme) scheme; California’s cap and trade program; China’s seven pilot ETS schemes; South Korea ETS to begin in 2015.

Problems: If the emissions limit is set too high, it is easily met and results in a low carbon price (as there is oversupply). This is a disincentive to be more carbon efficient as it is cheaper to trade than to improve. The limit can be set too high as projections of future emissions are exaggerated or participants complain it could hurt competitiveness.

Improvements: More accurate emissions inventories and projections of future emissions would make the limit more realistic.

Carbon credits

How does it work? A project (such as a wind farm) generates carbon credits which are then purchased by third parties.

How does it reduce emissions? Credits can be bought for compliance reasons (e.g. as part of an allowance in a trading scheme) or for voluntary reasons (e.g. a facility wants to be carbon neutral). If both the price and demand for credits is high, this creates demand for more projects.

Examples: The Clean Development Mechanism (CDM); China’s Certified Emissions Reduction (CCER) scheme.

Problems: These schemes are mainly voluntary resulting in no guarantee of demand for the credits. There are also wide variations in the certification process and debates as to whether credits are ‘additional’ or not. (See Box 3 on page 16 for a description of the *additionality* concept).

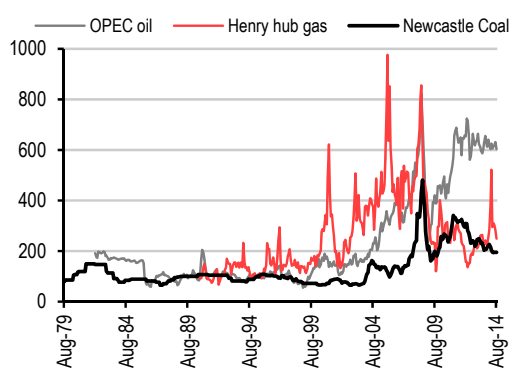
Why markets haven't worked

Price signals don't reveal the full cost

The transition to a world economic engine consistent with a good chance of keeping temperature rises less than 2°C needs a push in the right direction. Cheap, high carbon coal has been the energy of choice in the absence of a CO₂ pricing mechanism (Chart 2).

The lower cost of fossil fuels, especially coal, does not reflect the costs to the environment (such as pollution) and society (such as health). For instance, research by the US Government suggests that each tonne of CO₂ emitted in 2010, contributed to a social cost of USD33 (using 2007 dollars, 3% discount rate). From a carbon emissions perspective, coal emits (on average) 1,020gCO₂/kWh compared to 515gCO₂/kWh for gas, according to the US environmental protection agency.

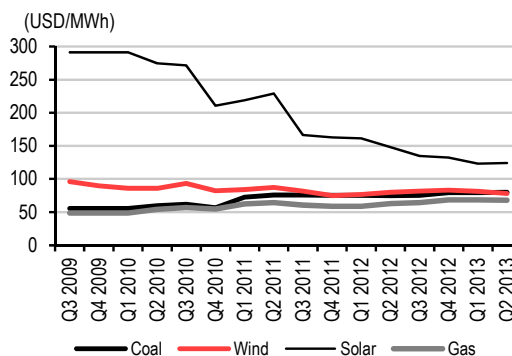
Chart 2: Highest carbon fuel is the cheapest most of the time



Source: Datastream, Note: prices rebased to 100 on 4 April 1990

Sun and wind are of course free, but the cost of converting them into electricity has been relatively expensive to date. However, the cost of these renewables is coming down as technology advances and efficiency improves whilst the cost of both nuclear (safety concerns) and fossil fuels (carbon pollution) is likely to rise. The levelised cost of electricity for wind projects can already be lower than coal (Chart 3) in some regions.

Chart 3: Cleaner sources are becoming more competitive



Note: Wind refers to onshore projects only; Solar refers to crystalline silicon PV with tracking. Source: BNEF.

Drivers of change

- ▶ Regional price competitiveness.
- ▶ Advances in renewables technology.
- ▶ Policy targets (e.g. renewables as a percentage of energy mix).
- ▶ Budgetary positions (e.g. reducing energy import bills).

Policy signals can be perverse

In theory, policy should provide a transition kicker, and so far the implementation of renewable energy targets as a share of the energy mix has helped. However on the flip side, many countries still subsidise carbon-intensive fuels either directly or indirectly through various government policies. These subsidies were originally designed for reasons such as consumer protection, energy access, or economic development. However some of the consequences include encouraging carbon-intensive development, higher energy consumption as well as discouraging renewables development.

The IMF analysed energy subsidies across 176 countries in its January 2013 paper, 'Energy subsidy reform'. They found that on a pre-tax basis (where the price paid by consumers is less than the benchmark or cost-recovery price), global subsidies for fossil fuels amounted to USD480bn in 2011. However, on a post-tax basis (where

negative externalities such as health and pollution are also taken into account), the global subsidy was USD1.9trn.

Despite this evidence of the negative effects, many countries are reluctant to remove subsidies to reflect the full costs of carbon-intensive fuels, as the removal can be inflationary (see [Indonesia: Fuel subsidies: a key inflexion point](#) 26 April 2013). This poses a challenge for 2°C financing since the *perception* is that returns are lower for low-carbon energy investment. However *in reality* this is because low-carbon energy does not benefit from the same level of subsidy top-up that carbon intensive fuels receive.

For example, the IEA estimates that financial support for renewables in 2012 was USD101bn which is about a fifth of the USD544bn of fossil fuel subsidies that year.

The removal of fossil fuel subsidies has increasingly been discussed at the UN level and is being driven by many organisations, including the UN-supported Global Subsidies Initiative. We expect more reform of these subsidies as climate change impacts are increasingly felt and also as the universal climate agreement (once agreed) is implemented at a country level.

In addition some development banks have policies in place to move funding away from high carbon. For instance, last year the World Bank stated “The WBG acknowledges the global challenge of balancing energy for development with its impact on climate change and will help client countries realize affordable alternatives to coal power. The WBG will provide financial support for greenfield coal power generation projects only in rare circumstances.”

Drivers of change

- ▶ Fossil fuel subsidy pressure (e.g. UN, IMF).
- ▶ Commitment towards low carbon (e.g. World Bank lending policies).

Unclear timing of high CO₂ impacts

Planning for the long term is naturally challenging, especially when there is significant uncertainty on the regional impacts of higher temperatures and how the climate system will change. For instance, embedding resilience to climate change consequences into infrastructure is essentially contingency planning without knowing what the worst case (i.e. 2°C, 3°C, 4°C, 5°C or 6°C of warming) scenario will be.

How the impacts of higher temperatures will manifest on a local basis is reasonably well understood, but it’s almost impossible to predict exactly when and where a particular extreme weather event will happen. Meteorologists can assess the likelihood of a 1-in-100 year event becoming a 1-in-25 year event – but even a 25 year spread is wide for infrastructure planning. See [Weather on Steroids](#) 19 July 2012 for more details.

Drivers of change

- ▶ Increased multidisciplinary approach to understanding impacts.
- ▶ More academic and government focus on regional impacts.

How would a 2°C world look?

Answer – prosperous and resilient

The path to a low-carbon economy means increasing energy efficiency, scaling up low-carbon energy provision and embedding resilience to the consequences of warmer temperatures. The idea is to lower the chances of the most catastrophic climate system effects (through reducing emissions) as well as prepare for some of the impacts.

In a 2°C world, the development of energy would take into consideration both the benefits of energy access (e.g. education, economy, time saved and spent doing other things etc.) as well as the associated costs with certain types of energy (e.g. health, climate change, pollution).

Economic growth using less energy

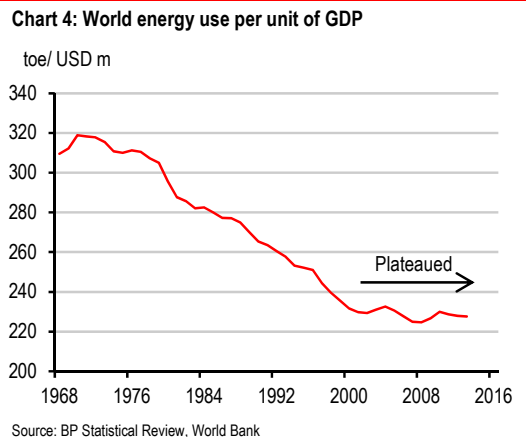
The amount of energy countries consume depends on their stage of economic development and the efficiency of energy infrastructure and processes, as well as domestic energy resources, see [Energy in 2050](#) March 2011.

The global economy more than doubled (115%) from 2002 to 2012 but energy supply grew by only 30%. This decoupling of economic activity from energy consumption means that each billion of GDP required almost 40% less energy in 2012 than it did in 2002.

This is to a large extent the result of greater energy efficiency in the three key sectors – buildings, industry and transport – but it is also a result of changes in economic structure, e.g. from manufacturing to services. We looked at energy efficiency in detail in [Sizing energy efficiency investment](#), 27 March 2014.

Over time, the global economy has extracted more value from each barrel of oil (Chart 4). In 1970, USD3,136 of output was generated from each unit of energy (measured as a tonne of oil equivalent, toe), now USD4,395 is the norm (measured in constant 2005 dollar terms).

Unfortunately, while the value we extract from energy is going up, total energy use is also rising so that the relative gain doesn't outweigh the absolute gain. For instance, the world used around three times more energy in 2013 (12.7bn toe) compared with only 3.7bn toe in 1965.



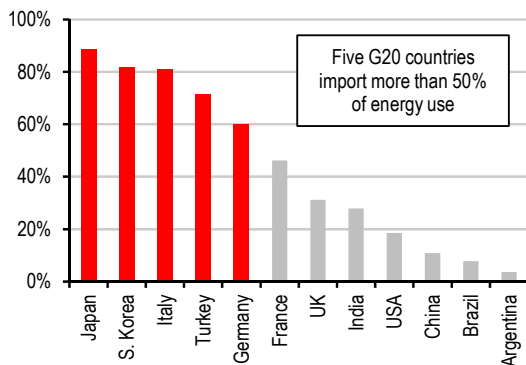
Enabling a 2°C world means channelling growth and energy in opposite directions – output grows while energy needed to produce it falls. Some countries have already achieved this in some years. For instance the EU has managed it 30% of the time since 1965 (see [EU: three-pronged attack on 2°C](#), 25 July 2014). The idea is if developed countries can produce output growth while energy use falls, developing countries can take up the some of the slack and use it for economic growth, boosting income levels.

Spend less on energy

In order to stay within the 2°C target, energy use at a global level needs to become more efficient and the energy mix itself to become less carbon intense. Sufficiently advanced technology is available to do this and deploying it in developing countries would mean ultra-efficient growth, enabling earlier peaking of their emissions trajectory.

Nationally, energy bills have been adding up, and energy independence and security is becoming more of a focus. Using UNCTAD data, we calculate global energy import capital flows in 2013 amounted to USD3.3trn, four times more than the USD780bn ten years ago. Chart 5 shows that five of the G20 countries are reliant on energy imports for over 50% of energy use; for Japan, South Korea and Italy, this reliance is over 80%.

Chart 5: Net energy imports as % of energy use (2011)



Note: These countries comprise the G20 countries that are net energy importers; other G20 countries are net energy exporters (e.g. Saudi Arabia)
Source: World Development Indicators (World Bank)

Stepping up energy efficiency efforts again would reduce national energy costs. For example, in the EU, the Energy Efficiency Directive (2012) should yield 17% energy savings by 2020 which should translate into lower energy costs.

Similarly, increasing energy use does not necessarily need to increase CO₂ emissions if lower carbon sources are used. However emissions do need to be reduced to further avoid a vicious circle of climate impacts and development disruption for certain countries. See [Scoring Climate Change Risk](#) 24 September 2013, for an assessment of G20 country vulnerability to climate change issues.

Co-benefits become clearer

The concept of co-benefits has gained momentum in recent years. For example, tackling the sources of pollution in China helps tackle climate change at the same time. Alternatively, tackling climate change through policy and innovation could bring other co-benefits such as reduced health costs (since the sources of pollution and climate change are similar).

A recent study by MIT, published in *Nature Climate Change*, finds that the “co-benefits.... May offset some or all of the near-term costs of GHG mitigation.” For instance, the study finds that a cap-and-trade system might cost US\$14bn, but the associated air pollution health benefits from implementing this system could be of the order of US\$139bn. For reference, US\$6.5trn was spent globally on health in 2010 (WHO).

The World Bank has looked at some of the other benefits from delivering a low-carbon economy using specific policy measure targeting transport and energy efficiency. The benefits include the lives and energy saved as well as positive effects on GDP growth. For example, its ‘Climate Smart Development’ report from June 2014 estimates the benefits of actions that help “build prosperity, end poverty and combat climate change.” It estimates that the annual benefits of implementing smart climate policies in just six regions (the US, China, the EU, India, Mexico and Brazil) would result in GDP growth in 2030 equivalent to USD1.8-2.6trn (2010 dollars).

Conclusion

The three main reasons why capital has not been channelled in the right direction for a low-carbon economy historically are: unfavourable economics for low-carbon, weak policy signals and the uncertain timing of high CO₂ impacts.

We think the transition towards a low-carbon economy is gaining momentum for three reasons:

- 1 we have the real possibility of a universal climate agreement to be signed in Paris in December next year;
- 2 the cost of renewables has fallen significantly even before the full costs to the economy (of high-carbon) are priced-in; and
- 3 we are beginning to understand how to better price-in other climate risks which would make low-carbon options not just economical but also beneficial.

In our view the ingredients are coming together (albeit slowly) to push capital in the right direction for a 2°C world. There is a growing nudge from policy in various countries (especially from the US and China); the competitiveness of low-carbon technology is improving; industries and corporations are more aware of doing business in a more sustainable manner, but the challenge now is how to turbo-charge funding to facilitate scale up.

What is 2°C finance?

- ▶ 2°C finance is hard to define, making capital allocation problematic
- ▶ Some capital allocation is consistent with 2°C but not labelled as such
- ▶ The IPCC estimates USD343-385bn was spent on 2°C finance p.a. from 2010 to 2012; some 95% of this figure was for mitigation

Box 2

Defining 2°C finance

There is no fixed, catch all definition of what 2°C finance or capital allocation consistent with a 2°C world is; for us, it means:

The allocation of capital for the development (transition to) and provision (build out) of a low-carbon economy that minimises and is resilient to the impacts of climate change.

In climate jargon, this is financing for *mitigation* and *adaptation*.

An important point to remember here is that *consistent with a 2°C world* does not necessarily result in *limiting temperature rises to 2°C*. We explain this in more detail in the “CO₂ benchmarking problem” section below, but the general concept is that making energy and economic systems *relatively* more CO₂ efficient (e.g. less CO₂ per tonne of steel produced) is beneficial, but may not translate into an aggregate *absolute* reduction in CO₂ to levels required to limit warming to 2°C.

Terminology: We use *2°C finance* as shorthand to denote capital allocation that is *consistent* with limiting warming to 2°C, NOT to denote that these activities *will* actually deliver a 2°C world.

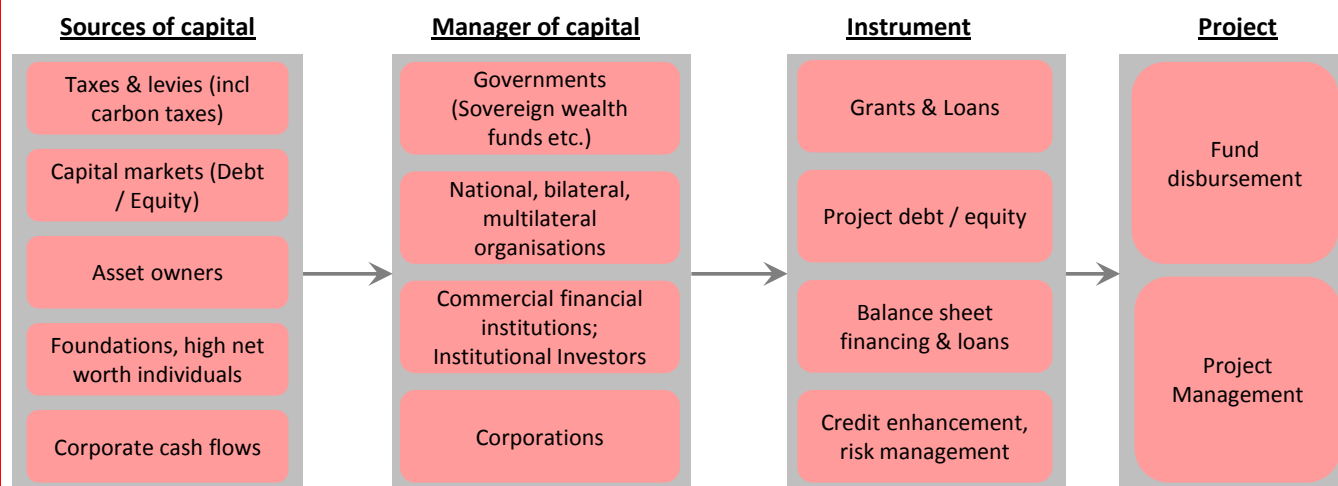
Who is investing in 2°C?

Sources and managers of capital are well known and are summarised in Chart 6 overleaf. Public sector funding comes from taxes and carbon credit allowance auctioning as well as larger scale fixed interest issuance on the capital markets. Other sources of funding come from asset owning organisations (such as public and private sector pension schemes) charitable foundations and high net worth individuals as well as corporate cash flows (which could be philanthropic or operational).

Capital might be invested directly into a project or indirectly (e.g. via a third party). There are many ways the capital manager can allocate the funds (as shown in the ‘instrument’ column of Chart 6). For instance, a public sector source of capital could be disbursed as a grant (which doesn’t need to be paid back) whereas an institutional investor would be more likely to invest in a more liquid instrument such as bond.

There is general agreement that the scale of funding requirements for 2°C will be large and that the sources will have to come from both the public and private sector. Estimates on the size of investment already made, and the requirements for a 2°C world are an art rather than a science because of definition difficulty and the magnitude of assumptions required. In our view, the IPCC

Chart 6: Sources of financial capital



Source: HSBC (adapted from IPCC Working Group III, Mitigation of Climate Change, Chapter 16: Cross-cutting investment and finance flows)

offered the most comprehensive assessment in its mitigation assessment report. They estimate that between USD343-385bn was spent on climate activities, mostly mitigation, annually between 2010 and 2012.

Whilst we think the entities, mechanisms and instruments to scale up 2°C finance are in place, the bottleneck comes from the problem of defining 2°C finance. We highlight some of the definitional issues below.

Finance versus 2°C finance

Many financiers do not take into account climate considerations when providing capital – they merely supply capital to projects consistent with their risk-reward profile. For those that do consider climate change, many do not explicitly label the project as being 2°C finance (or climate-aligned or climate-related etc.). Sometimes, isolating only the 2°C finance component of a project is difficult to do and may not tell the whole story.

For example, the construction of an industrial plant may cost a total of USD50mn, which includes USD5mn of specific components that make it highly resource and energy efficient. Some financiers might only consider the USD5mn

as 2°C finance; others may argue that the whole plant (USD50mn) is 2°C finance because the specific components make the *whole* plant much more efficient.

Turning finance into 2°C finance consists of analysing whether the use of capital is consistent with the provision of low-carbon systems or resilient to the impacts of warmer temperatures.

How to spot 2°C finance

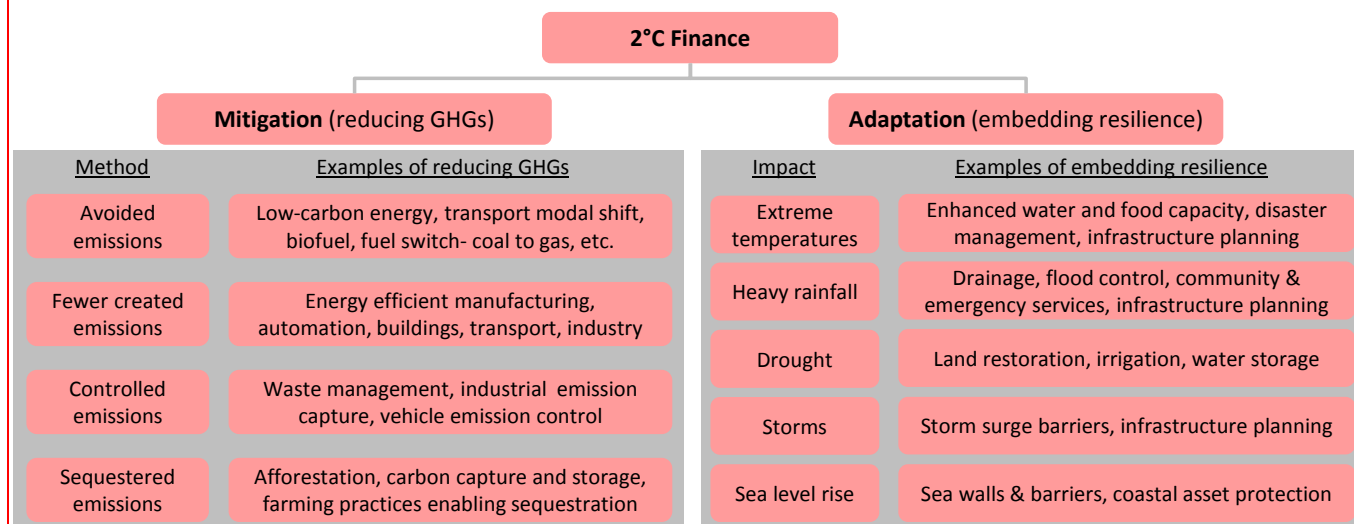
The immediate considerations of whether capital allocation can be considered 2°C finance are twofold and might be considered independently or collectively (Chart 7 overleaf). These are:

Mitigation – an assessment of emission reduction potential (e.g. through avoiding-, generating less-, controlling- or capturing- emissions)

Adaptation – an assessment of resilience to potential future impacts of higher temperatures (e.g. making assets stronger so that the cost of disruption is lowered)

The main complexities around these two points are how to benchmark CO₂ and what sort of resilience scenario should be built in.

Chart 7: How to spot 2°C financing based on mitigation and adaptation



Source: HSBC (adapted from Quantifying Greenhouse Gas Mitigation Measures, CAPCOA, California (2010), Greenhouse Gas Protocol)

The CO₂ benchmarking problem

Less CO₂ versus CO₂ for 2°C

Releasing less greenhouse gas (GHG) is beneficial, but is not the same as reducing GHGs to a level consistent with limiting temperatures rises to 2°C.

The IPCC estimates that a 40-70% reduction of annual GHG emissions in 2050 benchmarked against 2010 levels is consistent with a likely (i.e. >66% chance) of keeping temperatures changes below 2°C. Since CO₂ represents 80% of GHG's, and 80% of CO₂ comes from energy, much capital allocation in the energy sector can be assessed for alignment with 2°C finance.

The distinction between 'less CO₂' and 'CO₂ consistent with limiting temperature rises to less than 2°C' boils down to an assessment of relative and absolute emission reduction. For instance, making a steel facility process efficient enough to minimise CO₂ per tonne of steel produced is positive on a *relative* basis, but subsequently doubling steel output doesn't help with an *absolute* reduction in CO₂ emissions.

Various organisations such as the IFC, ADB and other lenders adopt many different methodologies to assess whether or not a project is "beneficial for the climate". Common threads include an account of the emissions reduction associated with the project, and an assessment of whether or not the project is "additional". (We look at the concept of *additionality* in Box 3 on page 16). Each project must be assessed on its individual merits. In all cases however we welcome transparency and disclosure of the methodologies used to calculate the emission gain.

Chart 7 also shows some of the nuances of mitigation and the benchmarking problem. We expand on these below.

Avoided emissions

Definition: For a given objective (e.g. getting to work), the method chosen avoids, either directly or indirectly, emissions which would have been created using another equally viable method.

Explained: There is a way to achieve the objective with no associated emissions. (We note this is not usually the case with large projects since some emissions are inevitable).

Measurement: Compare the zero-emissions method with emissions that would have been generated from alternative methods.

Example: Walking or cycling to work instead of driving.

Fewer Created emissions

Definition: For a given objective (e.g. providing electricity to a certain number of homes, or electricity provision for EV charging stations), the method used to accomplish this is improved or altered in a manner such that fewer emissions are created.

Explained: Where emissions are *unavoidable*, this method creates less.

Measurement: Compare chosen (improved) method with emissions that would have been generated from alternative (original) methods.

Example: Choosing to power a project using renewable energy over fossil fuel energy, improving the efficiency of an existing facility which uses fossil fuels; or choosing rail transportation over road.

Controlled emissions

Definition: The emissions generated from an activity are deliberately controlled in a manner which lowers the overall contribution to global warming.

Explained: The emissions are *already* being generated, so now the *choice* is what to do with them (i.e. convert them into something else).

Measurement: How much GHG was *directed away* (e.g. prevented) from escaping into the atmosphere (by the choice made).

Example: Converting the GHG into other chemical substances, for example, as a raw material for the production of urea.

Sequestration

Definition: The emissions generated from an activity (e.g. oil and gas processes) are deliberately captured and stored so that they don't contribute to global warming.

Explained: The emissions have *already* been generated but are *stored* to prevent escape into the atmosphere.

Measurement: How much GHG was prevented from escaping into the atmosphere (by storing).

Example: Using carbon capture and storage technology for oil and gas facilities.

The sum-of-the-parts might not add up to <2°C

We noted above that allocating capital in a way that is *consistent with a 2°C world* does not necessarily result in *limiting temperature rises to 2°C*. A perfectly valid question to ask is 'how much will the emission reductions from this project contribute to the global goal of limiting warming to 2°C?'

This is a very difficult question to answer. To establish the impact of an individual project on the global effort would mean that all mitigation efforts would have to be aggregated at the global level, the individual project gains would have to be measured against total emissions and then assessed if they are in-line with the 2°C reductions aimed for. Essentially, it is almost impossible to ascribe contribution to the global 2°C target to individual projects.

The CO₂ benchmark problem makes resilience

important: As described above, reducing CO₂ is not the same as reducing CO₂ to a level consistent with a 2°C world. So whilst we believe all efforts to reduce CO₂ should be welcomed, they might not be sufficient to avoid the consequences of warmer temperatures. This is why embedding resilience is also important.

Box 3

'Additionality' – the CO₂ challenge

Additionality describes whether a project delivers GHG reductions “*in addition to*” the status quo or a baseline scenario that either already exists or would have been implemented anyway. I.e. it tries to address the question of *more than* – for example, doing *more than* is required, or doing *more than* normal, or doing *more than* was planned.

Problem: This description is open to wide interpretation, especially since it relies on a truthful depiction of ‘baseline’; agreement on what ‘would have been’; as well as accurate accounting of GHGs. As such, additionality is a common gripe between countries at the negotiating table as some critics question the climate credentials of certain projects.

The embedding resilience problem

If mitigation efforts in aggregate are not enough to limit warming to 2°C then the consequences are likely to be far more severe. Given this possibility, many projects are being “adapted” – that is “embedded with resilience” – to withstand the impacts of a warmer world.

More warming; more impacts: According to the IPCC, “losses accelerate with greater warming” although the relationship is not linear because how events will play out at higher temperatures (i.e. what the tail risk is) become less clear. So whilst the phrase “the higher the warming, the more severe the impacts” is true, it is difficult to quantify this.

Planning for 2°C versus planning for 4°C: For planners and policy makers, it is challenging to decide whether to plan for the consequences of a 2°C world vs a 3°C or even 4°C one because “adaptation is place and context specific, with no single approach for reducing risks appropriate across all settings” (IPCC).

There are many variables in the decision.

Planners must find a balance between embedding additional resilience (which costs more now) and the potential disruption across the whole economic and social network associated with an asset or a project (which costs more later).

Embedding extra resilience now costs more

More often than not, embedding the *extra* resilience (e.g. able to withstand 3°C vs 2°C) costs more, and the costs are borne upfront today.

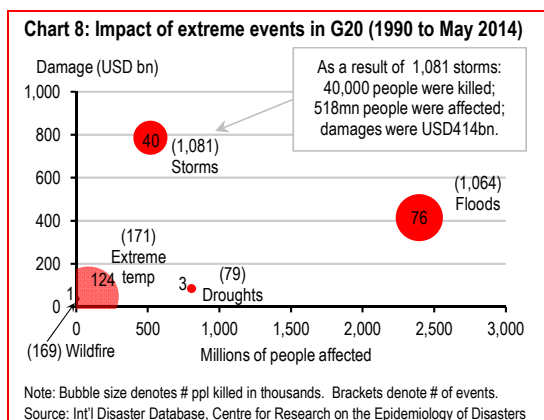
For example, building a bridge able to withstand 1-in-25 year storms (i.e. bigger and more severe with greater floods) will cost more now than one which is only able to withstand, say, 1-in-10 year storms. The decision over which bridge to build will need to factor in the potential for rebuild within 25 years and the disruption to the local population and economy caused by the more severe storm.

The financing decision would need to assess costs in at least three ways:

- 1 *build costs* – it would cost more to build *two* bridges (i.e. one now, and another after the storm) than to build *one* stronger bridge now;
- 2 *disruption costs* – the severity of the disruption to the local economy would mostly likely be higher with the weaker bridge (e.g. lost income or repair costs);
- 3 *wasted costs* – embedding *too much* resilience now is a waste of capital (since there is no way of predicting the timing and severity of storms).

Disaster costs are rising

The costs of disasters have also been rising. Since 1990, over 4.3bn people have been affected by natural weather related disasters (such as floods, storms, wildfires, droughts and extreme temperatures), with estimated damage costs at USD1.5trn. For the G20 alone, damages from these particular events are estimated to be over USD1.3trn (Chart 8).



It is difficult to attribute specific events to climate change – but the impacts are already being felt. The IPCC believes “In recent decades, changes in climate have caused impacts on natural and human systems on all continents”. The trends in weather extremes over the last few years are consistent with scientific views published in the IPCC assessment reports (see [Weather on Steroids](#), 19 July 2012).

The risks of these impacts could be lowered by keeping temperature rises to below 2°C (mitigation) and making infrastructure more resilient to the impacts (adaptation).

The embedding resilience problem brings an extra layer of complication to financing decisions. The challenge facing both planners and financiers is finding and agreeing on an acceptable balance between:

- ▶ Costs now versus costs later
- ▶ Risk of damage versus wasted capital

Uncertainty of timing and scale of impacts makes it all too easy to avoid financing resilience, with inertia resulting in accepting the easy option.

In spite of this however, we believe that more resilience is already embedded than is generally known publically. For instance, the 100-yr plan to protect the London Thames Estuary puts “climate

change adaptation at its core” rather than just flood risk in general.

We think that financiers need to be made more aware of the climate aspects of the projects they are financing, since many projects, particularly infrastructure, have long lifecycles. At the same time, it would be helpful if project planners and developers were more explicit in disclosing the climate information in relation to projects, such as the ability to face sea-level rises of 10m or to withstand 1-in-50 year storms.

Box 4

Financing infrastructure example

Infrastructure systems are the life blood of the economy. Energy systems power homes and factories, transport systems get people to work and water systems maintain good health. As countries upgrade aging infrastructure and roll out new ones, what makes these networks 2°C enabled instead of normal?

Essentially it’s an assessment of the emission reduction potential and the future impacts. The Konkan railway in India provides an illustration.

Preparing Konkan Railways for climate change impacts (based on the UNEP report ‘Promoting low carbon transport in India’, August 2013.) The Konkan railway project in western India spans 760km and was completed in 1998 at a cost of USD755mn. A number of cancellations and deaths since then have been attributed to boulders on the track, caused by rainfall and soil slippage.

A subsequent assessment looked at how much rain caused the boulders to fall historically, and importantly, how much rain is expected to fall (both frequency and intensity) in the future given known climate models. It also looked at how surrounding forest coverage prevented soil slippage and hence boulders falling.

The operating company invests in ongoing “preventive adaptation” to reduce the vulnerability of the railway to landslides as a result of increased rainfall. This helps to make its railway *stronger* i.e. *more resilient* to the impacts of climate change.

A further adaptation measure would be to invest in increasing the overall forest coverage area surrounding the railway, but this would cost too much and is beyond the ability of the operating company alone, highlighting the need for public and private funding.

Green vs 2°C

There are many reasons why 2°C finance is not more visible. One reason is the often confusing terms, definitions and labels used around green and climate. Another reason is because of a lack of climate-related labelling which results in hidden investment flows.

Green finance is not the same as 2°C finance

Some green projects are consistent with fostering a 2°C world by limiting temperatures and / or embedding resilience to impacts (and vice versa), but this is not always the case. There is also no widely accepted definition as to what qualifies as “green” although some issues are more evidently green than others, such as pollution clean-up.

Many green and climate themes overlap, such as renewable energy and energy efficiency. However, for us, whilst similar, green factors and climate factors are not quite the same. We demonstrate why with two examples.

Example of when green $\neq$ 2°C: a wastewater treatment plant (which improves the quality of water effluent to specific levels) can be classified as green because it is cleaning up pollution. However, unless it addresses the emissions from the effluent, or prepares for the impacts of warmer temperatures and water shortages by making sure

the plant is located in a suitable geography, it is not a 2°C project.

Example of when 2°C $\neq$ green: a nuclear power plant which produces zero CO₂/kWh helps to reduce emissions and can be classed as consistent with enabling a 2°C world. However, the issues around nuclear waste and health factors are not generally considered green.

The difference between green and climate is tough to pinpoint. In our view climate change extends beyond green and environmental issues because it touches humanitarian areas as well, such as energy access, food security and climate related migration. In addition, political factors such as energy security can also influence climate related decisions.

Direction of travel signal is important

We think the more important point is that labelling financial flows signals consistency with keeping temperatures down or preparing for the impacts of warmer temperatures. To put it another way, financial flows should be able to demonstrate that economic systems are moving in the right direction to slow warming.

On this basis, we think it is important for project developers and planners to be more explicit on what capital will be used for and how climate change factors are taken into account. We realise that in many cases this is easier said than done and that it may be more obvious for smaller projects than larger ones – nonetheless, we emphasise the importance of signalling the direction of travel. (We look more at signalling and specifically green bonds as an example of showing what capital will be used for later.)

Mixed views on 2°C spend

It is very difficult to calculate how much investment has already been dedicated towards the 2°C climate goal because of the lack of definitions and the paucity of disclosure. This year, for the first time, the IPCC’s ‘Mitigation, Pathways and Policies assessment report included

a chapter on finance. They estimated that from 2010 to 2012 USD343-385bn was spent annually with 95% for mitigation and 5% on adaptation activities. Their estimates of the segments of funding are highlighted in the table below.

Table 2: Estimates of 2°C finance vary widely

Segments of funding (may include overlap)	Period	Investments (USD bn)
Total investment for climate	2010-12	343-385 p.a.
Flow to developing countries	2009-12	39-120 p.a.
Investment in CDM* projects	2004-12	400 total
Carbon funds	Since 1999	14.2 total
Other multilaterals	2011-12	51 total
Carbon taxes / allowances	Various	9 p.a.

Source: Cross-cutting Investment and Finance Issues, final draft report (dated 17 Dec 2013) of 'Climate Change 2014: Mitigation of climate change', Intergovernmental Panel on Climate Change, Working Group III. *Clean development mechanism

Why aggregating 2°C flows is difficult

Aggregating the total flows of 2°C finance is difficult because many flows are hidden, in the sense that they could be invested according to another agenda. For instance, investment for sustainable development will often have similar characteristics with 2°C finance but could have an alternative ultimate aim such as reducing poverty.

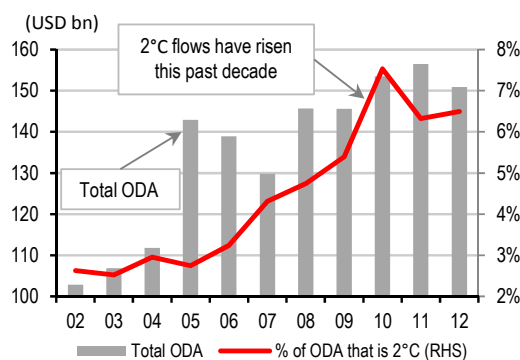
Official development assistance (ODA) is an example of potential capital allocation that may be 2°C finance consistent but not explicitly accounted as such. In addition, most development institutions already address climate change issues as part of project assessment.

Official development assistance (ODA)

According to the OECD, "ODA is the basic financial support used to develop the building blocks of nations, from healthcare and education services, to building infrastructure".

By looking at the classification of ODA finance flows, we have estimated the proportion of ODA that is consistent with 2°C finance by aggregating total global ODA flows reported by the OECD from obvious sectors such as 'power generation from renewable sources' as well as some less transparent categories such as 'environmental protection'.

Chart 9: 2°C finance ODA flows have broadly risen in the last decade (const 2012 prices)



Source: HSBC estimates (based on OECD-QWIDS data)

On this basis we estimate that around 6-7% of the USD151bn in total ODA deployed in 2012 could be considered as 2°C finance, which puts the figure at around USD10bn. We acknowledge our figure is very much an estimate since we did not scrutinise each and every project. Indeed, some ODA projects are labelled for mitigation and adaptation but the IPCC notes that researchers question the accuracy of project classification. Nevertheless, it is encouraging that this 2°C finance proportion has more than doubled in the decade since 2002, as shown in Chart 9.

Flows of total ODA did not decline significantly throughout the financial crisis, and could grow to reach the internationally recognised target of 0.7% of GNI in the future. (Note: According to the OECD, this 0.7% ODA/GNI target was first agreed in 1970 and has served as a reference at various political meetings such as the UN World Summit.)

We expect the proportion of ODA consistent with 2°C financing to grow in the future driven by increasing acknowledgement of existing climate impacts, global efforts to reach a universal climate agreement, and more accurate classification.

Based on the 0.7% target, our 2020E GDP forecasts for 27 DAC (Development Assistance Committee of the OECD) countries and a stable proportion of flows from other donors, we calculate the 2°C proportion of ODA could be around USD17bn in 2020 (using 6.5% of ODA).

Foreign Direct Investment (FDI)

It is much more difficult to estimate the 2°C finance flows within global FDI because of the broad nature of these investments made “outside of the home country”. In addition, the breakdown of FDI varies considerably between countries.

Bilateral Agreements

2°C finance can also be hidden amongst bilateral flows. For example, the European Commission recently launched a Pan-African Programme to “fund activities in a broad range of areas”. Some €845mn (USD1.11bn) will be allocated to “increased mobility on the African continent, better trade relations across regions and also better equip both continents for addressing trans-national and global challenges, such as migration and mobility, climate change or security.”

This shows that some part of the €845mn is essentially 2°C finance, but even here it is difficult to pin down exactly how much. The EU and Africa plan to focus on five strategic areas. These are:

- 1 Peace and Security
- 2 Democracy, Good Governance and Human Rights
- 3 Human Development
- 4 Sustainable and inclusive development and growth and continental integration

5 Global and cross-cutting issues

Interestingly, climate change is mentioned under four of these strategic areas (i.e. all except Democracy, Good Governance and Human Rights).

Multilateral development banks

Many multilaterals are actively involved in 2°C finance and most have strict guidelines governing what the funds can and cannot be used for. Chart 10 shows some of the key players in this arena.

The World Resources Institute (WRI) has looked at these flows in more detail. WRI estimates that the World Bank group, for example, provided USD9.6bn worth of finance to 40 projects in “climate-relevant sectors” over 2005-11 (this number excludes contributions to climate funds).

Other examples of hidden 2°C finance

2°C finance can also be hidden in grants, loans and loan guarantees provided by donors such as government organisations or multilateral banks. For example, over USD50bn in grants, USD24bn in loans and USD7bn in loan guarantees were given for renewables and energy efficiency between 2009-13 (according to BNEF). These are difficult to track and do not capture all types of financing (e.g. hybrid financing such as part grant etc.) and so we think total amounts are likely to be underestimated.

Chart 10: Key multilateral sources and intermediaries

Key players	Example of Financing instruments
World Bank Group IBDR – Int’l Bank for Reconstruction and Development IDA – International Development Association IFC – International Finance Corporation	Grants – project, advisory & assistance Loans – long term, concessional, direct Equity – convertible debt, preferred stock Funds – for ODA, trust funds, asset management, funds for private equity and debt De-risking – risk management, guarantees, swaps
Others multilaterals ADB – Asian Development Bank AfDB – African Development Bank IDB – Inter-American Development Bank EIB – European Investment Bank EBRD – European Bank for Reconstruction & Development	Grants – technical assistance Loans – direct, concessional, guaranteed, emergency, long term, project Equity – direct, indirect, convertible, mezzanine Funds – tranche facilities, special funds, VC De-risking – swaps, guarantees, synthetics, insurance

Source: HSBC (based on Public Financing Instruments to Leverage Private Capital for Climate-related Investment, World Resources Institute, 2012)

Other areas which could include 2°C financing but may not be explicitly disclosed as such could be: government subsidies (e.g. UK green deal); costs of establishing carbon trading schemes; private equity into low-carbon technologies.

Conclusion

We have demonstrated that pinpointing 2°C finance is complex. For us it means: *The allocation of capital for the development (transition to) and provision (build out) of a low-carbon economy that minimises and is resilient to the impacts of climate change.*

It is difficult to assess how much has already been spent towards financing a 2°C world given the definitional issues and the hidden sources of finance described above; we think aggregate flows are likely to be underestimated as a result.

We believe it is increasingly important that capital allocated in line with a 2°C finance framework is labelled as such, since signalling the direction of travel is a way to encourage more funding.

Additional funding is required to plug the gap between what is being spent today and what needs to be invested to be on track for a 2°C world. We look at this in the next chapter.

Scaling up 2°C finance

- ▶ Estimates of incremental cost to convert finance to 2°C finance are around USD700-800bn per year – in addition to normal spending.
- ▶ Labelling is an important signalling mechanism to encourage other investors to pursue similar opportunities in 2°C finance.
- ▶ Green bonds provide institutional scale-up potential and show that climate change is an important part of decision making.

Signalling direction of travel

The 2°C panacea won't happen overnight, nor will it be free, but going forward we believe that it is important for financial flows to demonstrate that the economic system is moving in the right direction. Over the near term, it will be more expensive than implementing “business as usual” but over the long run, it should be less costly.

How much is needed?

The general consensus is that delivering a 2°C world requires incremental investment, i.e. over and above the amount already pencilled-in for infrastructure expansion to cope with growth needs. However, just as it is difficult to estimate how much has already been spent, it is even harder to assess what the funding requirements are to transition to low-carbon and embed resilience. Some of this will be invested anyway to cope with a growing population, provide better networks and systems and enhance economic growth prospects.

Estimates vary widely

Different organisations have tried to put a figure on how much it will cost to reduce emissions.

In 2007, the *UNFCCC* estimated that additional investment of “USD200-210bnn will be necessary in 2030 to return global GHG emissions to current levels (26GtCO₂)”. It did not give an aggregate number for adaptation because “adaptation measures to climate change will be widespread and heterogeneous.” Adaptation is best assessed at a regional and local level.

In 2010, a World Bank study on the *Economics of Adaptation to Climate Change* concluded that the cost of adapting to a 2°C warmer world was USD70bn-100bn per year between 2010-50, however “costs could be even higher, once sectoral impacts are taken into account.”

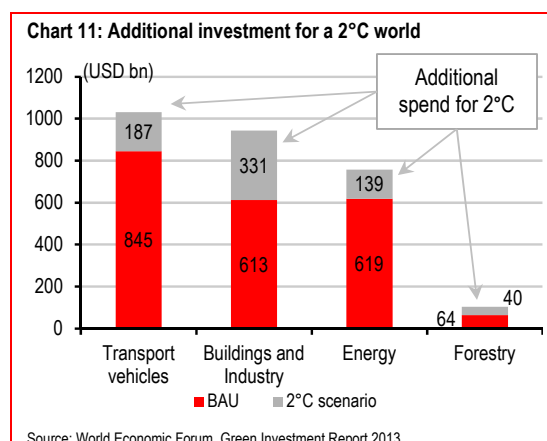
In 2013, the *World Economic Forum Green Investment report* estimated that the “additional investment needed to meet the climate challenge—for clean energy infrastructure, sustainable transport, energy efficiency and forestry—is about USD0.7 trillion per year.”

Another study published in *Climate Change Economics* in November 2013 found that “policies consistent with a 2°C climate change target would require.... USD0.8 trillion per year”.

The variety of studies and spread of estimates show that there are many ways and means to calculate how much it will cost to keep temperatures down and prepare for the consequences of change. Clearly the values provided are dependent on the assumptions made around economic growth, speed of energy efficiency take up and decarbonisation rates. For a summary of various studies, compiled by Friends of the Earth, see Appendix 2 on page 34.

Incremental or additional investment

The Green Investment Report (WEF, 2013) estimates USD5trn per year of infrastructure investment to 2020 is necessary for growth. However, an *additional* investment of USD697bn per year is required to meet the climate challenge, in other words, to convert this into 2°C finance. Chart 11 shows the additional spend for certain sectors.



In the previous chapter, we looked at how much has already been provided from a 2°C financing perspective and found that even taking hidden flows into account, estimates of annual spend are in the region of USD400bn. Using the WEF's calculation of USD700bn to convert financing to 2°C financing, there is still a funding gap of around USD300bn – annually.

An incremental amount of USD300bn to find for 2°C finance is not small change, and points towards significant scale up requirement of existing flows. This USD300bn gap is equivalent to the size of Singapore's economy.

We discuss why funding is a sticking point in global climate negotiations in Box 5 on page 28.

How to scale up

In chapters 1 and 2, we set out why there hasn't been more 2°C finance so far. Unfavourable economics for low-carbon, weak policy signals and uncertain timing of high CO₂ impacts have previously tipped the balance against 2°C finance.

Currently, policy and history tip the balance in favour of high carbon, for example, through fossil fuel subsidies or the perceived lower risks of carbon-intensive technologies. While low-carbon adoption is not yet widespread, we think that the dynamics are set for tipping the balance more in favour of 2°C finance. In some regions, the economics already add up, but in many cases they still need to be helped towards more favourable risk-reward characteristics. We look at how the balance can be tipped below.

- **Increasing the reward:** Minimise the incremental costs associated with less CO₂, or by removing the enhanced rewards of high carbon.
- **Decreasing the risk:** Requires more policy certainty on commitment towards a low-carbon economy and more knowledge on preparing for the consequences of a warmer world.

There is no way around the point that 2°C finance requires more thought than simply funding growth. We look at how to remove the short term pain (perceived lower returns and higher risk) to generate long term gain (a prosperous and resilient global economic infrastructure).

Increasing the reward

Price carbon and remove preconceptions

Over the longer term we expect carbon to be priced (Box 1 on page 7) and this should naturally favour lower carbon projects. In addition, the carbon price should rise as climate policies change (e.g. subsidy removal; increased urgency of reacting to the climate impact) and the external costs of high carbon projects are better priced-in (i.e. pollution damage, health costs). Essentially, we think it's going to become more expensive to emit in the future.

Pricing carbon is a slow process. In the meantime, the rewards can be enhanced by giving low-carbon a "leg up" via mechanisms like feed-in-tariffs. To make these work, policy commitment is key since policy drivers can create the right signals to grow markets and increase revenue potential. For example, targets for renewable energy as a percentage of the overall energy mix.

Decreasing the risk (differential)

Entities need a high credit rating to borrow at the lowest possible rates. But for 2°C finance the projects can often be in riskier geographies and for riskier projects. Some projects, such as large scale infrastructure, will gain the benefit of public backing which will enable more favourable borrowing rates.

In the short term, standard risk reducing mechanisms such as guarantees, government involvement and hierarchical payment structures help to bring low-carbon projects more on a par with high carbon projects. Table 3 gives some examples.

Table 3: Examples of some de-risking techniques

Method	Example of instrument
Guarantee	Partial risk, partial credit, policy-based, offshore liquidity, public sector, performance
Insurance	Political risk, export credit
Swaps	Currency, interest rates, index, risk management
Synthetics	Loans, interest rate cap/collar
Risk sharing	With local banks, through trade financing
Others	Disaster risk financing, letters of credit

Source: HSBC (based on Public Financing Instruments to Leverage Private Capital for Climate-related Investment, World Resources Institute, 2012)

At the same time, the risk for high carbon is also increasing. For example, in the USA the introduction of the 'Clean Power Plan' will make it more expensive to operate coal-fired power plants through stricter pollution requirements (see [USA: Climate boost for Paris 2015](#), 3 June 2014).

Also, over time, as low-carbon projects and technologies gain longer operating histories, the perceived risk differential should narrow.

De-risking challenges

Many short term instruments can be employed to spread the risk so that investors feel more comfortable with the risk-reward profile.

We think that if climate risks were better-understood and properly priced-in, then climate-aligned projects would be cheaper. Similarly, those projects which cause global warming would be deemed riskier and priced accordingly.

Risk and uncertainty are facts of life. We routinely incorporate them into most decision making, but so far it's been easier to ignore the risk and uncertainty on the impacts of climate change because they are global in nature and can come with very long timeframes.

Enter green bonds

An example of 2°C financing

The transition to a low-carbon world does not necessarily require new financial instruments as many appropriate instruments already exist, for example, in fixed income markets green bonds are a natural choice.

In the previous chapter, we showed that definitional issues were a bottleneck to more 2°C financing. Here, we use green bonds as an example of how some financiers have defined and labelled investments that are consistent with a 2°C world. For more on green bonds, see [The HSBC Guide to Green Bonds](#) (27 January 2014) and [Green Bonds FAQ](#) (19 February 2014).

In the first six months of 2014, green bond issuance reached USD18.4bn, already a 67% increase on 2013 as a whole. Since transparency and labelling provide an example for others to follow, we think that green bonds are signalling the direction of travel for the market.

As discussed in the previous chapter, the multilateral development banks have a head start in formulating 2°C finance, but more recently sub-sovereigns and corporates are signalling that they are factoring in green and/or climate issues into financing requirements by issuing green bonds. We think the fixed income markets offer the potential to raise funding levels. Some examples include:

Corporate bonds (green/2°C)

These are standard corporate bonds but the use of proceeds is stipulated for green/2°C finance projects. For example:

Toyota issued a USD1.75bn green bond over five classes of notes (0-0.19%, payable monthly; with maturities of 1-5yrs) in March 2014. These notes were rated from AA+ to AAA by S&P. The use of proceeds will be used to acquire “sales contracts and beneficial lease contracts” which finance low-emission vehicles such as its hybrid range. This is to encourage the transition to more carbon efficient transportation.

Unilever issued a GBP250mn (USD410mn) 4.75yr green sustainability bond at 2% p.a. in March 2014. It was rated A+ by S&P. The proceeds will be used to help the company meet its environmental impact targets under the Unilever Sustainable Living Plan. It includes halving the GHG impact of its products over their lifecycles by 2020; halving the water associated with its products by 2020; and halving the waste associated with the disposal of its products by 2020.

ASE issued a USD300m, 3yr, green bond at 2.125% p.a. (payable semi-annually) in July 2014. It was rated BBB by Fitch. The proceeds will be used to fund projects which promote “the Company’s transition to low-carbon and climate resilient growth.” For example, the renovation of ASE’s facilities to obtain green building certifications; reducing waste through recycling; and designing more environmentally friendly product and designs.

Supra-national bonds (green/2°C)

Bonds issued by multilateral organisations in any currency (where the use of proceeds are stipulated for green/2°C finance projects). For example:

The **IFC** issued a RMB1bn (USD160mn) green bond at 2% in June 2014. The proceeds will be disbursed to projects “in the fields of renewable energy and energy efficiency.”

The **World Bank (IBRD)** issued an AUD300m (USD280m), 5yr, Kangaroo green bond at 3.50% p.a. (payable semi-annually) in April 2014. The proceeds will be used to fund projects that “promote the transition to low-carbon and climate resilient growth”. (Kangaroo bonds are the AUD-denominated bonds issued by non-residents in Australian Market.)

Municipal bonds (green/2°C)

Bonds issued by a local government authority (where the use of proceeds are stipulated for green/2°C finance projects). For example:

The **County of Stockholm** issued a SEK1.1bn (USD160mn), 6yr, green bond in two tranches (2.125% and STIBOR + 37.5bp) in May 2014. It was rated AA+ by S&P. The proceeds will “promote the transition to low-carbon and climate resilient growth” within the 26 municipalities of Stockholm County. These include: mitigation projects such as sustainable public transportation and LEED buildings; more waste management to capture GHGs; and water management to adapt to the impacts of climate change.

Also, the **Chinese government** has been encouraging issuers to use bond financing to fund its transition to a lower-carbon economy (e.g. new energy vehicles, see [Driving away pollution in China](#) 7 August 2014) and the clean-up of pollution (e.g. shifting the energy mix away from fossil fuels). Besides issuing bonds domestically, issuers might consider issuing abroad through dim sum bonds. (Dim sum bonds are RMB-denominated bonds issued in Hong Kong.)

Table 4 on overleaf shows more examples of recent green bond issuance, and demonstrate that most proceeds are used for renewable energy and energy efficiency. It's still early days in the green bond market, which is small in the context of global fixed income markets, but demand is clear from the institutional investor take up of green bonds (for instance ASE was 6x oversubscribed) In the next chapter we show that more green bonds are being issued and at larger size.

Conclusions

We think we now have both the right definitions and the right instruments in place and expect more capital to be invested in a manner consistent with a 2°C world. That would involve lowering emissions as much as possible but also embedding resilience.

There is a large investment gap of approximately USD300bn per year which needs to be filled in order to convert normal financing to 2°C financing. Green bonds are an example of taking well utilised financial instruments and converting them to 2°C finance – issuance has been growing rapidly in recent years and we expect this to continue.

Table 4: Recent green bonds broken down by stated use of proceeds

Issuer	Latest issue date	Size	Issuer type	Low-carbon energy			Waste-to-energy 24%	Energy efficiency & management 72%	Environment & land use management 56%
				REN 80%	Fuel switching 12%	CCS 16%			
ADB	Jan-14	BRL283m	SSA	✓			✓	✓	✓
Advanced Semiconductor Engineering (ASE)	Jul-14	USD300m	Corporate					✓	✓
AfDB	Mar-14	SEK1000m	SSA	✓		✓	✓	✓	✓
Arise Wind Power	Apr-14	SEK1100m	Corporate	✓					
BAML	Nov-13	USD500m	Corporate	✓				✓	
British Columbia	Jul-14	CAD231.5m	Sub-sovereign					✓	
CGN Wind	Jun-14	RMB1000m	Corporate	✓					
DC Water	Jun-14	USD350m	Sub-sovereign						✓
EBRD	Sep-13	USD250m	SSA	✓	✓	✓		✓	✓
EDF	Nov-13	EUR1.4bn	Corporate	✓					
EIB	May-14	EUR350m	SSA	✓				✓	
Environmental Facilities Corp	Jun-14	USD213m	Sub-sovereign						✓
Export Development Canada	Jan-14	USD300m	SSA	✓			✓	✓	✓
FMO N.V.	Nov-13	EUR500m	SSA	✓				✓	✓
GDF Suez	May-14	EUR2.5bn	Corporate	✓				✓	
Gothenburg	Jun-14	SEK1.8bn	Sub-sovereign					✓	✓
Greenko	Jul-14	USD550m	Corporate	✓					
Hannon Armstrong	Dec-13	USD100m	Corporate	✓				✓	
Hera Group	Jun-14	EUR500m	Corporate						✓
Iberdola	Apr-14	EUR750m	Corporate	✓				✓	
IFC	Nov-13	USD1bn	SSA	✓		✓		✓	
IFC	Jun-14	RMB500m	SSA	✓				✓	
IFC	Aug-14	PEN42m	SSA	✓				✓	
Île-de-France	Apr-14	EUR600m	Sub-sovereign	✓				✓	
South Africa IDC ⁽¹⁾	Apr-12	ZAR500m	SSA	✓					
Johannesburg	Jun-14	ZAR1.5bn	Sub-sovereign	✓			✓	✓	✓
Jun Yang Solar Power	Apr-14	HKD190m	Corporate	✓					
Kommunalbanken Norway (KBN)	Nov-13	USD500m	SSA	✓			✓	✓	✓
Kexim	Feb-13	USD500m	SSA	✓	✓			✓	✓
Kredit für Wiederaufbau (KfW)	Jul-14	EUR1500m	SSA	✓					
Massachusetts	May-13	USD100m	Sub-sovereign					✓	✓
Munifin	Apr-12	EUR2.5m	SSA				✓		
Nedbank	Aug-13	ZAR4bn	SSA	✓					
Neo Solar	Jun-14	USD120m	Corporate	✓					
Nordic Investment Bank (NIB)	Feb-14	EUR40m	SSA	✓				✓	✓
NRG Yield	Jul-14	USD500m	Corporate	✓					
NRW.Bank	Nov-13	EUR250m	SSA	✓					✓
NWB Bank	Jun-14	EUR500m	SSA						✓
Region Île-de-France	Mar-12	EUR350m	Sub-sovereign	✓					✓
Region Nord-Pas-de-Calais	Sep-12	EUR80m	Sub-sovereign					✓	✓
Region Provence-Alpes-Côte d'Azur	Jul-12	EUR119.5m	Sub-sovereign	✓				✓	
Rentenbank	Aug-13	EUR50m	SSA	✓					
Sainsbury's	Jul-14	GBP200m	Corporate	✓				✓	
SCA	Mar-14	SEK1.5bn	Corporate	✓				✓	
Skanska	Apr-14	SEK850m	Corporate					✓	
Solar City	Apr-14	USD70.2m	Corporate	✓					
SunPower	Jun-14	USD400m	Corporate	✓					
TD Bank	Mar-14	CAD500m	Corporate	✓				✓	✓
Toyota	Mar-14	USD1750m	Corporate					✓	
Trina	Jun-14	USD150m	Corporate	✓					
Unibail-Rodamco	Feb-14	EUR750m	Corporate					✓	
Unilever ⁽²⁾	Mar-14	GBP250m	Corporate	✓				✓	
Vasakronan	Mar-14	SEK1bn	Corporate					✓	
Vornado Realty	Jun-14	USD450m	Corporate					✓	
World Bank	Apr-14	AUD300m	SSA	✓	✓	✓	✓	✓	✓

Source: HSBC, issuer websites. Note: % refers to the adoption rate by issuers for a particular criterion. ¹ Only the initial tranche of the R5bn bond is included. ² Use of proceeds also includes project resulting in reduction of waste generation; Updated to 20 August 2014

What next for 2°C?

- ▶ Climate finance could be a sticking point in 2015 so signals that capital is moving in a 2°C direction are important
- ▶ The UCA could be a catalyst for more 2°C finance – meeting investor demand for (policy) direction, disclosure and deals
- ▶ There is appetite from issuers to demonstrate alignment for low-carbon as shown by the growing size of green bond issuance

‘Climate finance’ sticking point

How the transition to a 2°C world will be paid for is a serious and perfectly valid subject of contention in the global negotiations for a universal climate agreement (UCA). The main sticking point surrounds ‘climate finance’ (Box 5).

For example, Brazil, South Africa, China and India, collectively known as the BASIC countries, noted in the joint statement post their most recent meeting (see [Same BASIC arguments](#), 15 August 2014), “[Ministers] urged developed countries to honour their obligations to provide new, additional and **predictable financial support** to developing countries in a measurable, reportable and verifiable manner.” (emphasis is ours).

It’s easy to see why funding is such a point of contention when we consider that much of the world’s population are still in very low income categories and desperately need affordable access to energy to grow. At least two-thirds of the population are in sub-USD5,000 per capita per annum countries.

Box 5

‘Climate finance’ and the deal

The term ‘**Climate Finance**’ most commonly refers to the flow of capital from developed countries towards developing countries in order to help with climate change mitigation and adaptation.

What’s involved: The generally agreed amount is USD100bn per year from 2020, to be channelled through the UN’s Green Climate Fund (GCF).

Problems: There are a number of areas of contention here. For example: 1) Developed countries are not willing to disburse funds without mechanisms in place to ensure that they will be used appropriately. 2) There is debate whether the funds should be from public or private sources. 3) The economies of many developed countries have been struggling in recent years.

The deal: Many developing countries argue that they cannot mitigate or adapt to climate change without financial assistance. Hence, climate finance has become a major point of contention in discussions towards a global agreement.

The essence of the UN climate change convention is one of ‘common but differentiated responsibilities’ which means that all nations should contribute to the 2°C goal, but that this should not interfere with the quest of developing countries to grow economies and reduce poverty.

Historical responsibilities: (see Chart 12)

Developing countries want developed countries to acknowledge that their historical activity is contributing towards warmer temperatures today *and* warmer temperatures in the future (since CO₂ molecules can stay in the atmosphere for up to thousands of years). In addition, they believe that those already responsible for warming should provide funds to signal a safety net commitment – for when the consequences of warmer temperatures hit. **Future responsibilities:** (see Chart 13) At the same time, developed countries want developing countries to recognise that they are contributing more to the stock of emissions each year and are likely to do so in the future.

Catch 22 situation: In Chart 14, we plotted the cumulative share of global GDP (absolute), the cumulative annual share CO₂ emissions and population, ranked from the poorest to the wealthiest (in terms of per capita wealth).

We calculate that 43% of annual CO₂ emissions in 2013 came from the 15 poorest countries (which collectively only generated 15.5% of the wealth). At the other end of the scale, around 19% of CO₂ emissions in 2013 were generated by the richest 5 countries (which collectively generated 30% of global wealth).

We are in a catch 22 situation, whereby on a *historical cumulative* basis, *developed* countries (or Annex 1 in climate jargon) represent 72% of total emissions, but on an *annual* basis, *developing* countries contribute almost three-fifths of the current stock (Charts 12 & 13).

Box 6

A universal climate agreement

The UCA refers to an agreement, scheduled for final discussions in Paris in December 2015, by which all nations globally would be bound by “legal force” to contribute to reducing emissions. A draft on the framework of the agreement is already in circulation. The broader topics to be included in the agreement are: mitigation, adaptation, finance, technology development, capacity building, transparency of action and support, and the cycle of commitments and contributions.

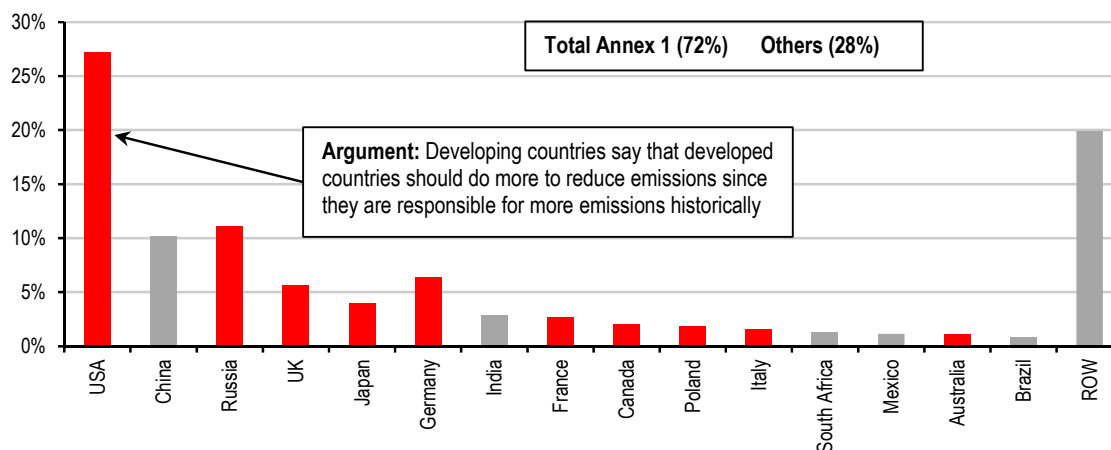
The idea is that the climate negotiations in Lima in December 2014 will agree on the elements of the UCA, leaving a year for countries to fill them in. Countries are supposed to put forward their pledges (nationally determined contributions) towards the 2°C target by the first quarter of 2015.

A safety net of finance flows

Developing countries are asking for a ‘safety net’ of cash from developed countries to be managed by the Green Climate Fund (GCF). The crucial point is that GCF capitalisation should come from additional financial flows (i.e. not an ODA purse).

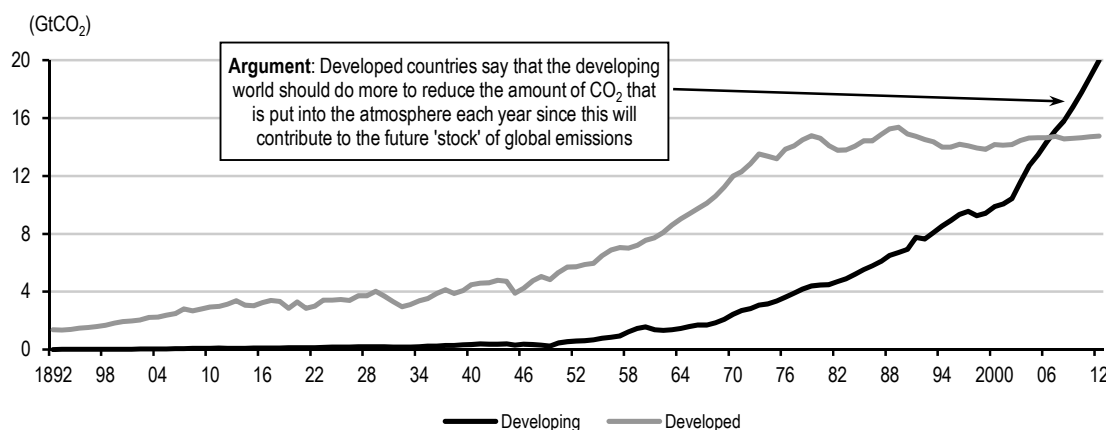
Germany has already provided a USD750m pledge for this but other countries are yet to follow suit. The expectation is that funds will be pledged by November 2014, with the UNFCCC hoping for USD10bn (See [The mobilisation of climate capital](#), 28 May 2014). Some more funding for the GCF could be announced at the upcoming UN Climate Leaders’ Summit in New York on the 23 September 2014.

Chart 12: Historical responsibilities – Total historical cumulative CO₂ emissions (from fossil-fuels and cement production) until 2010



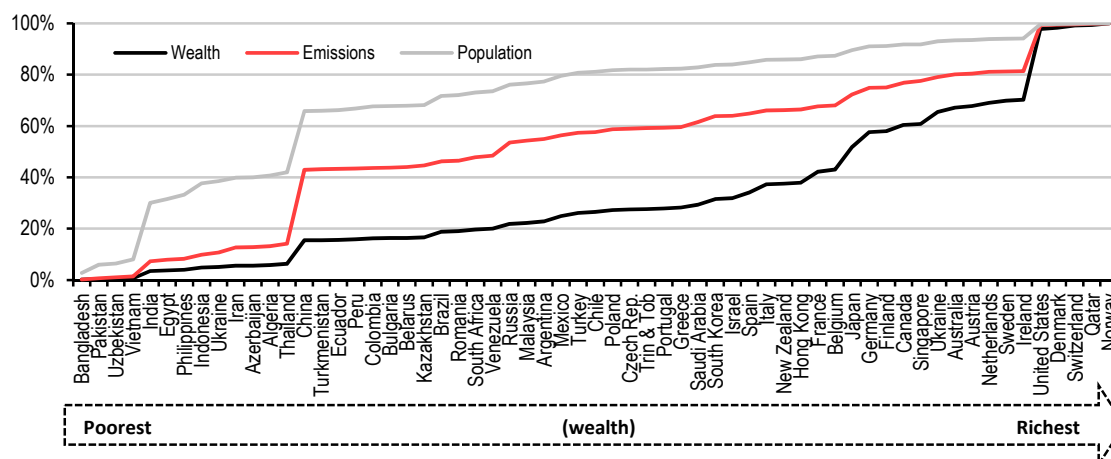
Source: HSBC (based on CDIAC data)

Chart 13: Future responsibilities – Annual emissions from fossil fuels from developed and developing regions



Note: Does not include sinks and other sources. Source: HSBC (based on CDIAC data)

Chart 14: Low income countries have a high share of people and need energy to prosper so keeping CO₂ in check will be difficult



Note: This chart covers 96.9% of global wealth, 94.1% of global CO₂ emissions from energy, and 81.5% of the global population
Source: HSBC (based on BP Statistical Yearbook 2014, World Bank data for GDP and population)

Signalling 2°C finance

Whilst climate finance is a sticking point in discussions towards a UCA, we think a global deal could actually also be a catalyst for more 2°C finance. We think there are two main signals at play here:

- 1 a policy signal
- 2 a momentum signal

It is important to realise that both these signals can affect one another.

The policy signal

A climate agreement would be a key policy signal that shows political commitment to the transition to a low-carbon world. As a result, both industry and financiers should then be more willing to invest in projects that help deliver this transition because they would come with more assurance that the associated returns are less risky.

At the same time, as described in Box 5 on page 28, the momentum surrounding climate finance is a sticking point for the UCA.

The momentum signal

Appropriate transparency (labelling and disclosure) around capital flow alignment with 2°C is a key signal of industry and investor commitment to a low-carbon world. It would help to provide investors with comfort that the

transition is underway and encourage other investors to pursue similar opportunities.

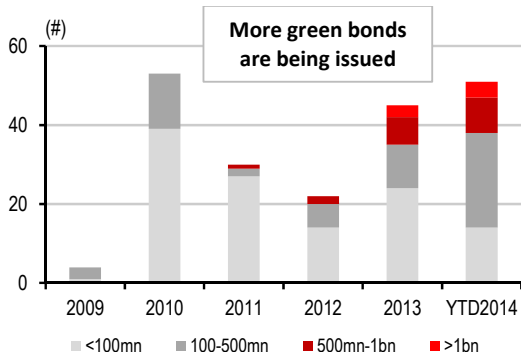
At the same time, 2°C capital flows show how far we have come, which is important for the UCA. As discussed in the previous chapter, we know that it won't happen overnight but the direction of travel is important.

The demand signals are clearer

The financing solutions for a 2°C world will come from a wide array of existing public and private entities investing across all regions. There is already a growing number of investor coalitions which support the transition to a low-carbon economy, for example, the Principles for Responsible Investment and the various investor groups on climate change around the regions. These are growing in terms of the number of members/signatories as well as representative assets (usually described as assets under management or AUMs). We think these investors signal a growing appetite for 2°C finance related deal flow.

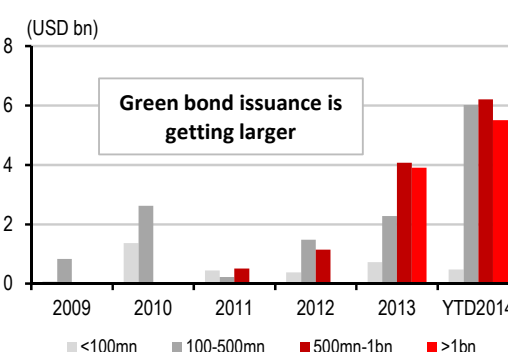
In addition, there is strong demand for green bonds. Charts 15 & 16 show that both the number and the size of green bonds being issued are growing. In 2013, three bonds were over USD1bn in size (chart 15); there were already four bonds over USD1bn issued in the five months to May 2014. It should be noted that the

Chart 15: Number of green bonds issued by size



Note: YTD2014 is to May. Source: HSBC (based on Climate Bonds Initiative)

Chart 16: Total amount of green bonds issued by size



Note: YTD2014 is to May. Source: HSBC (based on Climate Bonds Initiative)

total amount issued to May 2014 is already greater than for the whole of 2013.

The growing demand for green bonds is evidenced by large investors that have been increasing their exposure to these instruments. For example, Zurich Insurance stated in November 2013 that it would invest USD1bn in green bonds; in July 2014, Zurich decided to double this investment to USD2bn. Also, other large investors such as TIAA-CREF and Blackrock have been publically declaring their investments into green bonds.

We think demand for 2°C finance will not only remain strong in the future, but will even grow as drivers for transition to a low-carbon world become more evident. For example, the UCA should indicate political commitment and offer more policy certainty. In turn, more projects would be required for the transition to a low-carbon world and more issuers (government or corporate) would be able to turn to 2°C financing (green bonds or otherwise) to meet their capital needs.

Conclusion

Much of the discussion in this report has been on how difficult it is to define 2°C finance. We believe that transparency and disclosure will help to move forward this debate.

We think the drivers for the transition are falling in to place now. These include: the real possibility of a UCA to be signed in Paris next year; the competitive costs of renewables; the realisation that climate impacts are already affecting us now and are likely to increase; and also a better understanding of how to price-in climate risks and benefits into financial instruments.

The transition to a low-carbon economy will be challenging for all countries for many different reasons, including domestic politics and financial position, but it will be particularly tough for those in low income brackets to manage.

We think that if there are more signals that capital flows are moving in the right direction, there is a greater chance that global negotiations will be successful. This would improve the chances for an ambitious agreement which is equitable and would move the world onto a low-carbon trajectory.

Appendices

Appendix 1: Key regions and the risks from climate change

Region	Key Risks
Africa	
Food	Reduced crop productivity associated with heat and drought stress, strong adverse effects on regional, national, and household livelihood and food security, impact of increased pest and disease damage and flood on food system infrastructure
Health	Changes in the incidence and geographic range of vector- and water-borne diseases due to changes in the mean and variability of temperature and precipitation, particularly along the edges of their distribution
Water	Compounded stress on water resources, significant strain from overexploitation and degradation, drought stress exacerbated in drought-prone regions
Europe	
Food	Extreme heat wave to impact crop production
Health	Increased economic losses and people affected by extreme heat events: impacts on health and well-being, labor productivity; air quality, and increasing risk of wildfires in southern Europe and in Russian boreal region
Infrastructure	Increased economic losses and people affected by flooding in river basins and coasts, driven by increasing urbanization, increasing sea levels, coastal erosion, and peak river discharges
Water	Increased water restrictions, significant reduction in water availability from river abstraction and from groundwater resources, combined with increased water demand (e.g., for irrigation, energy and industry, domestic use) and with reduced water drainage and runoff as a result of increased evaporative demand, particularly in southern Europe;
Asia	
Health	Increased risk of heat-related mortality, increased risk of drought-related water and food shortage causing malnutrition
Infrastructure	Increased riverine, coastal, and urban flooding leading to widespread damage to infrastructure, livelihoods, and settlements in Asia
Australasia	
Ecosystem	Significant change in community composition and structure of coral reef systems in Australia
Infrastructure	Increased frequency and intensity of flood damage to infrastructure and settlements in Australia and New Zealand, increasing risks to coastal infrastructure and low-lying ecosystems in Australia and New Zealand, with widespread damage towards the upper end of projected sea-level-rise ranges
North America	
Ecosystem	Wildfire and flood induced loss of ecosystem
Health	Human morbidity, and mortality as a result of increased drying /temperature trends and urban floods;
Infrastructure	Property loss from wildfire, urban floods in riverine and coastal areas, inducing property and infrastructure damage, social system disruption, and supply chain impacts
Water	Water quality impairment, due to sea level rise, extreme precipitation, and cyclones
Central and South America	
Food	Decreased food production and food quality
Health	Spread of vector-borne diseases in altitude and latitude
Infrastructure	Flooding and landslides in urban and rural areas due to extreme precipitation
Water	Water availability in semi-arid and glacier-melt-dependent regions and Central America
Polar Regions	
Ecosystem	Risks for freshwater and terrestrial ecosystems and marine ecosystems, due to changes in ice, snow cover, permafrost, and freshwater/ocean conditions, affecting species' habitat quality, ranges, phenology, and productivity, as well as dependent economies
Food/ water	Food insecurity, lack of reliable and safe drinking water
Health	Risks for the health and well-being of Arctic residents, resulting from injuries and illness from the changing physical environment
Human settlement	Unprecedented challenges for northern communities due to complex inter-linkages between climate-related hazards and societal factors, particularly if rate of change is faster than social systems can adapt
Infrastructure	Damage to infrastructure, including infrastructure in permafrost regions
Small Islands	
Human settlement	Loss of livelihoods, coastal settlements, infrastructure, ecosystem services, and economic stability; the interaction of rising global mean sea level in the 21st century with high-water-level events will threaten low-lying coastal areas

Source: Summary for policymakers, Climate Change 2014: Impacts, Adaptation, and Vulnerability, contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change

Appendix 2: Friends of the earth – Compilation of selected climate finance estimates

Purpose	Estimate	Scope	Source
Mitigation			
	2 % GDP annually (USD1.4 trn using 2011 GDP)	Global	UNEP-2011
	USD262-670bn annually,	Global and developing countries	UNFCCC Expert Group on Technology (2009)
	USD105-402bn of which is in developing countries	Global and developing countries	UNFCCC Expert Group on Technology (2009)
	USD36trn for 2012-2050 (USD950bn annually)	Global	IEA (2012)
Adaptation			
	USD27-66bn annually	Developing countries	UNFCCC (2007)
	USD54-198bn annually, additional \$65-\$300bn annually for ecosystem protection	Developing countries	Parry et al (2009)
	USD75-100bn annually	Developing countries	World Bank (2010)

Source: Pro-poor Climate Finance report, Friends of the Earth, April 2013

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Notes

Notes

Disclosure appendix

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The following analyst(s), economist(s), and/or strategist(s) who is(are) primarily responsible for this report, certifies(y) that the opinion(s) on the subject security(ies) or issuer(s) and/or any other views or forecasts expressed herein accurately reflect their personal view(s) and that no part of their compensation was, is or will be directly or indirectly related to the specific recommendation(s) or views contained in this research report: Zoe Knight and Wai-shin Chan

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- 1 This report is dated as at 10 September 2014.
- 2 All market data included in this report are dated as at close 9 September 2014, unless otherwise indicated in the report.
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