



TRANSBOUNDARY

PRACTITIONER BRIEFING SERIES

Climate Finance

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Climate Finance in Transboundary Waters

Recent UN reports on climate change have put into stark relief the coming effects of an average global temperature increase above 2° Celsius — once again putting climate mitigation, and particularly adaption, at center stage.[i]

Water is central to climate change risks, as the primary medium through which climate change influences the Earth's ecosystem, and thus the livelihood and well-being of all societies.[ii]

Climate change is a complex problem, which requires integrated, multi-sectoral, and multi-disciplinary responses — as well as large amounts of funding. The current size of climate-aligned bond market is around 1.45 trillion USD, but with only 8% of this dedicated to water, compared with 44% for transport and 23% for energy. Clean transport and energy development are critical areas of addressing climate change, but neither are as central to human development as water.

The amount of finance required for our planet to stay within the 2-degree limit is staggering: globally, the World Bank estimated an annual investment of US\$4.1 trillion by 2030, whereas the OECD estimates an annual investment of up to US\$6.9 trillion — at least 14% of this will be spent on water & sanitation projects.

As discussed herein, part of the reason why water lags behind other sectors is due to the greater difficulty in generating private sector funding for water projects, which are typically underpriced and tend to be much longer term. In fact, much of the water projects labeled as “green-bonds” or being “climate-aligned”, include hydropower projects, which are less focused on water supply or sanitation, but on using water for power.

Shared Financing:

Examining the role of climate finance in addressing water and climate change

Despite emerging markets being the most vulnerable to water stress and climate change, Europe accounts for 63% of water-themed bonds. Global Water Intelligence estimates a need of 450 billion USD annually to meet the Sustainable Development Goals (SDGs) by 2030, or nearly five-times current funding levels. Climate Finance is one particular response to close the funding gaps for climate related projects, either via direct funding or by catalyzing additional funding from the private sector.

Practical Summary

We understand water to be a public good of vital importance that does not respect political boundaries, and requires regional and international cooperation mechanisms. While climate is a global public good that requires coordination levels even further afield.

Mitigation and adaptation projects are the two primary approaches within climate finance, holding different implications for each sector—transport, water, energy, agriculture, etc. In the water sector, adaptation is of primary importance, as most mitigation projects will not make sufficient impacts on climate change progress via greenhouse gas (GHG) emissions, while adapting to a more varied climate is imperative to societal well-being and meeting development goals.

Various climate finance methods and tools exist to develop and integrate these climate projects, but water has not taken proper priority to date. Water and energy projects are often integrated, and an increasing focus on the concept of the Water-Energy-Food Nexus has helped to increase the focus on water, but more can be done to achieve health and development goals while adapting to a more climate extreme future.

The climate financing gaps today are also the infrastructure gaps of tomorrow, which will cost trillions in economic and social development terms. Closing these gaps requires more than just public funds via official sources. Opening up climate projects and investment to the private sector is critical to generate the necessary financing for adaptation and mitigation projects. This requires deeper discussions of the trade-offs between the private procurement of public goods, and the ability or willingness to pay across various economic development levels.

Multilateral climate funds are leading these efforts as official international bodies to help establish markets, agree on standards, and encourage or crowd-in further investment. The Green Climate Fund (GCF), Global Environmental Facility (GEF), and the Adaptation Fund are some examples. Like the multilateral development banks (World Bank, Asian Development Bank, African Development Bank, etc.) they are only one part of the equation, which must be harmonized with local, national, and regional climate adaptation strategies, where climate finance tools will play an important part.

What is Climate Finance? — Global Public Goods

MEDRC's Transboundary Briefing series has looked at practical issues related to transboundary water themes, by looking at issues of shared water resources and shared data, shared wastewater, and shared infrastructure or policy responses. Next, we look at shared methods of finance to address these issues, in the context of global climate change. How do we pay for these shared policy responses and infrastructure developments in an equitable way?

Climate finance seeks to equitably fund projects in response to climate risks, in a global climate framework. There are four primary definitions of climate finance, ranging from the highly specific original concept, to the more broad-based definition that is typically employed today:

- 1) Official funds from governments and institutions of developed countries to developing countries for climate mitigation and adaptation projects.
- 2) Funds from developed countries to developing countries for climate mitigation and adaptation projects.
- 3) Funds to developing countries for climate mitigation and adaptation projects.
- 4) Funds for climate mitigation and adaptation projects.

As you can see, at its narrow definition, climate finance is specifically about rich countries helping poor countries to deal with closing the infrastructure gaps to address climate change and cutting emissions to halt its effects, and is done through very specific official channels from governments and institutions. Broadening out, these can be funds from other non-government sources based in rich countries, or from any country to another, and could include projects in developed or rich countries.

Ultimately, the problem is too large for the narrow definition, and all methods need to be considered and encouraged. However, it is important to note the original definition, in the context of equity and in terms of who should bear the financial burden. The countries that most contributed to emissions and have the most financial resources should bear a largest burden of the response, which is embedded in this definition.

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate finance as local, national or transnational financing — drawn from public, private and alternative sources of financing — that seeks to support mitigation and adaptation actions that will address climate change.^[i] This definition takes the broader approach, regardless of the source or destination of the funds, or if done through official channels.

Inherent in the UNFCCC definition and further agreements such as the Paris climate agreement, are the principles that the contributions of countries to climate change, both in terms of emissions, and their required responses, vary in both their capacity to either prevent climate change, or to cope with its consequences. Indeed, some of the most vulnerable have also contributed the fewest emissions to this global problem.

With a principle of equity, countries that contributed the most historically to climate emissions should also bear the most burden in climate mitigation and adaptation responses, and those most vulnerable to its effects, should receive the most support in concessional financing. However, in practice, all countries need to contribute and cut emissions, and long-term sustainability depends on increased domestic resilience.

Successive Conference of the Parties, or COP meetings, have produced agreements on emissions cuts, but there has been little concrete agreement on how much individual countries have to contribute, and when; or an internationally agreed definition of what counts as climate finance, to meet their requirements of contribution, or that they have received enough aid. COP 24 in December 2018 sought to rectify this.

Water is a public good, and is typically protected and delivered by governments accordingly - but is viewed from a local and regional level. The climate is a global public good, which impacts every aspect of life on earth, particularly through the water cycle. Addressing the challenges of public goods requires coordination and trade-offs, particularly in terms of their cost or pricing.

For global public goods, this takes on an additional transboundary component, requiring the coordination and interaction of public entities and governments. The further challenge is that public financing of global public goods is not sufficient, and private activity, both in terms of available financial resources, and the activity responsible for GHG emissions, dwarfs the impact of public policy responses, on local, national, or global levels.

As such, climate finance aims to mobilize both private and public resources through various methods, to crowd-in additional funds that would otherwise not be available. This requires developing a climate finance marketplace, setting its standards, and providing incentives or sanctions to encourage further development and additional flows.

These climate funds are then applied in two specific ways — towards projects aimed at climate mitigation or climate adaptation.

Mitigation & Adaptation — Water & Climate Change

Climate projects are classified into two categories, **climate mitigation** efforts — to reduce greenhouse gas emissions and stop the global rise in temperatures that are changing the climate and **climate adaptation** efforts — to cope with the results of climate change already occurring, such as increased climate variability, extreme weather events, and changes in the supply and demand of water, food, etc. A lack of sufficient climate mitigation worldwide further necessitates a greater focus on climate adaptation.

For the water sector, much of the mitigation efforts actually revolve around the impacts of energy and transport, and directly relate to water via the water demands for energy and food production — also referred to in the water-energy-food nexus. In some instances, projects can incorporate multiple techniques or approaches to accomplish both climate mitigation, and adaptation, particularly as it relates to the water-energy-food nexus.

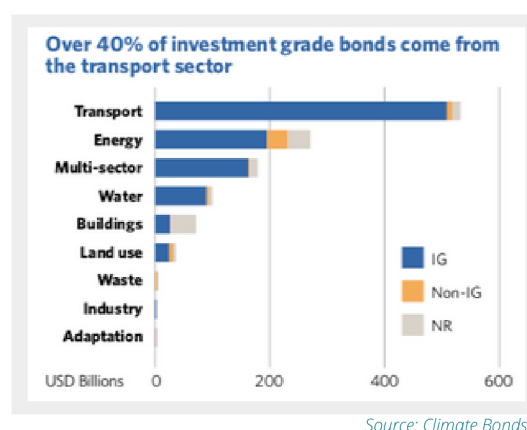
There are however, potential conflicts between mitigation and adaptation measures with respect to water resources, particularly at the regional and local levels. In regions where climate change will trigger

significant shifts in hydrological patterns, and where hydropower potentials are still available, this would increase the competition for water, especially if climate change adaptation efforts in various sectors are implemented — such as competition for surface water resources between irrigation, to cope with climate change impacts in agriculture, increased demand for drinking water, and increased demand for cooling water for the power sector. This illustrates the importance of integrated land and water management strategies for river basins, to ensure the optimal allocation of scarce natural resources.[iv]

Transboundary environmental issues present co-ordination problems as countries compete over resources, and effective climate responses require coordination both at the sectoral level — water, energy, food, transport — and in terms of approach — mitigation or adaptation — in order to be effective.

Other concepts that apply include Virtual Water, or the embedded water in all of the products we produce, consume, and trade, which can also affect climate mitigation efforts to reduce the carbon footprint, reduce waste, and save water resources. Climate projects need to account for global economic activity, environmental resources, and how these projects will impact or disrupt current regimes, and whether this is acceptable or desirable.

To date, mitigation projects have been the primary focus of climate finance projects, to reduce and stabilize the levels of heat-trapping greenhouse gases in the atmosphere. As a result, climate finance projects have primarily focused on the transport and energy sectors. With each passing year however, there is a greater need to focus on adaptation, which places a large focus on climate impacts on water resources.



Climate change directly impacts the water cycle and water resources through both the demand and supply of water. A changing climate means shifting hydrology profiles, and demand gaps that cannot be met with supply — whereby our economic activity does not match where our water resources are. Higher temperatures change the form, frequency, and intensity of the water cycle, from rain to glaciers, to groundwater flows. Increased competition for scarce water resources raises the demand for irrigation, with increased transpiration and evaporation — meaning more water is needed to grow the same crop outputs.

On the supply side, the water cycle is directly affected, lowering the water supply in some regions, while increasing it in others, and leading to decreased water quality through increased runoff, less groundwater recharge, and soil degradation. Current water infrastructure is not built to adapt to or anticipate such circumstances, and could then be either under-utilized or overwhelmed by a shifting climate and water cycle [v].

While climate mitigation projects are therefore critical to address the trend of climate change and increasing global temperatures, a greater emphasis is required on climate adaptation projects, particularly in the water sector. Extreme weather events that are more frequent and unpredictable require highly adaptable and flexible water security strategies, which are regional and cooperative, and which require far more funding than typically allocated. In addition, current systems and agreements have already been underfunded and over-allocated, without these additional challenges.

Climate finance in the MENA region has largely concentrated on a small number of large-scale projects focused on energy and mitigation, primarily funded by the Clean Technology Fund (CTF), despite the growing need for adaptation measures focused on water and food security. In total, 59% of climate funds have gone to Morocco, and 18% to Egypt, while 7 other countries have no climate finance, across 15 different funds.

- *Clean Technology Fund (CTF)*
- *Global Environmental Facility (GEF)*
- *Special Climate Change Fund (SCCF)*
- *Adaptation Fund (AF)*
- *Germany's International Climate Initiative*
- *Least Developed Countries Fund (LDCF)*
- *Green Climate Fund (GCF)*

One example of the renewed focus on climate adaptation projects is the UNFCCC's Adaptation Fund. True to the original concept of climate finance, the Adaptation Fund is focused on assisting developing countries to build resilience and adapt to climate change. Projects in MENA have included Senegal, Morocco, Egypt, Lebanon, Jordan, Iraq, Eritrea, Djibouti, as well as Mali, Niger, Chad and Ethiopia. Much of this has focused on food security and agricultural sectors, which include water, albeit without a direct focus.[vi]

As noted by UN Water, “long-term, sustainable adaptation to climate change will require the integration of infrastructure, policy and economic instruments, as well as behavioral changes into national development strategies.” This should be enacted along the following five principles:

1. Planning and applying new investments — reservoirs, irrigation systems, capacity expansions, levees, water supply, wastewater treatments, ecosystem restoration.
2. Adjusting operation, monitoring and regulation practices of existing systems to accommodate new uses or conditions — ecology, pollution control, climate change, population growth.
3. Working on maintenance, major rehabilitation and re-engineering of existing systems — dams, barrages, irrigation systems, canals, pumps, rivers, wetlands.
4. Making modifications to processes and demands for existing systems and water users — rainwater harvesting, water conservation, pricing, regulation, legislation, basin planning, funding for ecosystem services, stakeholder participation, consumer education and awareness.
5. Introducing new efficient technologies — desalination, biotechnology, drip irrigation, wastewater reuse, recycling, solar panels.[vii]

Enacting the above principles with a renewed focus on adaptation projects, and increasing private sector involvement can help to secure water security strategies into the future, while providing many opportunities to share costs and burdens through regional and international cooperation strategies across boundaries and basins.

Water Infrastructure Projects — Climate Finance Tools

The tools of climate finance consist of different forms of funding — concessional grants, investment-grade bonds, or insurance markets and risk guarantees. As previously mentioned, there is not yet a fully agreed definition of what constitutes climate finance, and what should not — with implications for meeting development assistance requirements in international agreements. The narrow view of official government funds to developing countries provides one outlook. Beyond that is the “green bond” market, or projects with are strongly or fully-aligned to climate goals, but not labeled specifically as “green bonds”.

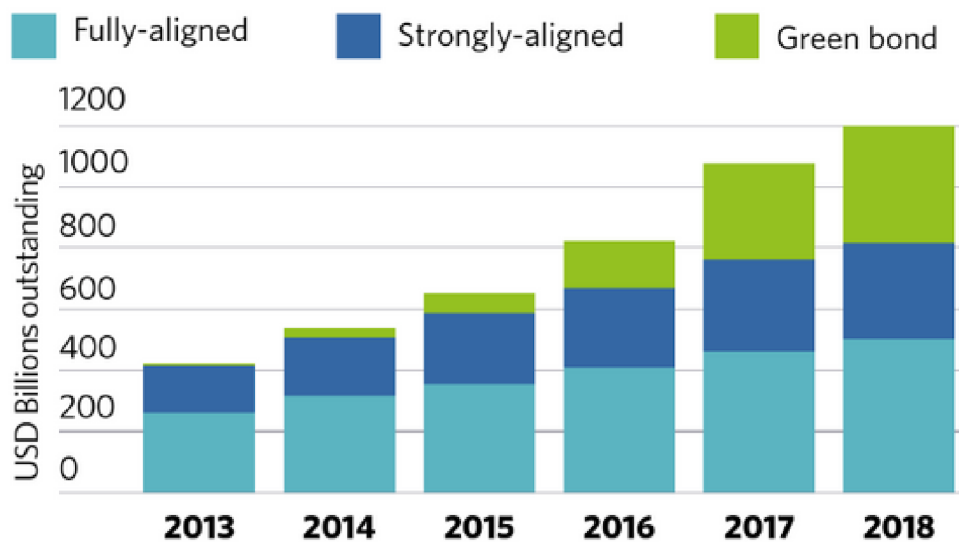
There is also a difference between public and private tools, and whether used at the local, regional, or global scale. According to the Climate Bonds Initiative (CBI), the climate-aligned bond universe, with over 75% of revenue streams coming from “green sources”, amounts to nearly 1.5 trillion USD. Limited to the Multilateral Climate Funds, the picture is much smaller, and the amount dedicated to water is even more limited, at only 4% of funds in 2017 according to ODI.

The prevalence of these additional green bond markets is in part due to the regulatory environment surrounding the climate projects. As shown below, the availability of guidance can have a large impact on where these funds are created — with Europe being the leading market both in terms of guidance, and issuance, and the leader in the water sector.

Specifically, green bonds are long-term financial instruments like other bonds, but issued in order to raise finance for climate change solutions, and labelled as green by the issuer. They can be issued by governments, banks, municipalities or corporations and can be applied to any debt format, including private placement, securitization, covered bond and sukuk.[viii]

We will also include the CBI’s definition of “fully-aligned” climate issuers - bond issuers that derive more than 95% of their revenues from climate-aligned assets and green business lines.

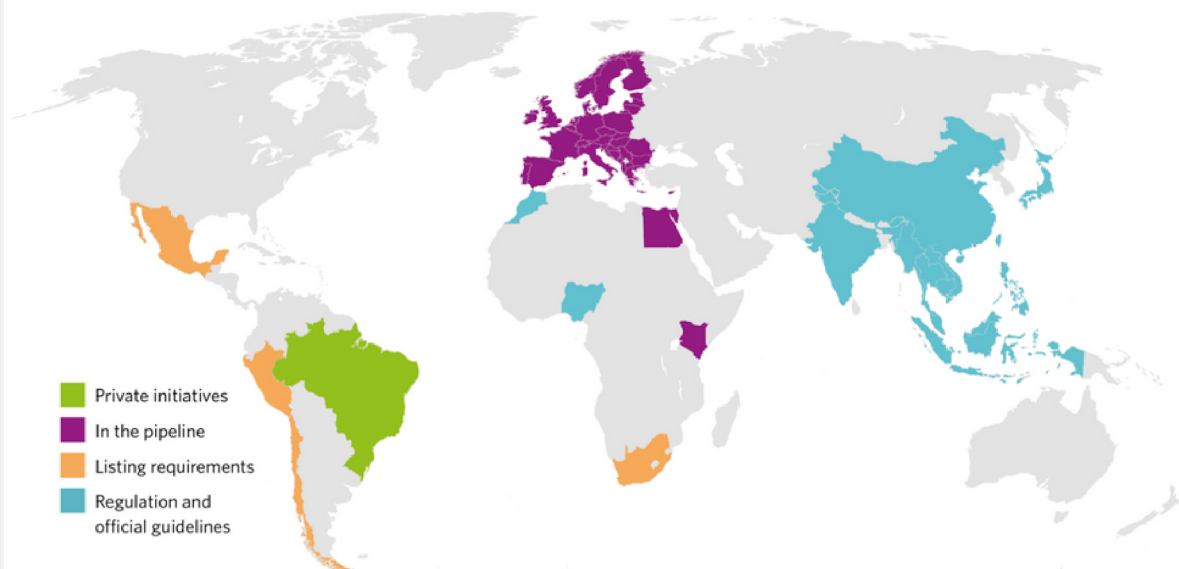
A climate-aligned bond universe of USD1.45tn



This year's research has identified USD1.2tn of aligned outstanding bonds from fully- and strongly-aligned issuers and green bonds (excluding bonds from US Muni fully-aligned issuers).

Source: Climate Bonds

Availability of national and regional green bond guidance

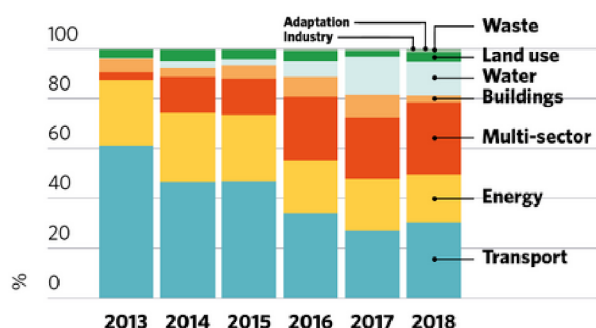


Source: Climate Bonds

In only a few short years, the green bond market has grown substantially and now includes several indexes devoted to tracking these climate-adapted investments:

- *Bloomberg MSCI Barclays Green Bond Index*
- *BAML Green Bond Index*
- *S&P Green Bond Index*
- *Solactive Green Bond*
- *ChinaBond - China Green Bond Index*
- *ChinaBond - China Green Bond Select Index*

Water projects have represented a growing share of the green bond or climate-aligned universe, but large funding gaps still remain. 1 in 9 people worldwide still lack access to safe and reliable drinking water, while 2.1 billion lack clean water access in their homes, and this will be further challenged by climate change going forward. In 2018 water is the 4th largest sector overall, not including Hydropower projects, but with only 17% of this labeled as “green bonds”.



Source: climatebonds.net

As mentioned, energy still plays a large role in the realm of climate finance, and appropriately so, but much of this is also related to water, in terms of water demand for energy projects, or the energy requirements of water treatment plants or desalination facilities, where it is still one of the largest determinants of cost.

Meeting the challenge of climate change is becoming more daunting for policy makers, because information is often limited on the status of availability and use of water, and on the potential impact of climate change on current infrastructure. Better data collection and mechanisms to share information are critical.

Hydrological monitoring networks are declining, and as a result, hydrological information is often incomplete, unreliable, inaccessible or simply lacking at the global regional, national and/or local levels. Even existing data are not used efficiently. There is little sharing of hydrologic data, owing mainly to limited physical access, policy and security concerns, lack of accepted protocols and often commercial considerations.

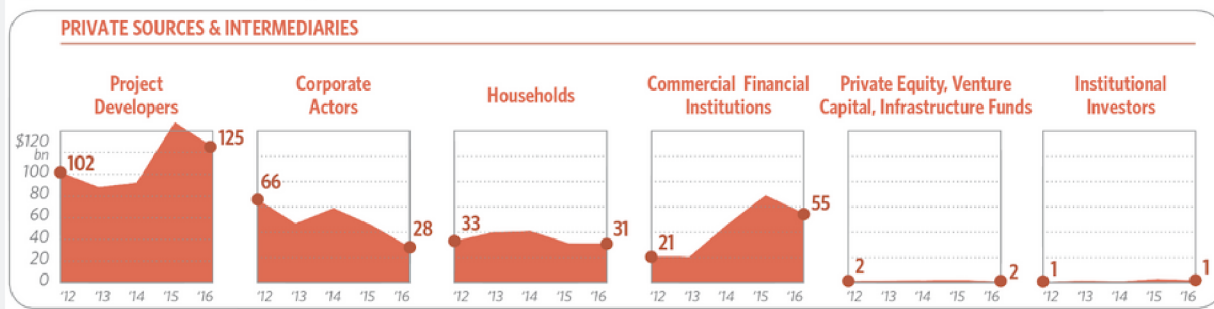
Transboundary cooperation in developing adaptation strategies can bring mutual benefit for all riparian parties—for example, it reduces uncertainty through exchange of data and information. This cooperation can also widen the knowledge and information base, increasing the set of options available for prevention, preparedness and recovery, and thereby helping to find better and more cost-effective solutions.[ix]

In addition to the traditional levers of climate finance - grants, debt, equity, and risk mitigation - eliminating barriers to private investment is also crucial. Key areas still to be addressed by the public sector, particularly by Multilateral Climate Funds, are providing information to businesses on climate data, and tracking progress to follow how the market operates in practice. Adjusting regulatory frameworks to create more incentives by rewarding climate-resilient policies, codes, or standards. Equip businesses with the information and tools they need to integrate climate change considerations into investment decisions. Business-friendly impact assessment tools that allow them to pursue climate policies in a clear and rational framework would ease barriers to entry and provide key information to make climate aligned investments.[x]

Other avenues to promote the private sector in climate resilience projects are new cost-sharing mechanisms, including the use of pilot projects that show new structures and how they can be implemented. Local banks should be more actively integrated into mainstreaming climate resilience into project financing, as they can best address the local market challenges.

Water projects are particularly regional in nature dependent on the natural water basin, and global climate finance efforts must align to those regional contexts, both in terms of environment, and politics.

Figure 3: Sources and intermediaries of private climate finance



Source: Climate Policy Initiative

Leveraging Private Sector Funds — Closing the Gap

Getting a sense of the size of the climate finance market can be difficult, as the CBI's nearly \$1.5 trillion USD climate-aligned market is greatly reduced to about \$400 billion USD for public and private according to the CPI. Much of the CPI's figure is attributable to private finance in the solar and wind energy markets, which have more mature markets and cost systems and do not require as much public support.

A critical component to achieving the necessary finance goals to adapt to climate change, at nearly \$1 trillion per year and growing each year, is to stimulate private sector investment into more sectors, and develop mature financial markets with sufficient guidance and standards. This has been particularly lacking in the water sector, which has seen greater private sector participation, but without a climate mitigation or adaptation element.

The mission statement of the multilateral climate funds is two-fold — to invest in climate mitigation and adaptation projects, and to catalyze further financing from additional sources by aiding market development. This includes additional official development assistance (ODA), national and multilateral funds (public funds), and private sector investment (corporate, private equity households).

The most important of these is private sector finance, as it is the largest potential resource, and the most untapped.

Facilitating the inclusion of private sector funding for climate mitigation and adaptation projects requires mechanisms to develop and deepen the market, in addition to developing projects that are worth funding

— meaning they will generate a return on investment that encourage their funding.

The use of public or private financing also relates to our earlier question about equity in climate finance — who should bear the burden of mitigation or adaptation? Public finance given on a concessionary basis is more appropriate for the least developed countries, which are the least capable of responding to climate risks, and have also contributed the smallest shares of GHG emissions to date. Yet the private sector likely presents the greatest efficiency and the necessary technology.

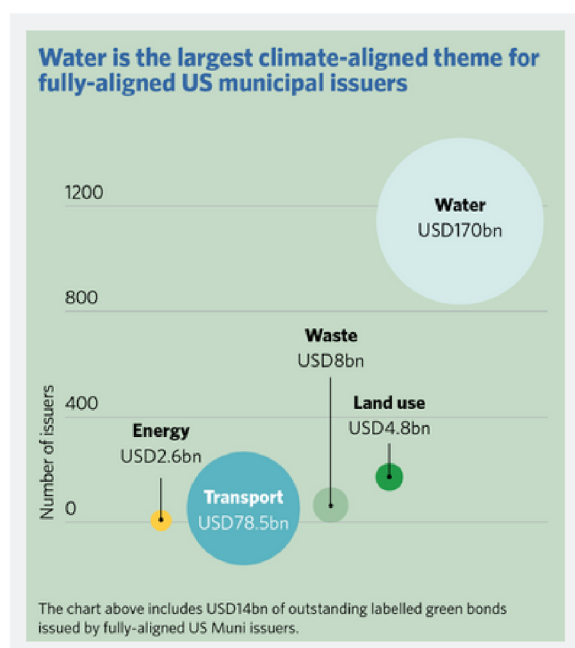
Private finance solutions that require a return on investment can mean increased cost for end users, which are borne by the public. Richer countries, which contributed the largest shares of GHG emissions, are better equipped to absorb these costs, while also having more deeply developed financial markets that are required to mobilize private capital in climate projects. As such, private solutions can be made a priority in more equipped countries, with concessional financing and private sector technology transfer in developing markets.

An example of this can be particularly seen in the water sector — as the majority of climate bonds for water projects are in the European market (63%).

The long-term goal should be an evenly distributed and robust system of public and private financing to meet climate mitigation and adaptation goals of each country — but the immediate needs of climate change requires concessional financing mechanisms to reduce emissions and provide critical water supply.

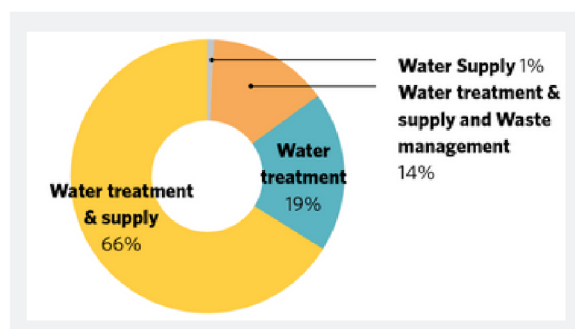
Over 90% of official flows to the water sector have been through investment projects, and a further crowding-in of the private sector through investment guarantees would be beneficial to leverage increased innovation and efficiency, while minimizing the cost to end consumers in developing nations.

Water is the 4th-largest 'climate-aligned' sector worldwide, at 101 billion USD, and most of this focused on developed markets. Only 17% of this funding would be labeled as "green bonds", the designation for bond specifically issued for green or climate projects. The vast majority of these funds are 'fully-aligned' according to the Climate Bonds Initiative (CBI). Much of this is from local governments, such as US municipal governments, where the water sector dominates.



Source: Climate Bonds

Climate bonds in the water sector are typically issued for a mix of services, covering supply, treatment, and waste.



Source: Climate Bonds

"17 out of the 38 fully-aligned entities in this sub-sector are UK based. English water utilities are privately held and often raise debt through an offshore dedicated finance subsidiary."[xi]

There have been some controversies in the developing world on the nature of private procurement of public goods, particularly with private water utilities being financially registered in legal tax havens outside of their domain of operation. This is further complicated in a global public goods context, in the issuance of climate bonds for projects on a global scale, with private profits, held in tax havens. While private finance is critical to meet the financial needs to address climate mitigation and adaptation - the sharing of burdens and benefits from these projects has still not been robustly discussed at any level.

CBI Estimates:

- 389bn in green bonds
- 497bn in bonds from fully-aligned issuers
- 314bn in issuance from strongly-aligned issuers
- 250bn in issuance from fully-aligned US Muni issuers

In order to bridge the financing gaps necessary to meet the immediate challenges of climate mitigation and adaptation, billions of public sector funds need to generate trillions in private sector funds. This is the primary mission and challenge of the Multilateral Climate Funds, to create a market, set the standards, and crowd-in investment, in such a short span of time.

While there has been progress in recent years, there is still much that needs to be agreed upon in order to continue and accelerate market growth.

The global growth of green finance is encouraging, and there is a large universe of unlabeled bonds that are financing green infrastructure ("fully-aligned bonds"). However, there is still huge potential for a larger and even more diverse green bond market. Against this progress, global emissions remain on track to exceed 2° of warming, with Paris commitments alone set to create 3° of warming, if they are met, and most are not on track to meet. This will lead to catastrophic consequences for much of the

planet. Over 90 trillion USD of investment in climate projects is needed by 2030, with a fraction spent in the past 5 years.[xii] Global green finance needs to reach over 1 trillion USD by the end of 2020, and grow with each year of the new decade.

Are we nearly there yet? Towards USD1 trillion a year of green bond issuance by 2020

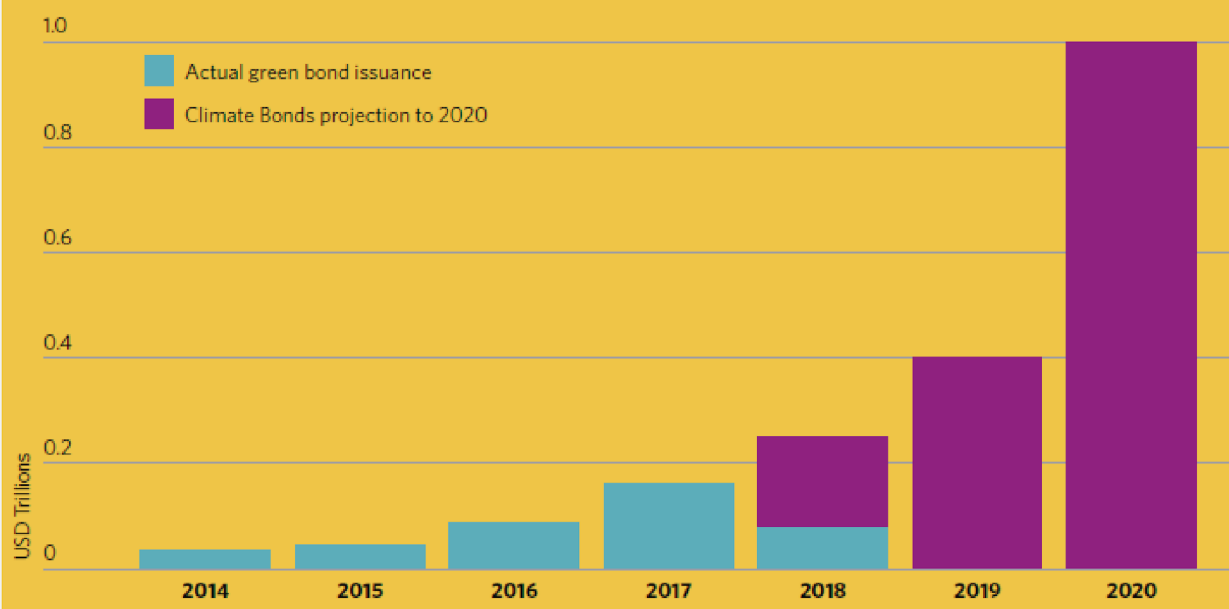
We estimate that the global green bond market would significantly boost progress on Nationally Determined Contributions (NDCs) in connection with the Paris Agreement and the implementation of country climate plans if it reaches USD1tn per annum by 2020.

This report identifies USD1.45tn of climate-aligned bond issuance currently outstanding which have been issued since 2005.

Meanwhile the labelled green bond market reached USD162bn of issuance in 2017.

The growth is encouraging but there is still a long way to go with global GHG emissions

on track to far exceed 2 degrees of warming. Over the coming decade, much stronger action from government and the private sector is needed to ensure there is a pipeline of low-carbon projects sufficient to meet the Paris Agreement targets.



Source: climatebonds.net

Climate Finance & Water-Energy-Food Nexus

As discussed, the largest sectors of climate finance bonds currently are in the energy and transport sectors. In addition, there are direct links between water, energy, and food, with the leading usage of water coming from agriculture and power generation. Furthermore, the largest contribution to greenhouse gas emissions comes from energy production. Reducing energy requirements and increasing efficiency in the water sector can help create positive feedback loops.

Climate finance for such projects can address both mitigation and adaptation through synergistic projects, by reducing energy requirements to lower GHG emissions, while treating wastewater to increase water supply, adapting to a more water stressed climate. One example is the harvesting of energy from wastewater processes to create a closed treatment system.

Biogas electricity has an enormous potential to contribute to a carbon neutral wastewater treatment. At present, German wastewater treatment plants cover about 25% of their energy demand by the use of biogas. This number is set to double in the future, leading to an annual savings of 1.1 million tons of CO₂ per year. Several examples show that in combination with high energy efficiency, wastewater treatment plants can cover almost 100% of their own energy demand.

Treated wastewater can then be used for irrigation reducing the impact of agriculture on water supplies, while lowering GHG, adapting our water infrastructure while mitigating climate change.

A future briefing will be devoted to the topic of the water-energy-food nexus, and the linkages to climate change and climate finance approaches to the nexus.

Transboundary Climate Finance Examples

The Multilateral Climate Funds

- UNFCC-Green Climate Fund (GCF)
- Global Environment Facility (GEF)
- Adaptation Fund

'In 2017, multilateral climate funds approved close to \$2 billion across 152 projects and 70 countries.

This was driven by the accelerating project approvals of the Green Climate Fund (GCF) that alone approved over \$1 billion.'^[xiii]

The Multilateral Climate Funds (MCFs), much like the Multilateral Development Banks, are governed by multiple national governments, and were specifically created to be vehicles for disbursing climate finance to achieve climate mitigation and adaptation goals.

The largest MCFs currently in operation are the Green Climate Fund (GCF), the Global Environment Facility (GEF), the Adaptation Fund, and the Climate Investment Funds. In 2016, these four funds approved \$2.78 billion USD of climate project support. The US is the largest donor across these four funds, while Norway makes the largest contribution relative to its population size.

Most multilateral climate funds use a wide range of financing instruments, including grants, debt, equity and risk mitigation options. These are intended to crowd in other sources of finance, whether from domestic governments, other donors or the private sector. Additional efforts in creating a climate finance market and lowering barriers to entry are more varied, but equally important.

The Green Climate Fund is currently the largest multilateral climate fund, with over 4.6 billion USD in committed financing to over 90 projects. The Adaptation Fund by contrast, formed out of the Kyoto protocol, has allocated over 500 million USD to over 80 projects to date.

In addition to providing guidance to the GEF and the GCF, Parties of the IPCC have established two additional special funds — the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF), both managed by the GEF.

These funds are critical first steps to developing climate finance markets, providing data and creating standards, to turn billions of public financing into trillions of private financing.

However, while great progress has been made and projects funded all over the world, there is still much to be done — and recent reports show poor countries are still waiting on the promised funds of rich countries.^[xiv]

The Green Climate Fund made headlines recently as the Fund's board members halted the funding of all projects after disagreements during a routine meeting, due in part to a lack of clarity from the 2015 Paris climate accord on financing to mitigate climate change.

In 2009, \$100 billion USD was pledged to be mobilized by 2020, specifically for the poorest countries. The GCF has so far only committed \$4.6 billion USD out of \$10.3 billion pledged, and another \$2 billion promised from the US has been cancelled under President Trump.^[xv]

Funds like the GCF are critical to getting all parties on board with climate efforts, as they are designed to help allocate funds from richer countries to poorer countries, and deal with the equity imbalances of GHG emissions, and the costs of mitigation and adaptation.

The slow rollout of funds, and the under delivery of total amounts greatly damages trust in global climate initiatives and agreements. Much of this indignation can again be traced to a lack of understanding of what financing or support should be counted as climate finance, or climate resilience projects, or simple aid.



Rowing boats through the streets of Hanoi after floods. Source: The New York Times / Nhac Nguyen / Agence France-Presse - Getty Images

Regional competition is also a factor with limited resources — as some of the most vulnerable areas may not see the necessary funding, in order to have a wider spread of projects and funds on the map. Southeast Asia is particularly vulnerable, with many coastal cities that must adapt to sea-level rise.

While the GCF is now moving towards more focus to this region, out of its first 74 projects, only 3 projects worth \$156 million USD covered Southeast Asia.

Vietnam for example, received one project for \$30 million, in a \$200 billion USD economy of 93 million people and thousands of KMs of exposed coastline. While Vietnam has made commitments under the Paris agreement, they will not be able to achieve these goals without large amounts of outside support in the form of climate finance.

While the MCFs have not delivered the desired results to date, this is mostly due to a lack of commitment and resources on the international level, rather than institutional failures. While some reforms are clearly needed to enhance efficiency and speed up project roll outs, this is unlikely to be accomplished in a sustainable manner without greater commitments from rich countries to meet their past pledges. Ultimately, the climate does not wait for us, and every day that is wasted increases the costs of adaptation long-term.

Example Multilateral Climate Fund Projects

- Bahrain (GCF) – [Enhancing climate resilience of the water sector in Bahrain](#)
- Kiribati (GCF) – [South Tarawa water supply project](#)
- India (GCF) – [Enhancing climate resilience of India's coastal communities](#)
- Niger Basin (GCF) – [Programme for integrated development and adaptation to climate change in the Niger basin \(PPIDACC/NB\)](#)
- Comoros Islands (GCF) – [Ensuring climate resilient water supplies in the Comoros Islands](#)
- Bolivia (CIF, IADB) – [Multipurpose drinking water and irrigation program for the municipalities of Batallas, Pucarani and El Alto](#)
- Cambodia (CIF, ADB) – [Enhancement of flood and drought management in Pursat province](#)
- Niger (CIF, IFC) – [Sustainable management and control of water resources \(PROMOVARE\) / Irrigation Program](#)
- Zambia (CIF, IBRD) – [Private sector support to climate resilience in Zambia](#)
- Yemen (CIF) – [Strategic program for climate resilience](#)

Climate Finance for Agriculture

In many countries - including the US, Mexico, Brazil, China, India, Pakistan, the largest use of water is for agriculture or irrigation. Climate change is likely to reshape the global agricultural trade, with huge implications for how the world meets the nutritional demands of a growing global population.

The effects of climate change will mean some agricultural producing areas of today will be unable to adapt, shifting their production elsewhere, or causing major declines in commodity production, leading to shortages and higher food prices. These disruptions, if abrupt, can cause major developmental impacts and lead to conflict between people and nations.

Climate finance is therefore critical to this sector in order to help nations adapt to a more climate extreme environment, specifically one with less water supply and shifting profiles in water demand.

For example, recent studies on projected US agricultural production in 2050-2059 under a 1.5 or 2 degree celsius temperature rise would decrease the US global market share of coarse grains from 30% to 10%. While in countries like China, some commodities will become more suitable to produce, potentially leading China to become a net export of rice to the rest of Asia.[xvi]

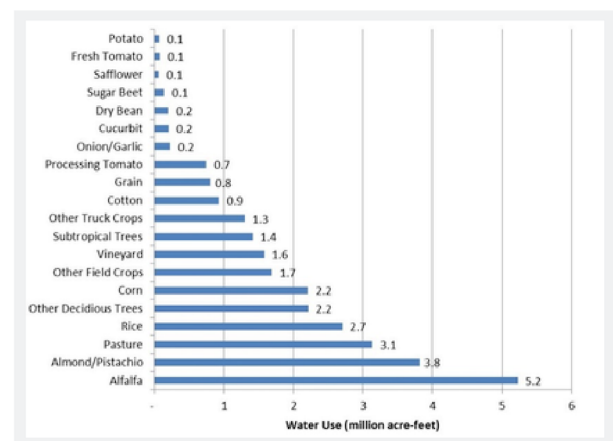
After years of decline, world hunger is on the rise again due to climate change and increasing population. The impact of climate mitigation or adaptation policies have very different impacts with respect to the agricultural sector. In the example of China, moving to a low-carbon economy and reforming the energy sector would be costly, while a new global food paradigm could provide opportunities, requiring a different approach to adaptation and less motivation for mitigation. However, due to feedback loops between climate, commodities, and economic growth, this is a very high-risk approach.

Sub-Saharan Africa faces the largest areas of population increase, along with some of the greatest potential reductions in its agricultural sector due to climate change.

The impact of a more extreme climate on water and food with increasing population poses tremendous risk for the region, with limited ability to pay.

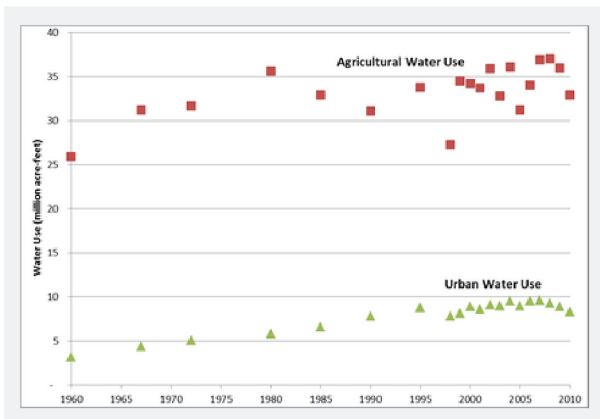
A European Commission report on global agriculture in 2050 notes that in all scenarios, with or without climate mitigation efforts, crop yields will decline globally. However, this should not mean mitigation efforts are not valuable, or that adaptation measures should take priority. In fact, depending on the commodity, if growth conditions will seriously deteriorate, no amount of technological adaptation will be economically viable, and the food production profile of the country will have to change. Limiting the need for this through mitigation efforts globally should still take priority.

This is exhibited in California, known as the bread basket of the United States, which despite lacking domestic water supply grows several very thirsty crops, such as pistachios, almonds (80% of global supply, and used for almond milk), or alfalfa, which is X-times more thirsty than other crops, which is primarily used to feed cows in California, or even exported to Japan.



Source: Pacific Institute

While not strictly a climate adaptation effort, the University of California, Davis has made some recent advances to reduce the water consumption of Alfalfa, to lower production costs for farmers, and alleviate water demand in California, where alfalfa alone accounts for 10% of all water usage.[xvii]



Source: Pacific Institute

The effects of climate change on our environment will be felt most directly through the water use cycle, and will in turn most directly impact the global economy through the agricultural sector; both domestically, and internationally through trade.

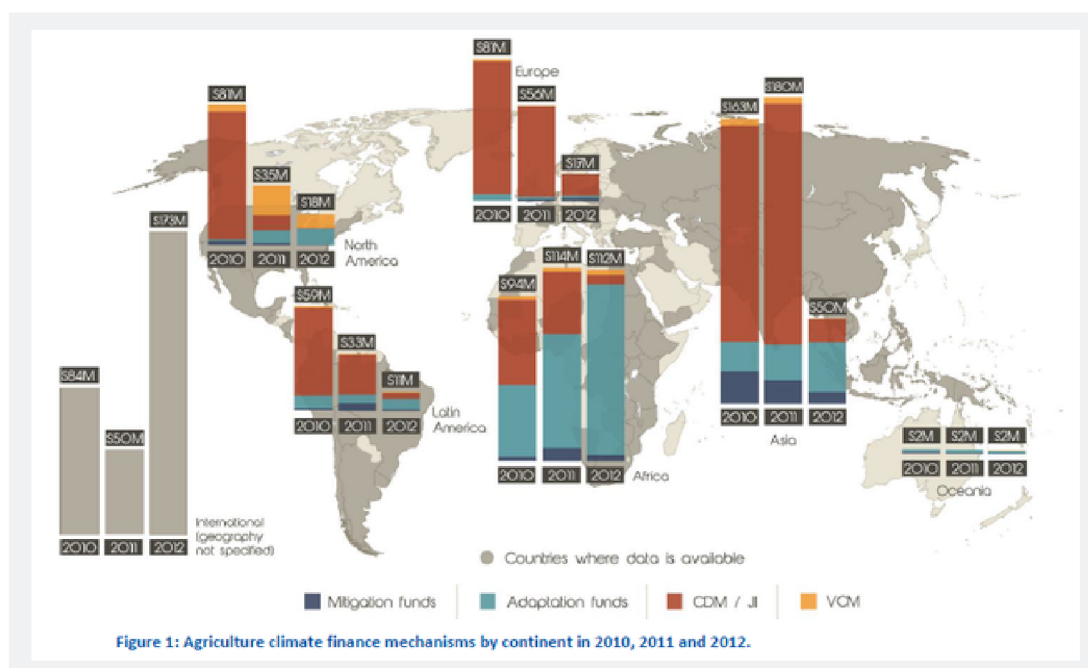
The use of climate finance tools to mitigate and adapt to climate change has thus far focused primarily on large-scale energy and transport projects, with insufficient funding or focus on water or its largest use — agriculture.

To address the impact of climate change on the environment most effectively, countries and international organizations must adapt a nexus approach, considering water, energy, and food, and the feedback loops between these elements, in order to make effective policy and project responses.

Climate Finance funds in particular should do more to establish such approaches in the funding mechanisms they use, to help establish a new norm of integrated analysis and projects. Impacting investing and Blended Finance initiatives can be used to help target small-scale approaches to farmers, and could be more responsive to the particular conditions facing a region.

For an individual farm, many choices do not need to be either/or, but can be pursued all at once, choosing more climate resilient crops, increasing water efficiency through better processes, increasing usage of tree cover to reduce overall temperatures, using renewable energy where possible, and growing crops that use less water.

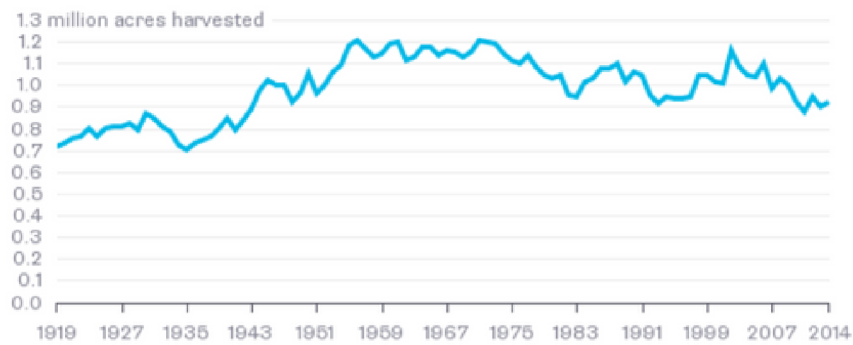
At the macro scale, governments and NGOs must look at all factors stemming from agriculture, and the choices individual farmers make, providing incentives to correct for market failures where necessary. In the case of California, Alfalfa is a thirsty crop, but California's 5 million cows must eat something, so increased water use efficiency can have the greatest impact without disrupting the meat and dairy industries. In the case of almonds however, allowing market forces to adjust production levels is not sustainable, and would require either large taxes or incentives for other crops to limit their growth. This will now be difficult with 80% of global almond production coming from California.



Source: Climate Focus

Alfalfa Hay Is Down but Not Out

California's 5.2 million cattle need something to eat, after all



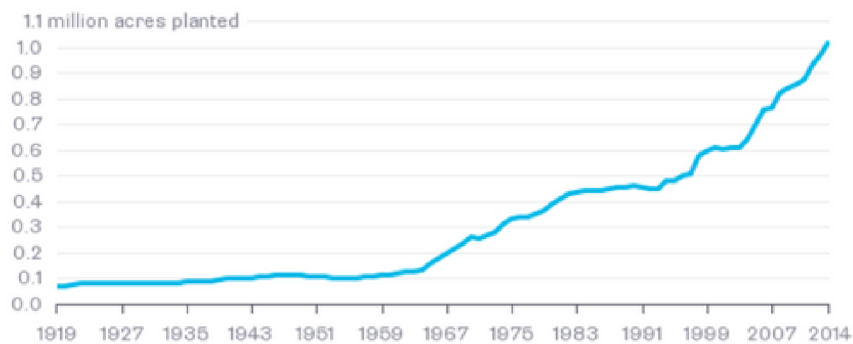
Source: U.S. Department of Agriculture

BloombergView

Source: Bloomberg

King Almond's Rise to the Throne

The rush into California's big new cash crop shows no signs of slowing



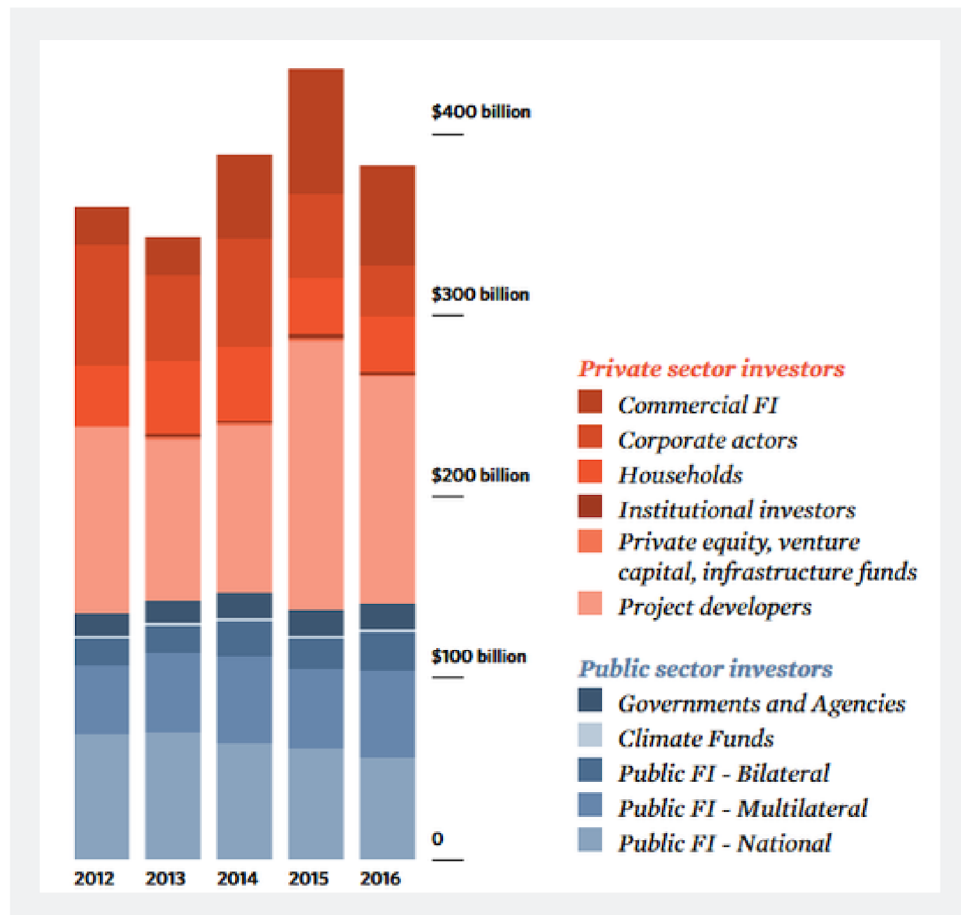
Source: U.S. Department of Agriculture

BloombergView

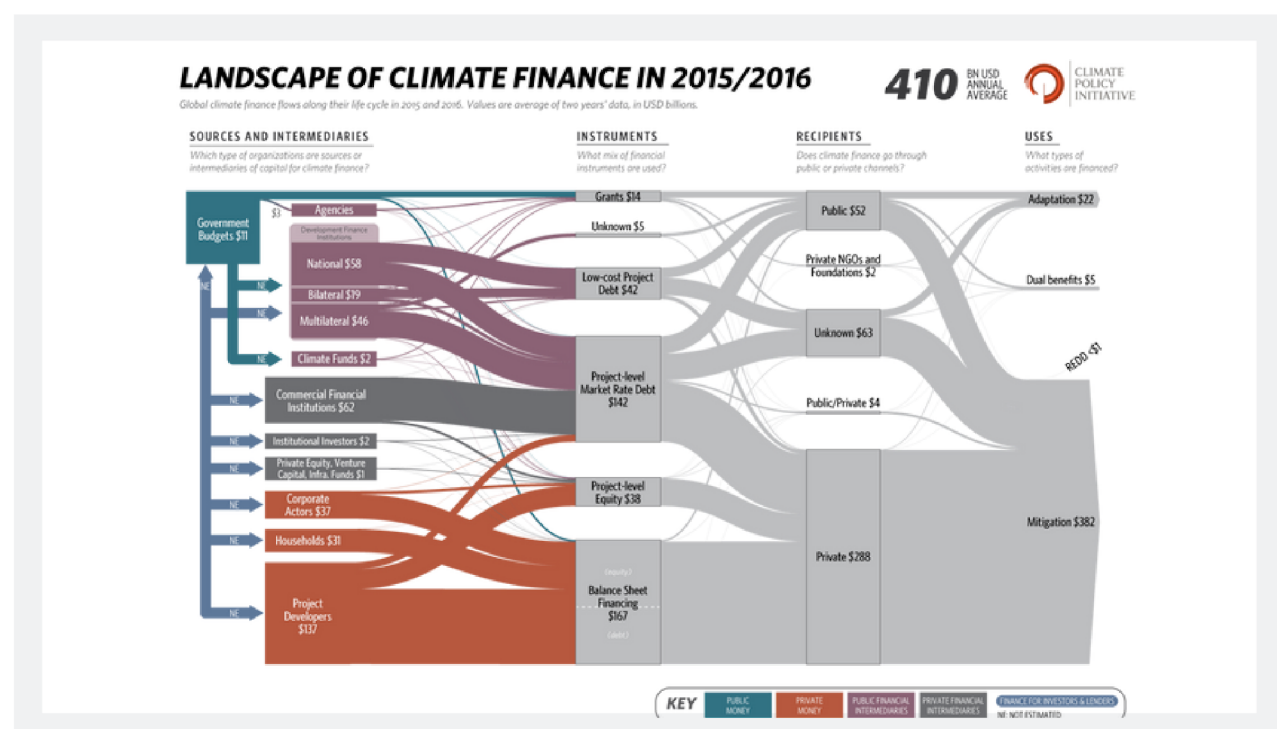
Source: Bloomberg

Transboundary Climate Finance Exhibits

Examples & Infographics on Climate Finance

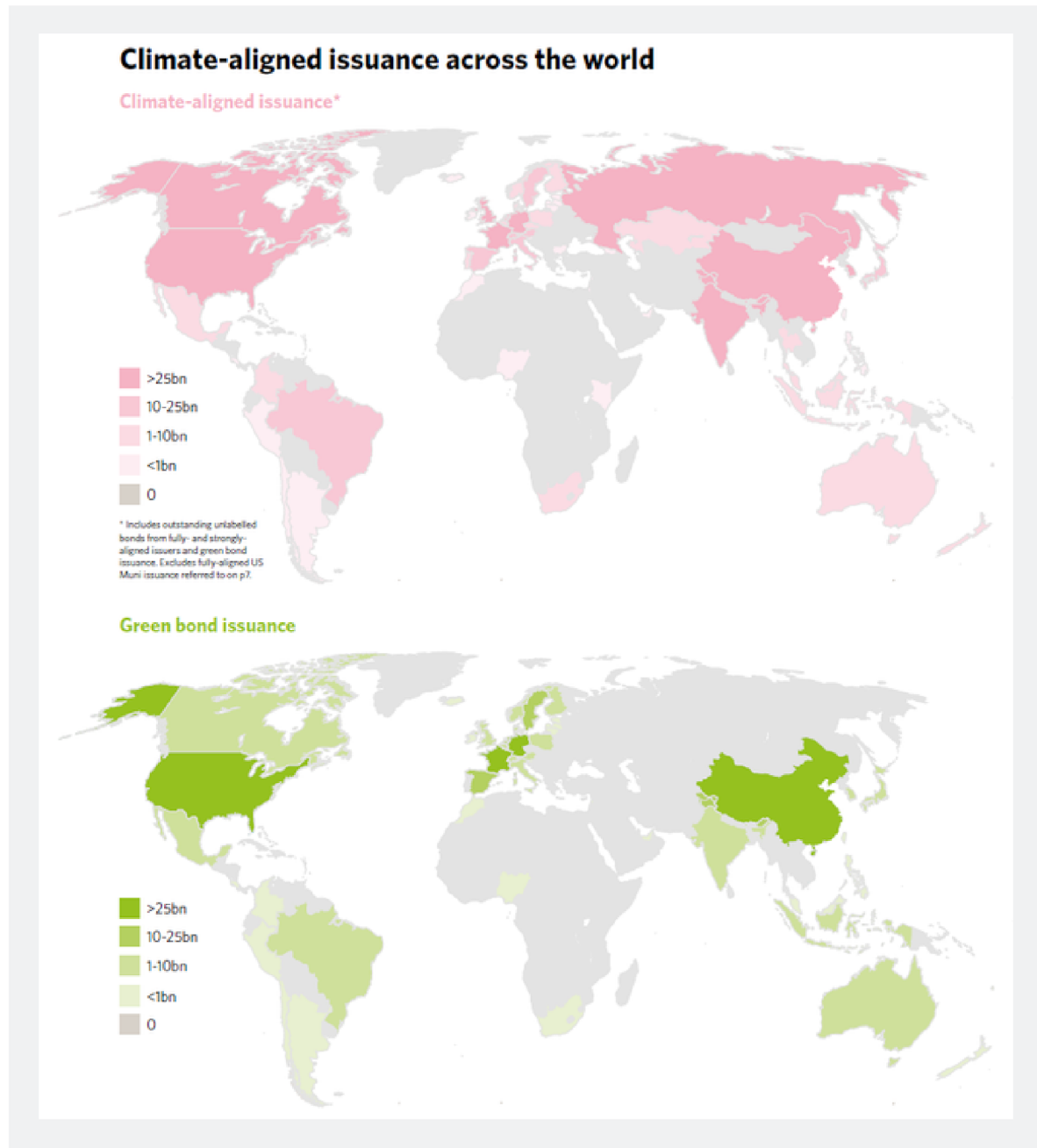


Source (both images):
Climate Policy Initiative



Transboundary Climate Finance Exhibits

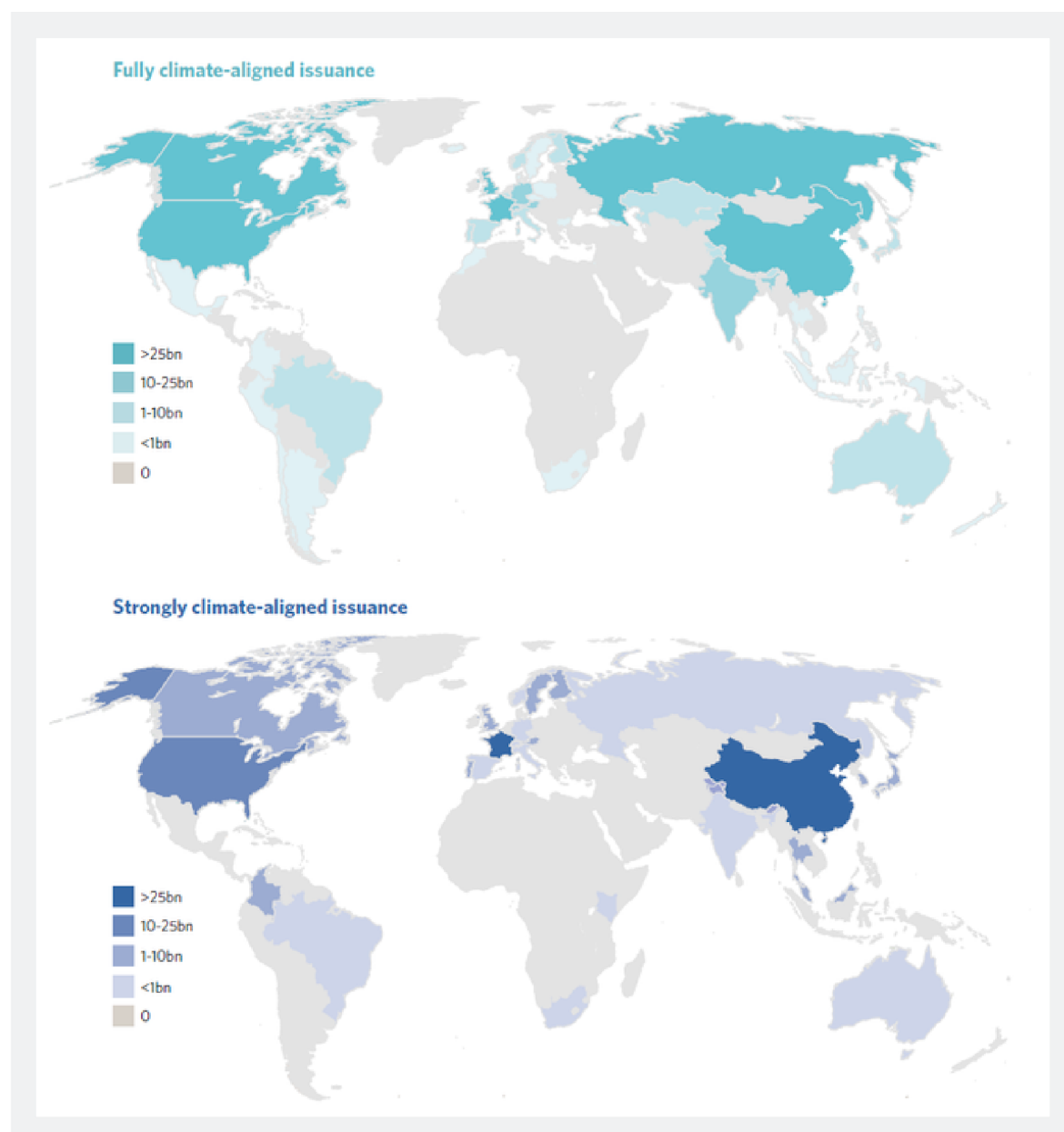
Examples & Infographics on Climate Finance



Source: Climate Bonds

Transboundary Climate Finance Exhibits

Examples & Infographics on Climate Finance



Source: Climate Bonds

Endnotes

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- [ix] Intergovernmental Panel on Climate Change (IPCC) — Climate Change Mitigation Measures and Water www.ipcc.ch/pdf/technical-papers/ccw/chapter6.pdf
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- [xvi] Phys.org — Climate change will reshape the world's agricultural trade www.phys.org/news/2018-09-climate-reshape-world-agricultural.html
- [xvii] Pacific Institute — California Agricultural Water Use: Key Background Information www.pacinst.org/wp-content/uploads/sites/21/2015/04/CA-Ag-Water-Use.pdf

Sources for Further Learning

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