

FINANCING THE TRANSITION FROM BROWN TO GREEN

How to track country performance towards low carbon,
climate-resilient economies

December 2017



AUTHORS AND ACKNOWLEDGEMENTS

This paper was prepared by Charlene Watson (ODI) and Hannah Schindler (HUMBOLDT-VIADRINA Governance Platform).

This paper benefitted significantly from the insightful review of Shelagh Whitley, Ipek Gencsu and Darius Nassiry (Overseas Development Institute (ODI)); Gerd Leipold and Sebastian Wegner (HUMBOLDT-VIADRINA Governance Platform); Katharina Lütkehermöller (NewClimate Institute); Franziska Marten (Germanwatch); Luis Zamarioli (Climate Analytics) and, Jeremy McDaniels (UNEP Inquiry). Thanks also to Orla Martin and Chris Little (ODI) for support in the production process and Steven Dickie for design.

This paper has been developed by ODI and the international secretariat of Climate Transparency. Responsibility for this report lies with the authors and does not necessarily represent the opinions of their organisations nor the partners of Climate Transparency. Corresponding authors: Charlene Watson (c.watson@odi.org) and Hannah Schindler (hschindler@governance-platform.org)

Suggested citation:

Climate Transparency. (2017). **FINANCING THE TRANSITION FROM BROWN TO GREEN: HOW TO TRACK COUNTRY PERFORMANCE TOWARDS LOW CARBON, CLIMATE-RESILIENT ECONOMIES.** (ODI and HVGP). Berlin, Germany. www.climate-transparency.org.

Supported by:



CONTENT

EXECUTIVE SUMMARY.....	4
INTRODUCTION.....	6
PART A: MAPPING THE FINANCING OF THE TRANSITION FROM BROWN TO GREEN.....	8
Green finance is increasing but a faster shift away from brown is needed.....	8
Critical actors for the transition are those central to climate but for whom climate may not be central.....	9
Public actors can deploy policy instruments, fiscal policy levers and public finance to transition.....	10
Indicators provide a concise and comparable picture of leaders and laggards.....	12
PART B: INDICATORS FOR TRACKING COUNTRY PERFORMANCE IN FINANCING THE TRANSITION FROM BROWN TO GREEN.....	14
Financial policy and regulation.....	15
Fiscal policy levers.....	18
Public finance.....	20
Increased private green finance.....	22
CONCLUSION.....	24
REFERENCES.....	25

EXECUTIVE SUMMARY

The understanding of how countries are progressing in their transition from brown to green models of economic development is growing ([Climate Transparency, 2016; 2017](#)). However, there remains no single set of indicators to allow an assessment of the financing of this transition to low carbon, climate-resilient economies. This paper develops a comprehensive picture on what financing the transition to a low carbon, climate-resilient economy looks like. Drawing on several stakeholder interviews and an expert workshop, Part A maps the landscape of financing the transition and Part B proposes a concrete set of indicators to measure country progress.

PART A: MAPPING THE FINANCING OF THE TRANSITION FROM BROWN TO GREEN

- While there has been progress worldwide in mobilising green finance, current brown (or high carbon, climate-risk inducing) finance substantially outweighs the green. The focus of transitioning to a low carbon, climate-resilient economy *must* be on shifting away from brown finance and not only on mobilising further green finance.
- In order to mobilise green finance and to shift away from brown finance, a range of public and private actors have to take action. A number of these are central to climate but for whom climate is not central. These actors are those whose day to day roles, responsibilities and priorities are not always focussed on the implications for and from climate change, but who nevertheless have a key role in financing the transition.
- Governments, central banks and financial authorities have at their disposal tools from three categories: 1) financial policies and regulations, 2) fiscal policy levers and 3) public finance. A transition requires the application of a combination of tools in each category. Together, these sets of tools support increased private green finance.
- Indicators measuring progress within these categories foster transparency. Comparing country action in financing the transition also drives competition and learning.

PART B: INDICATORS TRACKING COUNTRY PERFORMANCE IN FINANCING THE TRANSITION

This paper proposes nine indicators across the three categories of tools 1) financial policies and regulations, 2) fiscal policy levers and 3) public finance and for an additional fourth category, increased private green investment (Figure 1). To speak to actors central to finance and investment these must rely on credible data sources and be channelled through credible messengers.

These indicators can be applied to G20 countries to provide a broad summary of progress in financing the transition. A further ten indicators for further exploration at global, or indeed country level, are also presented. In 2018, Climate Transparency will continue to work on these indicators and aim to apply them, where possible, to G20 countries in their annual *Brown to Green Report* assessment report. Ongoing review and evolution of these indicators – such as through benchmarks – will reflect current thinking and data developments in a rapidly moving field.

FIGURE 1: NINE INDICATORS FOR TRACKING COUNTRY PERFORMANCE IN FINANCING THE TRANSITION

	<p>Financial policy and regulation</p>	<p>1. Checklist of policies greening the financial system and (re)directing finance</p> <ul style="list-style-type: none"> i. National brown to green finance strategy ii. Climate-related disclosure policies iii. Support for green market development iv. Climate-related policy and lending requirements for banks v. Climate-related investment requirements of public funds and development finance institutions
	<p>Fiscal policy levers</p>	<p>2. Net carbon price 3. Fiscal policies for resilience</p>
	<p>Public finance</p>	<p>4. Net public energy finance 5. International public finance for mitigation 6. International public finance for resilience</p>
	<p>Private finance</p>	<p>7. Stock exchanges with sustainable principles 8. Climate risk exposure and management of asset owners and managers 9. Green bond issuance</p>

Adapted from GGBP, 2014

INTRODUCTION

Transitioning to low carbon, climate-resilient economies requires the mobilisation of green finance and the redirection of brown finance (see Box 1). The scale of investment needed to meet countries' Nationally Determined Contributions (NDCs)¹ is substantial, estimated at more than USD 3.5 trillion² (Carbon Brief, 2015). Estimates of present climate finance³ fall far behind these investment needs. The 2016 Biennial Assessment identified total climate finance flows of USD 714 billion in 2014 (UNFCCC, 2016), while the Climate Policy Initiative estimated USD 410 billion annually between 2015 and 2016 (CPI, 2017). These estimates sit in the context of global financial assets of over USD 300,000 billion (Statistica, 2017).

Climate investment opportunities in emerging economies alone total USD 23 trillion for infrastructure, energy, energy efficiency and agriculture from 2016-2030 (IFC, 2017). Global investment in infrastructure over the next 15 years is estimated at USD 80-90 trillion. To make this investment compatible with a 2°C target will require additional upfront investment of 5%. Such investment will pay off over time (Bhattacharya et al., 2016). The scale and extent of this investment also offers significant opportunities not just for climate change mitigation and adaptation but also for economic growth and job creation (ILO, 2017).

In contrast, investment in climate vulnerable and high-carbon infrastructure may lead to asset stranding.⁴ For example, Australia's coal mining assets have been negatively impacted by increasing renewable energy production, worsening air pollution, decreasing water availability and China's reducing demand for thermal coal (Lloyds, 2017). Direct costs may also be incurred through climate-related hazards⁵; in 2016, USD 128 billion in economic losses resulted from such hazards (Munich Re, 2017).

The G20 countries are well positioned to provide the required leadership in the transition to a low carbon, climate-resilient economy. Together, they account for 85% of global GDP and 80% of CO₂ emissions (OECD, 2017). Since 2016, climate

change and green finance have become priority issues on the G20 agenda. For example, in 2016, the Chinese G20 Presidency established the Green Finance Study Group to identify institutional and market obstacles to the development of green finance and to mobilise capital for green investment (G20 GFSG, 2016). In 2017, 19 countries agreed to the G20 Hamburg Climate and Energy Action Plan for Growth that includes a pledge to create an enabling environment for making public and private investments consistent with the Paris Agreement goals. The plan further endorses the recommendations of the Green Finance Study Group and Task Force on Climate-Related Financial Disclosure (G20, 2017). Despite the Trump administration calling into question the extent to which the G20 are able to further progress these issues collectively – it intends to withdraw the US from the Paris Agreement – the G20 remain a key influential group. Argentina took over the G20 Presidency on 1 December 2017 and will continue these efforts through the Energy Transitions and Climate Sustainability Working Groups⁶.

Informed by a number of interviews with stakeholders⁷ and an expert workshop, this paper develops a clearer picture of what the financing of a brown to green transition might look like.

The paper is structured as follows:

Part A maps the financing of the transition to low carbon, climate-resilient economies. It describes the need to focus on shifting away from brown finance, engaging public and private actors, combining different tools and developing indicators to track progress.

PART B proposes a set of indicators for measuring country performance in financing the transition. It discusses their strengths and weaknesses as well as data availability of indicators.

The paper's findings will feed into the work of Climate Transparency and its annual *Brown to Green Report* (Box 2).

1) NDCs reflect states' intended efforts to reduce national emissions and adapt to the impacts of climate change (UNFCCC, 2014a).

2) Note that USD 2.5tn has been requested by India alone with the remainder the financial estimates submitted by 72 other developing countries in their INDCs.

3) See box 1

4) High-carbon infrastructure or that not resilient to climate risk can become stranded assets: those suffering from premature write-downs, devaluation or conversion to liabilities (Lloyds, 2017).

5) This includes buildings, other infrastructure and injuries and where possible, taken from governments, statistical offices and the World Bank. Not all climate-related hazards are attributed to climate change, nor can all economic losses be avoided, however, under a changing climate, the frequency and intensity of climate-related hazards will increase (IPCC, 2014).

6) In its Climate Sustainability Working Group Argentina's G20 presidency will focus on 'aligning and mobilising climate finance flows for the implementation of Nationally Determined Contributions under the Paris Agreement and low-emission development strategies' (see <https://www.g20.org/en/g20-argentina/thematic-areas/climate-sustainability>). In addition, sustainable finance is a theme of the finance track (see <https://www.g20.org/en/g20-argentina/thematic-areas/finance>)

7) Including five interviews with government representatives, three interviews with private sector representatives and seven interviews with representatives from international institutions, think tanks and foundations.

BOX 1: WHAT IS GREEN AND WHAT IS BROWN?

'Green' finance in this paper, refers to both domestic and international finance flowing towards low carbon and climate resilient solutions from both public and private sources. It is close, therefore, to the UNFCCC Standing Committee on Finance definition of climate finance as that aims 'at reducing emissions, and enhancing sinks, of greenhouse gases and at reducing vulnerability, and maintaining and increasing the resilience, of human and ecological systems to negative climate change impacts' ([UNFCCC, 2016](#), p19).

'Brown' finance in turn describes domestic and international finance flows that support carbon-intensive projects or activities and pathways that do not sufficiently consider future climate risks.

This paper thus uses a narrower definition of green finance than other actors of sustainable development. The Green Finance Study Group of the G20, for example, understands green finance as that providing any environmental benefit ([G20 GFSG, 2016](#)).⁸ It should be remembered that there is no global consensus on 'climate finance' and what counts remains a contentious issue ([Bodnar et al., 2015](#)), but this does not prohibit valuable analysis and scrutiny ([UNFCCC, 2014b, 2016; CPI, 2017](#)).

It is recognised that the 'brown' and 'green' classification of finance flows is more obvious in some sectors than others. Energy investments, for example, can be split into 'brown' referring to fossil fuel energy projects, including coal, oil and gas production, and fossil fuel-based power generation, and 'green' referring to clean energy projects, such as solar, wind, tidal and geothermal, with relatively minimal debate (see [OCI, 2017](#)).⁹ In other sectors, such as land use and activities increasing resilience to climate change, the brown to green distinction is more difficult to determine. For example, financing to support agricultural intensification may reduce the pressure to clear forests to make way for more agricultural land, reducing emissions from deforestation, or it may increase forest clearing due to the increased profitability of the agricultural land ([Falconer et al., 2017](#)).

BOX 2: CLIMATE TRANSPARENCY

Climate Transparency is a global partnership with a shared mission to stimulate a 'race to the top' in G20 climate action and to shift investments towards zero carbon technologies through enhanced transparency. It aims to increase awareness and peer pressure among policy-makers in G20 governments and influencers from civil society and the financial sector on a national and international level.

In its annual *Brown to Green Report*, Climate Transparency brings together the most authoritative climate assessments and expertise of stakeholders from G20 countries. Jointly, these experts develop a comprehensive and comparable picture on G20 climate performance. The Brown to Green Report covers the current state of emissions and alignment with global goals, climate policy, the financing of the transition and progress towards decarbonisation, as well as including detailed fact sheets on all G20 countries.

Climate Transparency convenes partners from Argentina (Fundación Ambiente y Recursos Naturales), Brazil (CentroClima/COPPE UFRJ), China (Energy Research Institute), France (The Institute for Sustainable Development and International Relations), Germany (Germanwatch, HUMBOLDT-VIADRINA Governance Platform, NewClimate Institute), India (The Energy and Resources Institute), Indonesia (Institute for Essential Service Reform), Mexico (Iniciativa Climática de México), South Africa (Energy Research Centre/University of Cape Town) and the UK (Overseas Development Institute). Climate Transparency is funded by the ClimateWorks Foundation, Stiftung Mercator and the World Bank and supported by the European Climate Foundation.

8) The Green Finance Study Group understands green finance as "financing of instruments that provide environmental benefits in the broader context of environmentally" ([G20 GFSG, 2016](#)). It is noted however that in some cases indicators in this paper are by necessity capturing the broader definition of green finance.

9) There are however, differences in opinions on how to categorise investments in large hydro, transmission and distribution, nuclear power, and energy efficiency improvements for fossil fuels that can have significant environmental impacts.

PART A: MAPPING THE FINANCING OF THE TRANSITION FROM BROWN TO GREEN

GREEN FINANCE IS INCREASING BUT A FASTER SHIFT AWAY FROM BROWN IS NEEDED

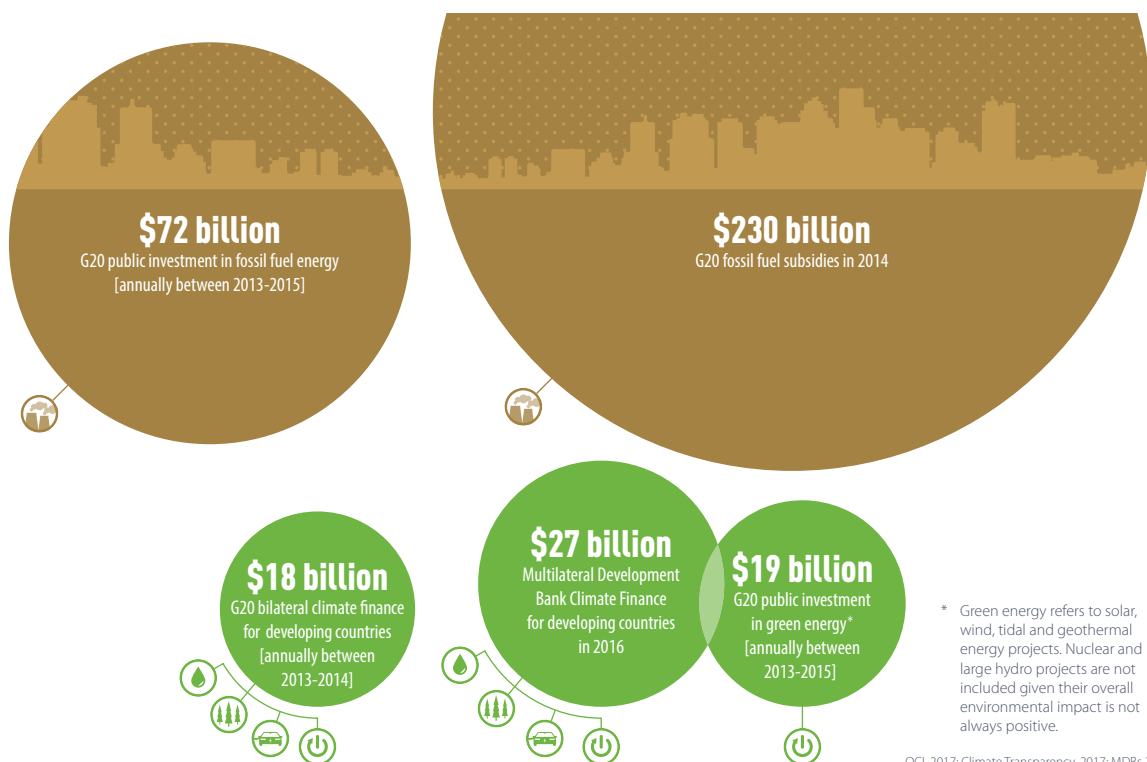
Green finance is increasing. G20 governments spent USD 19 billion a year on green energy between 2013 and 2015 (OCI, 2017). Multilateral Development Banks (MDBs) committed USD 27 billion in climate finance in 2016, attracting USD 38 billion in co-finance (MDBs, 2017). Bilateral climate related finance reported to the OECD Official Development Assistance Committee reached USD 30 billion in 2016, maintaining an upward trend (OECD, 2017). The Green Climate Fund, the newest and largest part of the Financial Mechanism of the UNFCCC, has approved over USD 1 billion in projects in 2017 in only its second year of operation (Climate Funds Update, 2017).

Brown finance flows, however, grossly overshadow green flows (Figure 2). G20 countries spent USD 72 billion annually in public finance on fossil fuel energy production between

2013 and 2015 (OCI, 2017). Fossil fuel subsidies in the G20 countries alone were estimated at USD 230 billion in 2014 (Climate Transparency, 2017). While a number of the MDBs are shifting away from brown finance in their portfolios, independent analysis highlights others still have energy portfolios biased towards fossil fuels (Economist, 2017).

Endorsers of the Paris Agreement – 169 countries as of December 2017 – have committed to ‘making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development’ (UNFCCC, 2015). It is thus critical to not only mobilise green finance but to **shift from brown investments** as part of the transition to a low-carbon, climate-resilient world.

FIGURE 2: GREEN FINANCE IS INCREASING BUT A FASTER SHIFT AWAY FROM BROWN IS NEEDED



* Green energy refers to solar, wind, tidal and geothermal energy projects. Nuclear and large hydro projects are not included given their overall environmental impact is not always positive.

OCI, 2017; Climate Transparency, 2017; MDBs 2017

CRITICAL ACTORS FOR THE TRANSITION ARE THOSE CENTRAL TO CLIMATE BUT FOR WHOM CLIMATE MAY NOT BE CENTRAL

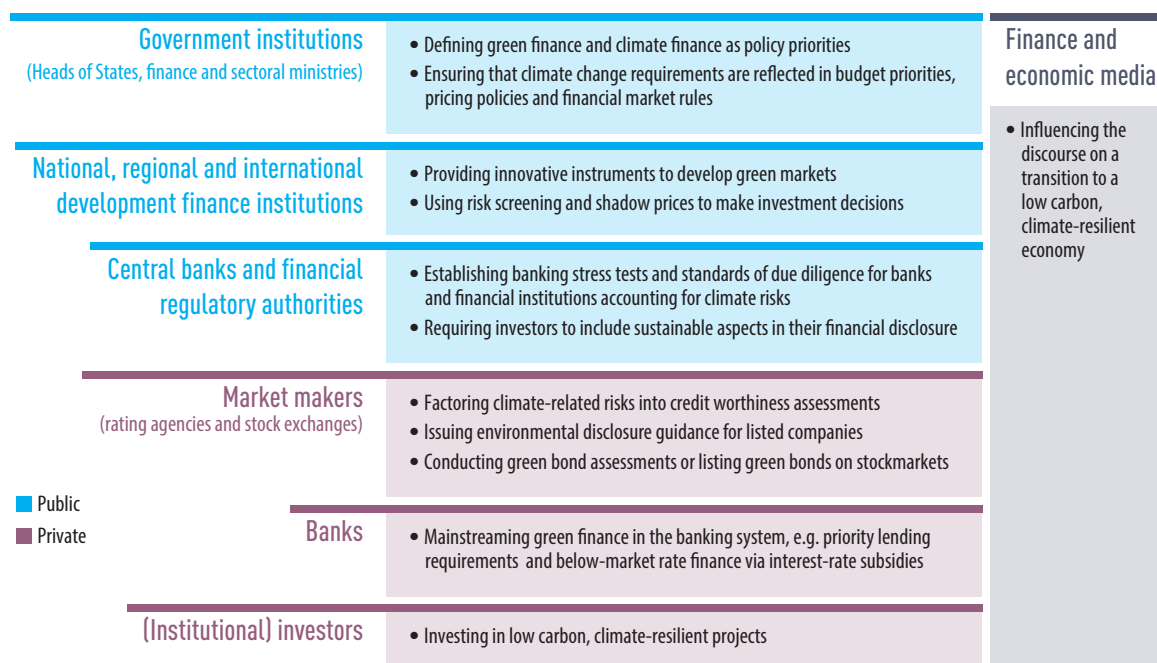
To increase green finance and shift investments from brown to green, public and private actors can take various actions (Figure 3):

Governments can incentivise private actors through **policies and regulations** such as financial market rules, and channel **public finance** through national, regional and international development finance institutions (DFIs) as well as through multilateral climate funds. Since 2009, for example, the **G20** countries have been discussing a phase out date for fossil fuel subsidies. Heads of State and other government representatives involved in the G20 process can

also lead on international financial frameworks or reforms related to climate change within the G20. Under the Chinese G20 Presidency in 2016, the G20 Green Finance Study Group and the Task Force on Climate-related Financial Disclosure (TCFD)¹⁰ were established, and their work continued under the German G20 Presidency.

It is also worth noting that there are financial policies and regulations that are outside of the domain of individual countries. Basel III and Solvency II regulations, for example, act to shape and constrain investment flows in emerging markets (e.g. [CISL and UNEP FI, 2014](#)).

FIGURE 3: CRITICAL ACTORS FOR THE TRANSITION FROM BROWN TO GREEN INVESTMENT



¹⁰ At the request of the G20, the Financial Stability Board (FSB) engaged the private and public sector to review how the financial sector can incorporate climate-related issues in financial reporting. The Task Force on Climate-related Financial Disclosures (TCFD) was established to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to lenders, insurers, investors and other stakeholders ([Germanwatch, 2016](#)).

Public entities can support and test new green financing tools or establish guidelines on green finance. **Development Finance Institutions (DFIs)** can and have made commitments to take climate risks and the carbon footprint into account when making investment decisions. They can move away from fossil fuel investments and provide financial instruments to reduce risks or issue products such as green bonds ([OECD, 2017](#)). **Central banks and financial regulators** can set market rules shifting investments, often driven by short-term yields, to long-term sustainable solutions. These include banking stress tests and improving standards of due diligence for banks and financial institutions to consider climate risks. In several G20 countries, regulators require investors to disclose their environmental, social and governance (ESG) criteria in their financial reports ([UNEP, 2015](#)). The Bank of England has become a key driver in the debate on climate-related financial risk disclosure.

In addition to governments, central banks and financial regulators, **market makers** such as **rating agencies** and **stock exchanges** can influence the behaviour and investment decisions of private actors. Rating agencies can factor-in climate-related risks and conduct green bonds assessments ([Moody's, 2016](#)). Stock Exchanges can operate under sustainability principles. Luxembourg, for example, launched the world's first green stock exchange in 2016 ([LSE, 2016](#)) and the London Stock Exchange Group released an ESG guidance for listed companies incorporating climate-related financial disclosure as recommended by the TCFD ([LSEG, 2017](#)).

By governments and other actors deploying the tools above, increased **private finance** can be mobilised through various sources. **Banks** can direct finance towards green projects through, for example, priority lending. Equally, private **investors** and funds can shift activities towards greener products. **Institutional investors** (both public and private) – including pension funds, sovereign wealth funds and insurers – could provide significant flows if they shift their investments towards green projects.

Public and private finance actors are influenced by **finance and economic media** that can raise awareness and frame the discourse on a transition to a low carbon, climate-resilient economy.

As highlighted above, the success of the transition does **not depend on single actors alone**. A transformation to a low-carbon and climate-resilient economy is driven by the interplay of the financial sector and the real economy. Governments can foster the real economy's demand for green finance via appropriate incentives. Financial sector innovation facilitates the allocation of capital into these real economy activities in a sustainable manner. This in turn, creates demand for further financial innovation. For example, institutional investors and financial institutions supported the development of green bond markets ([UNEP and WBG, 2017](#)).

PUBLIC ACTORS CAN DEPLOY POLICY INSTRUMENTS, FISCAL POLICY LEVERS AND PUBLIC FINANCE TO TRANSITION

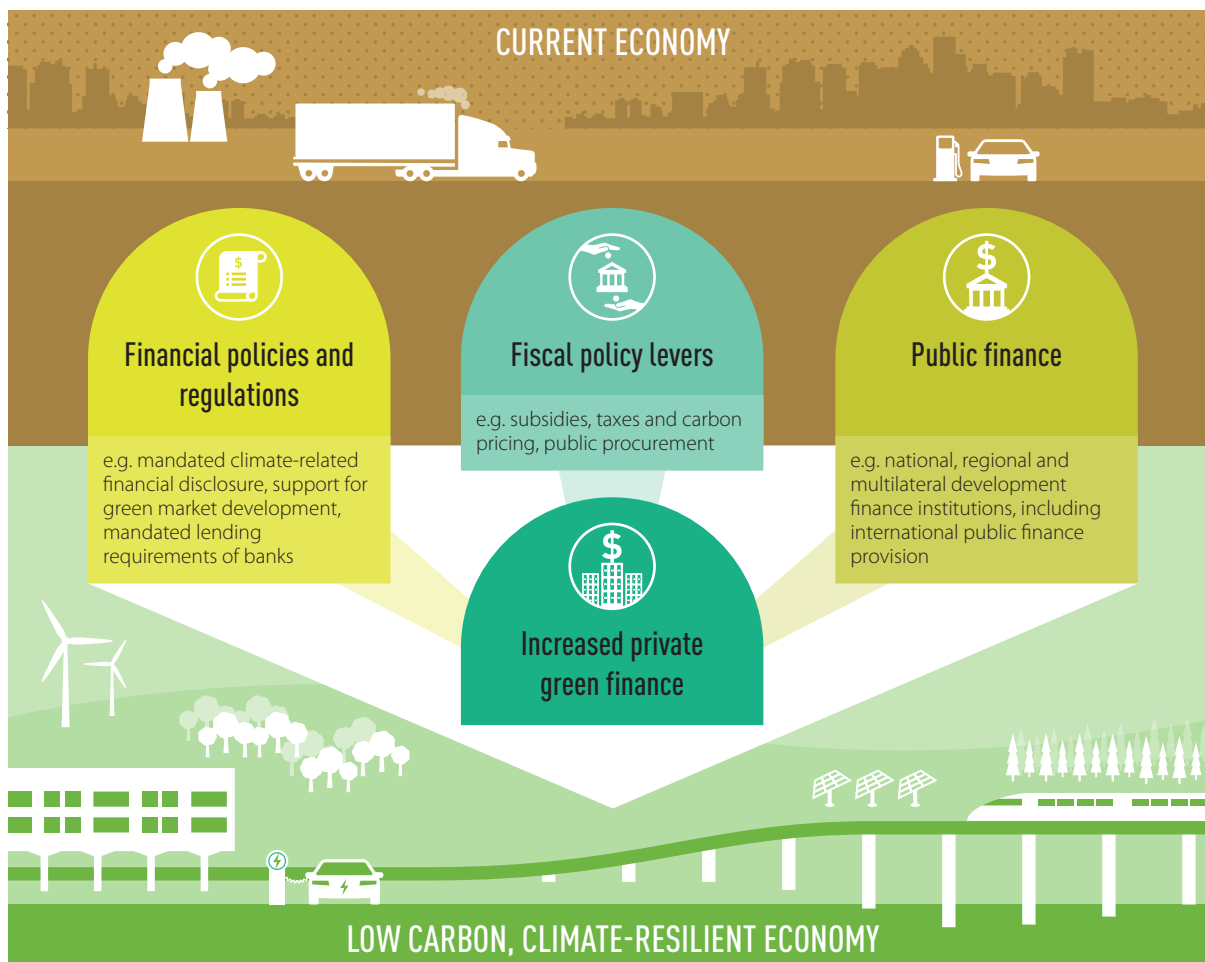
Change has to come from public and private actors. However, public institutions are crucially important in creating an enabling environment. Three categories of tools these actors can employ can be identified: 1) *financial policies and regulations*, 2) *fiscal policy levers* and 3) *public finance* (adapted from [GGBP, 2014](#)). *Increased private green investment* is both an output of the application of these tools, and a catalyst to further green investment (Figure 4).

Through **policies and regulations** governments can overcome challenges to mobilising green finance: real and perceived risks, insufficient returns on investment, capacity and information gaps, competing development priorities

and other regulatory and institutional barriers ([GGBP, 2014](#)). For example, France became the first country to pass a law introducing mandatory climate-related reporting for asset owners and asset managers in 2015 ([Assemblée Nationale, 2015](#); see also [UNEP & WBG, 2017](#)).

Fiscal policy levers can shift private investment decisions and consumer behaviour towards low carbon, climate-resilient activities. Well known instruments include energy taxes, carbon pricing schemes and the phasing out of fossil fuel subsidies. In 2016, the Canadian government required all provinces and territories to have a carbon pricing initiative in place by 2018, according to federal criteria. British Columbia,

FIGURE 4: HOW GOVERNMENTS CAN SHAPE THE TRANSITION FROM BROWN TO GREEN FINANCE



Alberta and Ontario have all implemented carbon taxes and emissions trading schemes (some in addition to pre-existing carbon taxes), while a further three (of ten) provinces and territories have carbon pricing regimes scheduled for implementation ([World Bank, 2017](#)).

Public finance has a significant impact on the transition. It can stimulate innovation, mainstream new technologies, overcome market failures and barriers to private investment as well as being directly invested in climate action; in advanced economies, for example, public resources contribute about 40% of the infrastructure investment (Ahmad, 2015). The UK's Green Investment Bank (GIB) was able to channel national government funding into lowering

emissions via renewable energy projects at market rates before it was reclassified as a private institution.¹¹ The GIB's Operating Offshore Wind Farm Fund reached a first close of GBP 463 million from pension funds and a sovereign wealth fund to purchase operating offshore wind farms from utility companies to allow them to recapitalise and invest in further development ([OECD, 2015a](#)). Concessional public finance is also critical in supporting research, innovation and capacity building.

It is through combinations of tools within these three categories that public actors can drive the financing the transition to low carbon, climate-resilient economies.

¹¹ The UK's Green Investment Bank (GIB) has been sold to Macquarie and is no longer a public institution, however, Macquarie has committed to the GIB target of leading GBP 3 billion of investment in green energy projects over next three years.

INDICATORS PROVIDE A CONCISE AND COMPARABLE PICTURE OF LEADERS AND LAGGARDS

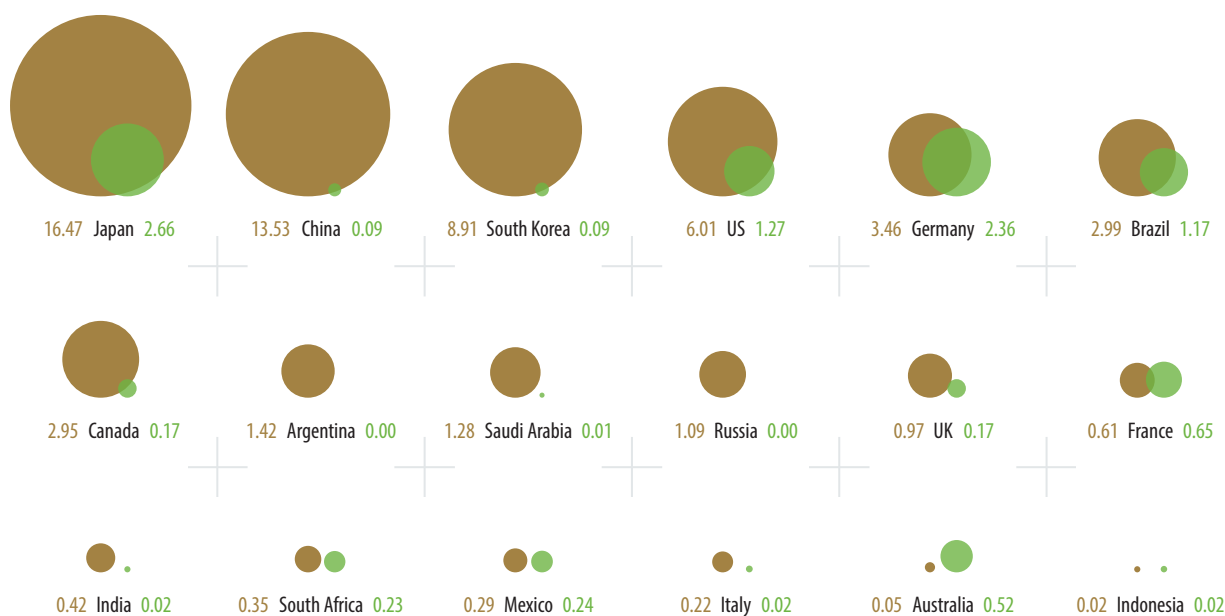
Indicators for 1) financial policies and regulations, 2) fiscal policy levers, 3) public finance and 4) private finance help to track the country performance of financing the transition from brown to green. These indicators can be of qualitative and quantitative nature depending on their focus, for example policies or financial flows. They seek comparability between countries and the wide coverage of sectors as well as both mitigation and adaptation. Ideal indicators are those for which both the brown and green can be established, so as to create a ratio from which to track progress.

Through such indicators, transparency and comparison of climate action in G20 countries will increase awareness and stimulate national debate on finance. A comprehensive set of indicators can foster learning and competition; possibly even laying 'the basis for strategic adjustments in both policy

and practice' (UNEP and WBG, 2017, p16).¹² But to reach out to those in the finance sector who are 'central for climate, but for whom climate is not central' indicators need to be based on recognised sources and be clear and simple. Ideally, they should also speak the interests of specific actors, such as finance ministries (Box 3).

Figure 5 illustrates the scale of public finance G20 countries are spending on energy. Oil Change International looked at project data from G20 institutions and their contributions through the MDBs between 2013 and 2015, finding that USD 72 billion a year supported fossil fuel production while just USD 19 billion supported clean energy such as wind, solar, geothermal and small hydro. The remainder going to that classified as neither brown or green, such as large hydro dams or transmission infrastructure (OCI, 2017). Japan and China,

FIGURE 5: PUBLIC FINANCE IN MANY G20 COUNTRIES SUPPORT BROWN ENERGY RATHER THAN GREEN



Annual average public investment (USD billions, 2013-2015) in:

- Fossil fuel energy projects, including coal, oil, gas and fossil fuel-based power generation/transmission
- Solar, wind, tidal and geothermal energy projects.

Nuclear and large hydro are not included given their overall environmental impact is not always positive.

OCI, 2017

¹² Note that recent efforts have been made to measure the contribution of the financial system to sustainable development, specifically in the environmental dimension. UNEP Inquiry has promoted the measurement of progress towards a sustainable financial system that works to 1) Effectiveness - the degree to which the market prices sustainability factors in asset valuations; 2) Efficiency - the costs of running the financial system that delivers the flows of finance aligned with sustainable development requirements; 3) Resilience - the strength of the financial system in the face of disruptions related to unsustainable development such as air pollution, climate change, or water scarcity.

providing between USD 17-19 billion in public finance each year for brown energy, rank worst in absolute terms, while South Korea and Japan are worst offenders relative to GDP.

Acknowledging different classifications of green and brown as well as data gaps, there is sufficient detail to start tracking the financing of the transition. A set of nine main indicators are suggested to compare the performance of G20 countries (see figure 1). These indicators do not all have an end-point. A phase out of fossil fuel subsidies is a clear benchmark for fiscal policy in the transition, for example, but public investment in resilience has no clear benchmark. Despite this, the indicators in this paper are able to track the speed and depth of the financing of the transition.

BOX 3: INDICATORS SPEAKING TO THE INTERESTS OF FINANCE MINISTRIES

Finance ministries set budget priorities, pricing policies and financial market rules ([World Bank, 2017](#); [MOF, 2017](#); [Stern, 2016](#)). They are thus engaged in the national deployment of the three tools: 1) financial policies and regulations, 2) fiscal policy levers and 3) public finance (Figure 4). To encourage their engagement in financing the transition, information and indicators tracking progress should speak to their interests:

- Finance ministries and central banks are mandated to secure financial market stability that is “the efficient allocation of financial resources and risks along with the provision of a well-functioning financial infrastructure” ([BME, 2016](#)). The TCFD identified physical risks as well as transition risks of climate change – the misalignment of financial markets and long-term strategies to address climate change leading to heavy losses in investment assets, particularly in oil, gas and coal intensive industries ([TCFD, 2017](#)). Thus, indicators focusing e.g. on climate-related disclosure policies are of particular relevance to this target group (even though not all G20 finance ministries have prioritised this issue). Equally, considering the short-term focus of capital markets, indicators addressing this time frame and revealing the short-term impacts of climate change are crucial.
- Finance ministries in charge of the national budget have an interest to keep public expenditures within limits and look for fiscal returns ([Skovgaard, 2017](#)). Fiscal policies with the aim to reduce greenhouse gas emissions are in line with these objectives. Next to the phase out of fossil fuel subsidies, energy taxes and carbon pricing create fiscal space. In 2016, governments raised about USD 22 billion in carbon pricing revenues¹³ ([WBG and Ecofys, 2017](#)). Pricing reforms in India, mainly to gasoline (2010) and diesel (2014) have cut the country’s subsidies bill in 2014 by USD 15 billion ([IEA, 2015](#)) and subsidy reforms have led to the parallel implementation of one of the largest cash transfer programs in the world ([Nordic Council of Ministers, 2017](#)). Fiscal policy indicators highlighting these benefits are more likely to create impact.
- Finance ministries strive for economic growth and job creation ([G20, 2016](#)). Presenting public finance indicators in light of the co-benefits of climate change contributes to the public debate. According to the IRENA, 9.8 million jobs were created in the renewable energy sector worldwide in 2016 ([IRENA, 2017](#)).

¹³ This includes revenue from allowance auctions, direct payments to meet compliance obligations and carbon tax receipts ([World Bank, 2017](#)).

PART B: INDICATORS FOR TRACKING COUNTRY PERFORMANCE IN FINANCING THE TRANSITION FROM BROWN TO GREEN

To compare how countries are performing in financing the transition to a low carbon, climate-resilient economy, this part of the paper proposes a set of indicators. Indicators relate to the three tools of public actors – 1) financial policies and regulations, 2) fiscal policy levers and 3) public finance – as well as 4) private actions and finance. The development of indicators is based on expert interviews across government, think tank and financial institution actors, and an expert workshop.¹⁴

An enabling environment for low carbon, climate-resilient economies encompasses many aspects of policy and regulation. Already, several initiatives measure G20 country climate policy performance. This includes the annual Climate Transparency *Brown to Green* Report that assesses G20 country climate actions (Box 4). So far, however, these assessments do not account for financial policies and regulations.

BOX 4: CLIMATE POLICY PERFORMANCE ASSESSMENT IN THE BROWN TO GREEN REPORT

The climate policy section of the [2017 Brown to Green Report](#) contains:

- 1) A climate policy performance rating that evaluates countries with respect to a long-term low emissions development strategy, 2050 GHG targets, renewable energy in the power sector, coal phase-out, efficient light duty vehicles, efficient residential buildings, energy efficiency in industry and efforts for reducing deforestation. Benchmarks for this analysis are taken from the Climate Action Tracker analysis on the ten steps to limit warming to 1.5°C ([Climate Action Tracker, 2016](#)).
- 2) An expert evaluation of climate policy (Climate Change Performance Index, [Burck et al., 2017](#)) that evaluates a country's performance in national climate policy, meaning the performance in establishing and implementing a sufficient policy framework, as well as international climate diplomacy through feedback from national climate and energy experts.
- 3) The Regulatory Indicators for Sustainable Energy ([RISE, 2016](#)) of the World Bank, indicating national policy and regulatory frameworks for renewable energy and energy efficiency taking into account legal frameworks, planning for renewable energy expansion and energy efficiency, renewable network connection, energy labelling systems and building energy codes, and pricing amongst other indicators. It includes elements of financial and regulatory incentives as well as carbon pricing.
- 4) A Nationally Determined Contributions (NDCs) evaluation ([Climate Action Tracker, 2017](#)) that quantifies, evaluates and rates NDCs against effort-sharing ranges consistent with holding warming to below 2°C. The method abstains from defining what is fair but covers a holistic inclusion of very different viewpoints of what could be fair, including considerations of equity, historical responsibility, capability and equality.

¹⁴ The workshop was held in London, 23rd October 2017 see: <http://www.climate-transparency.org/workshop-financing-the-transition-from-brown-to-green>



FINANCIAL POLICY AND REGULATION

I. TRANSITION INDICATORS: FINANCIAL POLICY AND REGULATION

This paper suggests a qualitative checklist of policies for greening the financial system and (re)directing finance (see Table 1), including:

→ **National brown to green finance strategies** - a number of countries are progressing national green-finance strategies. China has produced 'Guidelines for Establishing the Green Financial System' ([People's Bank of China, 2016](#)). Argentina, China, Italy and South Africa are all developing financial system roadmaps, or systemic plans to enhance the ability of the financial system to mobilise private capital for green investment ([UNEP Inquiry, 2017a](#)). This qualitative indicator seeks long term, systemic plans to enhance the ability of the financial system to develop green markets and finance flows but also to shift public and private finance from brown to green. It is this latter point that is, to date, missing in efforts to progress national strategies.

→ A qualitative indicator on **climate-related disclosure considers policies** that require actors to report on climate change, specifically ensuring that climate risk is factored into decision-making. The Climate Disclosure Project has long tracked corporate climate action ([CDP, 2017](#)), such as that mandated by the US Environmental Protection Agency's (EPA) Mandatory Reporting of Greenhouse Gases Rule (see [EPA, 2016](#)). More recently, the Task Force on Climate Related Financial Disclosure (TCFD) has increased the visibility of material climate risk in the financial system, as has France's Article 173 of its Energy Transition Law that requires investors to disclose how they factor environmental, social and governance dimensions into their investment policies (see analysis of [PRI, 2016](#)). As a comprehensive approach such as in France cannot be observed in other G20 countries so far, an alternative indicator might look at the acknowledgment and first responses of public entities to climate-related financial risks and thus the need for disclosure of private actors. It might include references to these in assessments, such as the German Federal Ministry commissioned study on potential impacts of climate-related risks to market stability) ([Bank of England, 2016](#); [BMF, 2016](#)).

→ **Policies (re)directing finance**, including:

- a. **Support for green market development** can be diverse. Sub-indicators will therefore be needed to indirectly assess the support for green markets. In the first instance, the *support for green bond market development* is a useful sub-indicator. China has launched seven green bond indices since mid-2016, for example, but the sub-indicators may also include *support for green loans*. It will remain challenging, however, to compare the relative scales of support from G20 countries according to their needs and responsibilities;
- b. **climate-related credit policies and lending requirements for banks** – This qualitative indicator looks at how banks mainstream green finance in the banking system, e.g. via priority lending requirements, below-market finance via interest-rate subsidies or integration of climate-related risks into the assessment of their debtors' credit ratings; and,
- c. **climate-related investment requirements of public funds and development finance institutions** – Such requirements will enable the shifting of huge public financial flows from high carbon to low carbon solutions. Qualitative indicators can include quantitative objectives of climate-related activities (e.g. percentage of climate investments in the overall or sectoral portfolios), investment priorities for climate-compatible projects or exclusion criteria for carbon-intensive projects. Equally, public funds and development finance institutions can set emission reduction targets achieved through investments ([I4CE, 2017](#)).

Further qualitative data, such as a survey of country experts, can complement this policies and regulations checklist, assessing the extent to which policies and regulations are enforced and providing more forward-looking analysis. Surveys could also reflect how far policies are mainstreamed across different sectors and ministries, capturing contradictory policies and regulations. With the challenges associated with creating such checklists of policy – countries may have very evolved policy frameworks and engaged institutions that may not translate to show overall progress on green finance – it is necessary to view this checklist alongside the additional indicators presented below ([UNEP Inquiry, 2016](#)).

TABLE 1: FINANCIAL POLICIES AND REGULATIONS: INDICATORS FOR ASSESSING PROGRESS TOWARDS FINANCING A TRANSITION FROM BROWN TO GREEN

Indicator	Description	Data	Challenges
Financial policies and regulations			
National brown to green finance strategy	<p>Long-term, systematic plans that address and enhance the ability of the financial system to mobilise public and private capital for green investment and shift public and private finance away from brown.</p> <p>Example: <i>China's "Guidelines for Establishing the Green Financial System" incentivising and promoting green loans, green bonds and green funds (note: this example just focuses on green finance, not brown finance).</i></p>	UNEP Inquiry Green Finance Progress Report (2017a) and desk research.	<p>The focus of current country strategies is on greening the financial system rather than shifting from brown to green.</p> <p>Where countries have sectoral financing strategies they would not be included.</p>
Climate related disclosure policies	<p>Mandatory and voluntary government schemes on reporting of climate change-related information from banks and credit providers, asset managers and institutional investors as well as companies. They might include:</p> <ul style="list-style-type: none"> → Assessment of climate-related opportunities and risks (physical and transitional risks), e.g. regular stress tests for climate risks and/or portfolio exposure to climate-related risks → Implementation of ESG policies → Emission reduction contribution <p>Example: <i>France's Art. 173 of its Energy Transition Law; USA: "EPA Mandatory Reporting of Greenhouse Gases Rule", combined with guidance by "US federal securities laws and regulations"</i></p> <p>Alternative indicator: Acknowledgements of climate-related risks and need for disclosure</p> <p>Example: <i>The German Finance Ministry released a commissioned research report on the potential impact of climate change on financial market stability.</i></p>	UNEP Inquiry Green Finance Progress Report (2017a), OECD analysis on G20 countries (2015c), and desk research.	<p>Schemes vary between countries, making comparison difficult. It may be necessary to break down into categories (e.g. disclosure guidance, voluntary frameworks, comply or explain, mandatory reporting and enforcement and compliance structures).</p> <p>The degree to which policies are enforced or are sufficiently ambitious are hard to capture.</p>
Support for green market development	<p>National and sub-national government and/or national development banks are providing green bond guidelines and standards.</p> <p>Examples: <i>France issued a EUR 7 billion sovereign bond in 2017; China provided a green bond catalogue and green bond guidelines; Japan's Ministry of the Environment released green bond guidelines in March 2017.</i></p>	Climate Bonds Initiative and UNEP Inquiry Green Finance Progress Report (2017a).	Green bonds are primarily a refinancing tool and it is not clear to what extent they are representative of growth of green markets.
Climate-related credit policies and lending requirements for banks	<p>Central banks and financial authorities' credit policies and lending requirements for (commercial) banks that take into account climate-related risks and shift loans to green projects.</p> <p>Examples: <i>The Reserve Bank of India (RBI) has included lending to small renewable energy projects within the targets of its Priority Sector Lending requirement; Bank Indonesia regulates the environmental aspects of credit policies for commercial banks</i></p>	Desk research	Regulations may differ substantially in scope and format. May need to be broken down into further sub-indicators (e.g. priority sector lending requirements, preferential refinancing treatment).
Climate-related investment requirements of public funds and development finance institutions	<p>Public funds and development finance institutions' investment and/or screening requirements that increase green investments and/or divest from brown.</p> <p>Example: <i>France's SWF Caisse des Depots (CDC) is reducing the carbon footprint of its equity portfolio by 20% by 2020, and is exiting companies that derive more than 20% of revenue from coal.</i></p> <p><i>French Development Agency (AFD group) decided in 2013 to formally exclude the financing of coal power plants without an effective Carbon Capture and Storage (CCS) system in place.</i></p>	Desk research, Asset Owner Disclosure Project (AODP, 2017)	May be hard to compare between options chosen by institutions and the extent to which they are applied.

II. FURTHER TOPICS TO EXPLORE

It is challenging to distil which financial policies or regulations will have the most impact on increasing ambition in G20 countries. Topics of relevance include:

- The **existence of green banks and green-bank like institutions** – the OECD has recently defined green banks and green-bank like institutions as ‘a publicly capitalised entity established specifically to facilitate private investment into domestic low carbon, climate-resilient (LCR) infrastructure and other green sectors such as water and waste management’ (OECD, 2016; NCE 2017). Australia, Japan, the UK are all G20 countries with national green banks, operating on commercial terms. The Development Bank of Southern Africa (DBSA) has created a Climate Finance Unit that operates as a green-bank like institution within an institution (Coalition for Green Capital, 2017). State and county-level green banks also exist. While being a useful tool, they are not a necessity; countries may achieve similar ambitions through their national development banks, for example.
- The **existence of and support for insurance products supporting the transition** – insurance plays a critical role in facilitating capital reallocation and a country’s economic resilience (and thus has an impact on financing conditions such as pricing of sovereign debt). An indicator might capture the development of insurance products for green assets, the availability of reinsurance for high-risk assets, or the existence of sovereign catastrophic risk schemes, for example (see UNEP Inquiry, 2017b).
- **Support for project development facilities** – green investment can be limited by the lack of well-prepared, investment ready projects particularly in infrastructure (Nassiry et al., 2015)¹⁵. Governments, in addition to other actors can, for example, encourage the development of quality pipelines through investing in project preparation facilities. These may include the provision of technical advice for design and conceptualisation, funding for prefeasibility studies and project identification and matching functions aimed at linking projects with funding from other sources and investors. Support at scale for project preparation, however, is often a collaborative effort between countries and development finance institutions (Nassiry et al., 2015).
- Membership and/or leadership of research, learning and other platforms and initiatives – there has been a significant expansion of learning networks for capacity building, the facilitation of knowledge-sharing on environmental and financial risk, and the improvement in measurement of green finance activities. These include initiatives such as the Sustainable Business Network (SBN) and Principles for Responsible Investment (PRI), noting these are not public sector only initiatives, but also toolkits such as the G20 Energy Efficiency Investment Toolkit (2017). An indicator may, however, remain an insufficient measure of progress unless further measures could be included to understand their engagement with these platforms, such as the shareholder resolutions brought forward by each institution as a result.

¹⁵ Nassiry et al., (2015) suggest that delivering an investment of USD 93 trillion in sustainable infrastructure between 2015 and 2030 is likely to require project preparation support of USD 2.3-4.7 trillion, or approximately USD 155-310 billion per year.



FISCAL POLICY LEVERS

Fiscal policy levers raise public revenues and direct public resources. Critically, they can shift investment decisions and consumer behaviour towards low-carbon activities by reflecting externalities in prices. Fiscal policy levers include: budget expenditure, taxes, price support and controls, royalties, access to resources at reduced costs, and tradeable permits ([GGBP, 2014](#)).

Appropriate carbon and energy pricing mechanisms are critical to incorporate the cost of emissions and environmental damages into the price of fuels and energy. Fiscal policy can also encourage resilience to be built into systems. Resilience refers to the ability to cope with *and* adapt to shocks and stresses, such as those generated by climate change.¹⁶ Fiscal policy can support infrastructure development and natural resource management (such as water- or land-use sectors) to be more resilient to climate change impacts. It can also support the development of social protection schemes and instruments to support resilience across groups and communities.

I. TRANSITION INDICATORS: FISCAL POLICY LEVERS

Indicators are proposed by theme – mitigation and resilience – recognising that this may require sub-indicators (Table 2). For mitigation, more and more carbon pricing mechanisms have been introduced in recent years. A **net carbon price** indicator could include the effective carbon rate (which takes into account carbon pricing schemes and various energy taxes ([OECD, 2016](#)) and fossil fuel subsidies that act as ‘negative carbon price’. This might also indicate useful waypoints for progress such as fossil fuel subsidy reform or carbon pricing benchmarks. A supplementary indicator showing the revenues generated by carbon prices¹⁷ versus those lost through fossil fuel subsidies could also be presented that may have more interest to finance ministries, expressed as a percentage of GDP.

An understanding of **fiscal policy support for resilience** to climate change is needed, but nascent. Early analysis includes work to identify and quantify fiscal incentives in the agriculture sector and the water and sanitation sector, as well as in transport infrastructure; these range from tariffs and exemptions for water supply to tax breaks for geographical diversification of farming, exemptions from land use fees for road and rail infrastructure ([Canales Trujillo et al., 2015](#); [Norman et al., 2016](#)).

Qualitative rather than quantitative indicators are sought in the first instance given a lack of research as well as data in this area. A sectoral focus, such as land use, where there are numerous taxes and subsidies in G20 countries that influence investment could aid early analysis. It should include both resilient fiscal policy, but also those that are maladaptive, i.e. those decreasing resilience, such as those incentivising building on flood plains. There is, however, a strong link between fiscal policies for resilience and policies and regulations. While there might be fiscal policy to disincentivise building on flood plains, for example, there is a complementary need for supporting building codes, zoning and regulations, as well as direct investment to make areas more attractive for development.

¹⁶ Resilience - ‘the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation’ ([IPCC, 2014, p127](#)) - is an increasingly used term that is more intuitive to government and business than adaptation - the process of adjustment to actual or expected climate and its effects ([IPCC, 2014, p118](#)) - considering a suite of risks in a single concept, while also leaving open the links between mitigation and adaptation (energy access, for example, can also increase resilience to climate shocks).

¹⁷ The Earth League ([2016, p12](#)) estimates that revenues generated from carbon pricing could be substantial at USD 30t/CO₂.

TABLE 2: FISCAL POLICY LEVERS: INDICATORS FOR ASSESSING PROGRESS TOWARDS FINANCING A TRANSITION FROM BROWN TO GREEN

Indicator	Description	Data	Challenges
Fiscal policy levers			
Net carbon price	<p>A net carbon price indicator comprised of:</p> <ul style="list-style-type: none"> → Effective carbon rate – the total carbon price applying to CO2 emissions from energy use (carbon price, other taxes and price of tradeable emission permits); and → Fossil fuel subsidies that currently act as a 'negative carbon price' by continuing to support specific sectors and uses of fossil fuels. <p>Example: <i>an early analysis for Canada has been compiled showing fossil fuel subsidies to oil and gas producers total USD 3.3 billion a year (paying USD 19 tCO2 to pollute) (EDC, 2017)</i></p>	<p>Indicator would combine: OECD data on effective carbon rates (OECD 2016¹⁸) and fossil fuel subsidies (including tax breaks and budgetary support) from the latest OECD subsidy inventory (expected to be updated by the end of 2017).</p> <p>Figures could be expressed as a percentage of GDP – and would need to be expressed per tonne of carbon (or by total dollar value) to be comparable.</p>	<p>It does not provide an understanding of the actual effectiveness of carbon pricing on the ground.</p> <p>Not all sector emissions are covered and the effective carbon rate does not take into account support measures for fossil fuel use that may affect energy prices, and which also act as a negative carbon price.</p> <p>To have a complete data set for G20 countries OECD and IEA data need to be combined, making comparison more difficult as OECD and IEA use different methodologies for the transport sector¹⁹.</p>
Fiscal policies for resilience	<p>Tariffs and exemptions for water supply, tax breaks for geographical diversification of farming, exemptions from land use fees for road and rail infrastructure.</p> <p>Examples: <i>The UK Regulators Network (UKRN) Adaptation Group is co-ordinating a cross-sector review of the penalties and incentives in place to encourage increased resilience to weather and climate change.</i></p>	<p>Analysis is case study specific and not linked to G20 countries. There is therefore a significant conceptual and data gap to identify and quantify fiscal incentives for resilience.</p> <p>To make data more comparable, place in context of vulnerability to climate change or risk profile of a country.</p>	<p>Lack of categorisation of resilience spending.</p>

II. FURTHER TOPICS TO EXPLORE: FISCAL POLICY LEVERS

Other fiscal policy levers that could work to stimulate the transition from brown to green include:

- **Fiscal incentives in other mitigation sectors:** this paper's focus for mitigation is on energy pricing. It excludes large parts of the transport sector (including aviation and shipping), mitigation through land use and even food, areas that also have climate effects and can be influenced with fiscal policies.
- **Shadow price of carbon** – government or public entities can use best estimates of abatement costs, as well as willingness to pay for abatement in investment decisions weighing the benefits of reduced warming against the costs of cutting emissions (Price et al., 2007). Shadow price (in addition to the use of the social cost of carbon)

application varies between countries and it is not always transparent what figures are used in decision-making – nor are methods and underlying models applied to arrive at figures – thus there is no shadow price benchmark.

- **The existence of insurance subsidies** – insurance plays a role in a country's economic resilience (and thus impact on financing conditions such as pricing of sovereign debt). A number of governments subsidise insurance. This includes catastrophe insurance by the public sector in the US, Japan, France and Spain (McAnaney et al., 2014). An indicator might capture the costs of such insurance products or more broadly, the products available for green assets, the availability of reinsurance for high-risk assets, or sovereign catastrophic risk schemes, for example (see UNEP Inquiry, 2017b).

18) OECD data on effective carbon rates includes six sectors: road transport, off-road transport, industry, agriculture and fisheries, residential and commercial electricity (OECD, 2016). It is understood that the OECD will update at the end 2017 (and mid 2018 for road transport).

19) OECD inventory does not contain data for Argentina and Saudi Arabia. Therefore, numbers for these are based on the from the IEA database, which uses a different methodology for calculating subsidies, called the 'price-gap' approach (e.g. comparing the price of energy to a 'reference' price that takes into account the full costs).

20) Private actors are also incorporating shadow price of carbon into their investment decisions, but this report focusses on public entities (Brookings, 2015).

21) Social cost of carbon is the global cost of the damage of an incremental unit of greenhouse gas, thus the scale of the externality to be incorporated into policy and investment decisions (Price et al., 2007).



PUBLIC FINANCE

Governments steer investments through their public finance institutions including via development banks, both at home and overseas, and green investment banks. Finance can be offered as grants, debt, equity, guarantees and insurance ([Whitley et al., 2016](#)). The multiple institutional arrangements prove useful for blending public and private finance.

Developed G20 countries have an obligation to provide public finance to developing G20 countries.²² The provision of international climate finance remains key to building trust and faith in the UNFCCC negotiations between developed and developing nations. While it is not just public flows that comprise these obligations, they remain centrally important given the ability of public finance to take on risk as well as support capacity building and knowledge creation. The institutional arrangements for such finance includes bilateral and multilateral channels ([Bird et al., 2017](#)).

I. TRANSITION INDICATORS: PUBLIC FINANCE

A mitigation focussed, **net public energy finance** indicator presents finance from all public finance institutions going to fossil fuel projects versus clean energy projects. This data is useful as it demonstrates the ratio of brown and green public investment. It is focussed on project level activities, and thus productive spending. An indicator of financial flows would not, however, indicate efficiency (of the capacity installed or the capital intensity). Over time, the sectoral focus might be expanded beyond energy. This indicator would be complemented by an indicator on the **international provision of public mitigation finance**, as in that provided to developing countries. It will, however, need to ensure that overlaps between the data sets are removed (such as green MDB spending).

Another indicator would be focussed on **international public finance for resilience**. Data is not available for domestic spending or international spending on non-concessional terms for resilience. The indicator includes bilateral, MDB and multilateral climate fund spending. There are significant challenges associated with data, largely resulting from definition and methods, to extract further public spending on resilience.

While under the UNFCCC, and reaffirmed in the Paris Agreement, developed countries committed to jointly mobilise USD 100 billion a year by 2020 to address the climate needs of developing countries, this benchmark remains a political one about trust and faith in a UNFCCC process. Given the public and private nature of the contribution as well as the complexities on what counts ([Bodnar et al., 2015](#)) it does not help identify country progress towards financing the transition.

II. FURTHER TOPICS TO EXPLORE: PUBLIC FINANCE

Public finance is channelled through many institutions and across many financial instruments. It is therefore challenging to capture all, as well as establishing which are most impactful. Other flows of public finance that might be considered relevant for the transition from brown to green are:

- The state of **green public procurement** – public authorities are major consumers. By choosing 'green' goods and services, they can increase demand for such products and encourage green market development (see OECD, 2015b). High-impact sectors are construction, food & catering, and vehicles & transport. 'Green public procurements' reduce carbon emissions, energy consumption, water consumption and waste production and increase efficiency. There is, for example, an **EU wide Green Public Procurement Initiative** (see [EC, 2016](#)) that allows public sector purchasers to take account of environmental factors. It would be challenging, however, to ensure comparability of initiatives across countries, as well as to understand their effectiveness.
- **Public green bond issuance** – there are growing issuances of green sovereign and sub-sovereign bonds (e.g. Argentina, Canada, France, Germany, Mexico and Japan) although corporate and financial issuers still dominate ([CBI, 2017a](#); [White and Case, 2017](#)). State actors have good credit-worthiness, can make large scale issuances and create policy that directly and indirectly drives the market. So far, the sovereign bond issuance remains a fraction of the overall green bond market. Further challenges are noted in Table 4 on green bonds issued by the private sector.

²² The eight Annex II G20 countries that have obligations to provide climate finance under the UNFCCC are: Japan, France, Germany, UK, US, Australia, Canada and Italy (in order of percentage of climate finance per dollar of GDP) see ([Climate Transparency, 2017](#)). Though it should be recognised that a number of non-annex I countries are contribution international climate finance for climate action in other developing countries (south-south flows).

TABLE 3: PUBLIC FINANCE: INDICATORS FOR ASSESSING PROGRESS TOWARDS FINANCING A TRANSITION FROM BROWN TO GREEN

Indicator	Description	Data	Challenges
Public finance			
Net public energy finance	Government support for energy projects via public finance institutions (national development banks and other development finance institutions, overseas aid agencies, export credit agencies and key multilateral development banks) 'Brown' refers to fossil fuel energy projects, including coal, oil, gas and fossil fuel-based power generation/ transmission. 'Green' refers to clean energy projects, such as solar, wind, tidal and geothermal.	The data is from Oil Change International (OCI, 2017). Data is available for the years 2013-2015.	The indicator is focussed on energy infrastructure and omits other infrastructure, transport, agriculture (and resilience). Nuclear and large hydro projects are classified as a third 'grey' category in the OCI database (given their overall environmental impact is not as straightforward as projects classified as green). There is double counting with international provision of mitigation finance as both measure MDB spending (particularly green).
International public finance for mitigation	Bilateral and multilateral climate finance for mitigation from developed G20 countries spent in developing countries, additional effort is made to include South-South cooperation from developing G20 countries.	OECD Development Assistance Committee Creditor Reporting System (OECD DAC CRS, 2017) Data can be presented as a percentage of GDP.	It does not consider the 'brown' spending in bilateral aid or MDB spending and may have overlaps with the net public finance for energy projects indicator.
International public finance for resilience	Bilateral and MDBs climate finance for adaptation ²³ from developed G20 countries spent in developing countries. Additional effort to include South-South cooperation.	OECD Development Assistance Committee Creditor Reporting System (OECD DAC CRS, 2017) Data can be presented as a percentage of GDP.	It does not consider the 'brown' or mal-adaptive spending in bilateral aid or MDB spending.

→ **Green public land use spending** and **green public infrastructure spending** can help to reduce emissions and build resilience. There are studies looking at land use (Falconer et al., 2017). But definitive numbers are hard to establish as a result of the existence of 'grey' activities; those that may or may not lead to increasing emissions.²⁴ There are emerging guidelines for sustainable infrastructure, but the focus is currently on appropriate standards and regulations, a step before investment can be counted (Vallejo and Mullan, 2017).

→ Climate risk transfer (such as governments engagement in **risk-pooling instruments** and **catastrophe bonds**) or the provision of risk retention mechanisms (such as **contingent credit lines** and **contingency funds** held by

governments) could be used to boost public investment in resilience. A number of governments subsidise insurance, largely through publicly-sponsored private schemes (some with mandatory participation) (UNEP Inquiry, 2017b). An indicator might establish the government cost of the insurance premiums paid. However, data on these instruments is scattered and is highly specific to country climate risk, so it is not easily comparable. Furthermore, a focus on insurance could reduce attention paid to finance for resilience that reduces risk, such as building outside of flood plains or flood resistance, rather than just insuring buildings in the event that a hazard occurs. It also remains challenging to develop a 'brown' counterpart to green public spending for resilience.

23) See footnote 16 on the difference between resilience and adaptation, adaptation is used here to follow convention of the data set.

24) For example, the intensification of agriculture may reduce the pressure on clearing of new forests and so reduce emissions from deforestation and soils. On the other hand, such intensification increases the opportunity costs of land and may well lead to increasing deforestation where policies and regulations (and their enforcement) are not sufficiently in place.



INCREASED PRIVATE GREEN FINANCE

While private finance might be abundant, flows need to be directed towards climate action. Public actors can facilitate this through policies and regulations, fiscal policy levers and public investment, as noted above. While public action and finance can therefore leverage private finance, the attribution of private finance in climate action to public action is a challenging exercise. The indicators proposed are thus intended to describe the 'health of the system' and not are not a direct measure of government achievement (Table 4).

For the purposes of this paper, when discussing private finance, both equity finance and debt finance – both of which can be publicly or privately raised – are considered. In addition, project finance that often combines both equity and debt finance instruments towards a specific project or physical asset is considered.

I. TRANSITION INDICATORS: INCREASED PRIVATE GREEN FINANCE

An indicator on the existence of **stock exchanges with sustainable principles** would illustrate the extent to which stock exchanges have implemented ESG reporting. Listed companies on stock exchanges have an important role to play in reducing emissions ([SEE, 2017](#)) and governments have an interest in promoting standards in cooperation with stock exchanges to ensure climate goals are met. The degree to which these stock exchanges are 'sustainable' however, has not been assessed and data on stock exchanges without ESG criteria is not available.

An indicator on **climate risk exposure and management by major private asset owners and asset managers** would compare metrics and targets on governance and strategy as well as portfolio carbon risk management ([AODProject, 2017](#)). The biggest private asset owners can provide an important signal to the rest of the market. This data set could include a useful measure of those that take no action, i.e. those that could be classified as brown.

An indicator on **green bond issuance** benefits from increasing data availability²⁵ and growing standardisation (the majority of issuances are based on the International Capital Market Association's (ICMA) Green Bond Principles ([ICMA, 2017](#))). The indicator would look at annual changes in green bonds issuance. As some countries have less

developed debt markets than others, green bonds issuance as share of the debt market might be misleading. In 2017, Mexico and South Africa, both with small debt securities markets, rank highly if total outstanding issuance is considered even though they have not issued green bonds recently ([Climate Transparency, 2017](#)).

A challenge remains in that bonds are an instrument for refinancing and encompass many arrangements (e.g. guarantees, asset-backed securities, insurance). Thus, it is debatable to what extent green bonds are an indication of progress (new finance). There are also different standards and degrees of compliance with these standards. However, the label of green can attract new investors thereby increasing their reputation and awareness, helping to drive change. There are calls for green bond markets to reach USD 1 trillion of issuance by 2020 ([CBI, 2017b](#)) which can be used as benchmark.

II. FURTHER TOPICS TO EXPLORE: INCREASED PRIVATE GREEN INVESTMENT

It is unlikely that a small set of indicators would be able to capture the full suite of actions that private sector actors are engaging in. Other areas might include:

→ The development of an indicator focusing on **private project finance** across climate-related sectors. There are many institutions that look at various aspects of project financing. This indicator might be focussed on the energy sector, or on MDB actors, or look at finance on a country by country basis (e.g. [CPI, 2017](#); [I4CE, 2016](#)). The challenge would be creating a comprehensive picture using these data sources. As a backward-looking measure, it would also be critical to understand more about the systems structural ability to attract new green finance in the future. More needs to be done, however, on a classification system for projects. Indeed, outside of energy, the classification of brown and green becomes challenging. Of course, just tracking project finance does not illustrate the extent of shift from brown to green in private investment. The cost of capital, for particular projects, may be more telling (acknowledging many challenges of finding comparable information not just across countries, but across sectors and technologies), or

²⁵ While it is recognised that green bonds capture more than just climate action, the data on climate bonds remains weaker at present, thus green is a good proxy.

TABLE 4: INCREASED PRIVATE GREEN FINANCE: INDICATORS FOR ASSESSING PROGRESS TOWARDS FINANCING A TRANSITION FROM BROWN TO GREEN

Indicator	Description	Data	Challenges
Increased private green finance			
Stock exchanges with sustainable principles	The number of stock exchanges that are operating under sustainable principles. Example: <i>Brazil's stock exchange was the first exchange in any emerging market country to sign up to the Principles for Responsible Investment in 2010 and one of the five founding signatories to the Sustainable Stock Exchange Initiative.</i>	Sustainable Stock Exchange Initiative (2017). To seek comparability, the relative country emissions covered by the companies in the stock exchanges could be sought.	This indicator is not focussed on a flow of finance, but on a status of green in the financial system. The degree to which the stock exchanges are truly sustainable has not been assessed.
Climate risk exposure and management by major private asset owners and asset managers	Superannuation/pension funds, insurance companies, foundations/endowments and sovereign wealth fund performance on managing climate risk. Example: <i>In the US 63% of asset owners with USD 4.5 trillion of investments are ignoring climate change, despite the US being the leader in low-carbon investment in absolute terms.</i>	Asset Owners Disclosure Project database (2017) can be filtered by region, country and asset owner type. Or their country ratings could be used.	The database includes both public and private asset owners and beyond insurance companies, many of the Asset Owners are public and therefore note clear if this is a useful indicator.
Green bond issuance	Green bonds issuance on an annual basis.	Bonds included are those labelled 'green' by the issuer that also pass Climate Bonds Initiative filters ²⁶ . Data is regularly updated from total debt securities by country from the Bank of International Settlement (BIS).	Bonds are green, rather than climate, recognising data limitations for 'climate' bonds. It is only in rare cases that the loan is new finance. The country attributed to each bond is the country of risk of the issuing entity. Bonds issued by supra-nationals such as the World Bank are not attributed a country as the proceeds are spend across multiple geographic locations. These are not included in the data.

opex rather than capex, might be more useful, such as in the land use sector. These issues need to be further explored alongside more data transparency on project finance, in order to create a valid indicator.

→ **Membership and/or leadership of research, learning and other platforms and initiatives** – as noted in the section on policies and regulations, there has been a significant expansion of learning networks for capacity building, the facilitation of knowledge-sharing on environmental and financial risk, and the improvement in the measurement of green finance activities. The private sector has been engaged in and driven many of these initiatives and innovations, representing progress made towards greening of the financial system. In addition to platforms such as the Principles for Responsible Investment (PRI), Principles for Sustainable Insurance (PSI), Sustainable Stock Exchanges Initiative (SSE) and

Principles for Positive Impact Finance, they have also driven the development of tools along the investment chain. ISO in partnership with 2 Degrees Investing will launch a standard to measure investor's contributions to climate change goals. The [Transition Pathway Initiative toolkit](#) allows an assessment of companies' carbon management quality and carbon performance. MSCI, a private research institution that provides advice and tools for institutional investors, is providing ESG data research, ratings and analysis of companies, and HSBC has launched a [Climate Risk Analysis Framework](#). Despite this, an indicator would struggle to attain comparable engagement across diverse platforms and may also be insufficient to capture the extent to which green finance is embedded in national context – the 'greenness' of the system – if the extent of assets or operations of those driving these initiatives are not factored in.

²⁶ Bond labelled green or climate; bond in line with Climate Bonds Initiative taxonomy; no link to fossil fuels (e.g. clean coal); more than 95% of proceeds are going to finance and refinancing green projects; bonds with social spending are not included.

CONCLUSION

While there is increasing transparency around the financial flows supporting climate action, more must be done to better understand and shift public and private investment that is not climate-aligned. Governments have a significant responsibility to address climate change, both mitigation and building resilience, and they also significantly influence investment decisions. Through financial policies and regulations, fiscal policy and public investment they can create and develop green markets, catalyse private flows and drive innovation and change. The G20 countries remain well positioned to provide the necessary leadership in the transition to low carbon, climate-resilient economies, having built strong work streams on climate change and green finance over the past two years. Argentina's work streams on climate sustainability and energy transitions will be particularly relevant in this space.

This paper identifies nine indicators offering a comprehensive, concise and comparable snapshot of country performance in financing the transition from brown to green (see Figure 1). These indicators are sufficiently simple yet credible and can drive competition between countries. They can also inform the 2023 Global Stocktake of the UNFCCC Paris Agreement.²⁷

Countries do not all start from the same point nor will they all follow the same trajectory. Indicators should be regularly updated to point to the progress being made, but also reviewed to reflect current thinking and data developments. In some issue areas, pronounced country differences and data gaps currently prevent indicator development. The paper lists these at the end of each section and calls for further exploration at both global and country level.

Generally, care must be taken to ensure that indicators speak to actors who are central to climate but for whom climate is not central. These key actors in the finance sector need credible data sources and credible messengers that frame the issue in terms of the short to medium term alongside wider economic development objectives.

²⁷ The global stocktake is a collective review of ambition under the UNFCCC Paris Agreement and takes place on a five-year cycle starting in 2023.

REFERENCES

- Assemblée Nationale (2015) ISSN 1240 - 8468. *Projet de Loi relative à la transition énergétique pour la croissance verte*. [Online] Available from: <http://www.assemblee-nationale.fr/14/ta/ta0575.asp> [Accessed 29th November 2017].
- Asset Owners Disclosure Project (AODP). (2017) *Global Climate Index 2017: Rating the World's Investors on Climate-Related Financial Risk*. [Online] Available from: http://aodproject.net/wp-content/uploads/2017/04/AODP-GLOBAL-INDEX-REPORT-2017_FINAL_VIEW.pdf [Accessed 30 November 2017].
- Bhattacharya, A., Meltzer, J.P., Oppenheim, J., Qureshi, Z. & Stern, N. (2016) *Delivering on Sustainable Infrastructure for Better Development and Better Climate*. [Online] Available from: https://www.brookings.edu/wp-content/uploads/2016/12/global_122316_delivering-on-sustainable-infrastructure.pdf [Accessed on 29th November 2017].
- Bird, N., Watson, C. & Schalatek, L. (2017) *The Global Climate Finance Architecture*. ODI Climate Finance Fundamentals. Report number: 2. [Online] Available from: <https://www.odi.org/publications/10973-climate-finance-fundamentals-2-global-climate-finance-architecture-2017-update> [Accessed 30 November 2017].
- BMF (Federal Ministry of Finance, Germany). (2016) *Climate change and financial markets – German Finance Ministry to receive report on how climate change could affect Germany's financial sector*. [Online] Available from: http://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/Financial_markets/Articles/2016-09-19-Climate-change-and-financial-markets.html [Accessed 29th November 2017].
- Bodnar, P., Brown, J. & Nakhooda, S. (2015) *What Counts: Tools to Help Define and Understand Progress Towards the \$100 Billion Climate Finance Commitment*. ODI. [Online] Available from: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9807.pdf> [Accessed 29th November 2017].
- Buchner, B., Oliver, P., Wang, X., Carswell, C., Meattle, C. & Mazza, F. (2017). *Global Landscape of Climate Finance 2017*. CPI (Climate Policy Initiative). [Online] Available from: <https://climatepolicyinitiative.org/wp-content/uploads/2017/10/2017-Global-Landscape-of-Climate-Finance.pdf> [Accessed 29th November 2017].
- Burck, J., Marten, F., Bals, C. & Höhne, N. (2017). *Climate Change Performance Index: Results 2018*. [Online] Available from: <https://www.climate-change-performance-index.org/the-climate-change-performance-index-2018> [Accessed 29th November 2017].
- Canales Trujillo, N., Xuan, H.V. & Whitley, S. (2015) *Mapping current incentives and investment in Viet Nam's water and sanitation sector: lessons for private climate finance*. ODI. Report number: 417. Available from: <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9642.pdf> [Accessed 30 November 2017].
- Carbon Brief (2015). Paris 2015: *Tracking requests for climate finance*. [Online]. Available from: <https://www.carbonbrief.org/paris-2015-tracking-requests-for-climate-finance> [Accessed 4th December 2017].
- Carney, M. (2015) *Breaking the tragedy of the horizon - climate change and financial stability*. [Online] 29 September. London. Available from: <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx> [Accessed 29th November 2017].
- CISL and UNEP FI (2014). *Stability and Sustainability in Banking Reform: Are Environmental Risks Missing in Basel III?* University of Cambridge Institute for Sustainability Leadership (CISL) and UNEP FI. [Online] Available at: <http://www.unepfi.org/fileadmin/documents/StabilitySustainability.pdf> [Accessed 4th December 2017]
- Climate Action Tracker. (2017) *CAT Warming Projections: Global Update 2017*. [Online] Available from: <http://www.climateactiontracker.org/> [Accessed 29th November 2017].
- Climate Action Tracker. (2016) *The Ten Most Important Short-Term Steps to Limit Warming to 1.5°C*. [Online] Available from: http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/May/IRENA_RE_Jobs_Annual_Review_2017.pdf [Accessed 29th November 2017].
- Climate Bonds Initiative (CBI). (2017a) *Green Bonds Policy: Highlights from Q1-Q2 2017*. [Online] Available from: https://www.climatebonds.net/files/CBI-PolicyRoundup_Q1-2_2017.pdf [Accessed 30 November 2017].
- Climate Bonds Initiative (CBI) (2017b). *Bonds and Climate Change: The State of the Market 2017*. [Online] Available at: https://www.climatebonds.net/files/files/CBI-SotM_2017-Bonds%26ClimateChange.pdf [Accessed 4th December 2017].

- Climate Disclosure Project (CDP). (2017) *Tracking Climate Progress 2017*. [Online] Available from: <https://www.cdp.net/en/research/global-reports/tracking-climate-progress-2017> [Accessed 29th November 2017].
- Climate Transparency. (2017) *Brown to Green: The G20 transition to a low-carbon economy*. [Online] Available from: <http://www.climate-transparency.org/g20-climate-performance/g20report2017> [Accessed 29th November 2017].
- Climate Transparency. (2016) *Brown to Green: The G20 transition to a low-carbon economy*. [Online] Available from: <http://www.climate-transparency.org/g20-climate-performance/g20report2016> [Accessed 29th November 2017].
- Coalition for Green Capital. (2017) *On the Road to a South African Green Bank*. [Online] Available from: <http://coalitionforgreencapital.com/2017/08/18/path-south-african-green-bank/> [Accessed 29 November 2017].
- Cochran, I. & Deheza, M. (2017) *Building Blocks of Mainstreaming: A framework for integrating climate change across financial institutions*. I4CE (Institute for Climate Economics). [Online] Available from: <https://www.i4ce.org/wp-core/wp-content/uploads/2017/06/0619-I4CE-ReportClimat-BuildingBlocksMainstreaming.pdf> [Accessed 29 November 2017].
- Doukas, A., DeAngelis, K. & Ghio, N. (2017) *Talk is Cheap: How G20 Governments are Financing Climate Disaster*. [Online] Available from: http://priceofoil.org/content/uploads/2017/07/talk_is_cheap_G20_report_July2017.pdf [Accessed 29th November 2017].
- Earth League & Future Earth. (2017) *The 10 Science 'Must Knows' on Climate Change*. [Online] Available from: http://www.the-earth-league.org/uploads/2/4/5/9/24599880/the_10_science_must_knows_on_climate_change.pdf [Accessed 30 November 2017].
- Economist. (2017) *Multilateral Lenders Vow Openness about their Carbon Footprints*. The Economist. [Online] Available from: <https://www.economist.com/news/finance-and-economics/21730448-environmentalists-allege-their-lending-has-been-less-green> [Accessed 29th November 2017].
- EC (European Commission). (2016) *Buying green! A handbook on green public procurement*. [Online] Available from: <http://ec.europa.eu/environment/gpp/pdf/Buying-Green-Handbook-3rd-Edition.pdf> [Accessed 30 November 2017].
- Environmental Defence Canada (2017). *The Elephant in the Room: Canada's Fossil Fuel Subsidies Undermine Carbon Pricing Efforts*. [Online] Available at: <https://d36rd3gki5z3d3.cloudfront.net/wp-content/uploads/2016/11/Fossil-Fuel-Subsidies-EN.pdf> [Accessed 5th December 2017].
- Environmental Finance. (2017) *HSBC launches climate risk analysis tool*. [Online] Available from: <https://www.environmental-finance.com/content/news/hsbc-launches-climate-risk-analysis-tool.html> [Accessed 30 November 2017].
- EPA (Environmental Protection Agency, United States). (2013) *Greenhouse Gases Reporting Program Implementation*. [Online] Available from: <https://www.epa.gov/sites/production/files/2014-09/documents/ghgfactsheet.pdf> [Accessed 29th November 2017].
- Falconer, A., Dontenville, A., Parker, C., Daubrey, M. & Gnaore, L. (2017) *Landscape of REDD+ Aligned Finance in Côte d'Ivoire*. CPI (Climate Policy Initiative). [Online] Available from: <https://climatepolicyinitiative.org/publication/landscape-redd-aligned-finance-cote-divoire/> [Accessed 30 November 2017].
- G20. (2017) *G20 Hamburg Climate and Energy Action Plan for Growth – Annex to G20 Leaders Declaration*. [Online] Available from: https://www.g20.org/Content/DE/Anlagen/G7_G20/2017-g20-climate-and-energy-en.pdf?blob=publicationFile&v [Accessed 29th November 2017].
- G20 (2016). *Communiqué – G20 Finance Ministers and Central Bank Governors Meeting, Shanghai, February 27, 2016*. [Online] Available from: <http://www.g20.utoronto.ca/ministerials.html> [Accessed 29th November 2017].
- G20 EEFTG (Energy Efficiency Finance Task Group). (2017) *G20 Energy Efficiency Investment Toolkit 2017*. [Online] Available from: <http://www.unepfi.org/wordpress/wp-content/uploads/2017/05/G20-EE-Toolkit.pdf> [Accessed 30 November 2017].
- G20 GFSG (Green Finance Study Group). (2016) *G20 Green Finance Synthesis Report*. [Online] Available from: <http://climateobserver.org/reports/g20-green-finance-synthesis-report/> [Accessed 29th November 2017].
- Germanwatch (2016). *From Hangzhou to Hamburg – Green Finance in the G20*. Germanwatch. [Online] Available from: <https://germanwatch.org/de/download/16330.pdf> [Accessed 4th December 2017].
- Green Growth Best Practice Initiative (GGBP). (2014) *Green Growth in Practice – Lessons from Country Experience*. [Online] Available from: http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green-Growth-in-Practice-GGBP_0.pdf [Accessed 29th November 2017].

- Hainaut, H., Cochran, I. & Morel, R. (2016) *Landscape of Climate Finance in France*. I4CE (Institute for Climate Economics). [Online] Available from: <https://www.i4ce.org/download/landscape-of-climate-finance-2016-edition/> [Accessed 30 November 2017].
- ICMA. (2017) *The Green Bond Principles 2017*. [Online] Available from: <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/GreenBondsBrochure-JUNE2017.pdf> [Accessed 30 November 2017].
- International Energy Agency (IEA). (2015). *World energy outlook 2015*. Paris: IEA/OECD. [Online] Available at: <http://www.worldenergyoutlook.org/weo2015> [Accessed 5th December 2017]
- International Labour Organisation (ILO). (n.d.) *Frequently Asked Questions on Climate Change and Jobs*. [Online] Available from: http://www.ilo.org/global/topics/green-jobs/WCMS_371589/lang--en/index.htm [Accessed 29th November 2017].
- International Finance Corporation. (2016) *Climate Investment Opportunities in Emerging Markets: An IFC Analysis*. [Online] Available from: https://www.ifc.org/wps/wcm/connect/51183b2d-c82e-443e-bb9b-68d9572dd48d/3503-IFC-Climate_Investment_Opportunity-Report-Dec-FINAL.pdf?MOD=AJPERES [Accessed 29th November 2017].
- IPCC. (2014) *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Washington: IFC. [Online] Available from: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_Annexes.pdf [Accessed 30 November 2017]. Cambridge: Cambridge University Press.
- IRENA (International Renewable Energy Agency). (2017) *Renewable Energy and Jobs – Annual Review 2017*. [Online] Available from: http://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/May/IRENA_RE_Jobs_Annual_Review_2017.pdf [Accessed 29th November 2017].
- Lloyd's. (2017) *Stranded Assets: The Transition to a Low Carbon Economy. Overview for the Insurance Industry*. [Online] Available from: <https://www.lloyds.com/~media/files/news-and-insight/risk-insight/2017/stranded-assets.pdf> [Accessed: 29th November 2017].
- LSE (Luxembourg Stock Exchange). (2016) *Luxembourg Green Exchange*. [Online] Available from: <https://www.bourse.lu/lqx> [Accessed 29th November 2017].
- LSEG (London Stock Exchange Group). (2017) *London Stock Exchange Group launches guidance for ESG reporting*. [Online] Available from <https://www.lseg.com/resources/media-centre/press-releases/london-stock-exchange-group-launches-guidance-esg-reporting> [Accessed 29th November 2017].
- Mason, A., Martindale, W., Heath, M. & Chatterjee, S. (2016) *French Energy Transition Law: Global Investor Briefing*. [Online] Available from: https://www.unpri.org/download_report/14573 [Accessed 29th November 2017].
- McAneney, J., McAneney, D., Musulin, R., Walker, G. & Crompton, R. (2016) Government-sponsored natural disaster insurance pools: A view from down-under. *International Journal of Disaster Risk Reduction*. [Online] 15. Available from: <https://doi.org/10.1016/j.ijdr.2015.11.004> [Accessed 30 November 2017].
- MOF (Ministry of Finance, Indonesia). (2017) *Role of MOF in Climate Financing*. [Online] Available from: <http://www.fiskal.kemenkeu.go.id/pkppim/en/site/index/role-of-mof-in-climate-financing> [Accessed 29th November 2017].
- Moody's Investors Service. (2016) *Moody's publishes methodology on Green Bonds Assessment*. [Online] Available from: https://www.moody's.com/research/Moodys-publishes-methodology-on-Green-Bonds-Assessment--PR_346585 [Accessed: 29th November 2017].
- Morris, A. (2015) *Why the federal government should shadow price carbon*. [Online] Available from: <https://www.brookings.edu/blog/planetpolicy/2015/07/13/why-the-federal-government-should-shadow-price-carbon/> [Accessed 30 November 2017].
- Munich RE. (2017) *The Year in Figures*. [Online] Available from: <https://www.munichre.com/topics-online/en/2017/topics-geo/overview-natural-catastrophe-2016> [Accessed 29th November 2017].
- Multilateral Development Banks (MDBs) (2017). *Joint report on Multilateral Development Banks Climate Finance*. [Online] Available at: <http://www.eib.org/attachments/press/2016-joint-report-on-mdb-climate-finance.pdf> [Accessed 4th December 2017].
- Nassiry, D. & Nakhouda, S., with Barnard, S. (2015) *Finding the pipeline: Project preparation for sustainable infrastructure*. London: ODI. [Online] Available from: <http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2016/11/Finding-the-Pipeline.pdf> [Accessed 29 November 2017].
- New Climate Economy & OECD. (2017) *Green Investment Banks: Innovative Public Financial Institutions Scaling up Private, Low-carbon Investment*. Paris: OECD Publishing. [Online] Available from: <http://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2017/01/Green-Investment-Banks-OECD.pdf> [Accessed 29th November 2017].

- Nordic Council of Ministers (2017). Making the Switch: From fossil fuel subsidies to sustainable energy. Nordic Council of Ministers. [Online] Available from: <https://norden.diva-portal.org/smash/get/diva2:1094676/FULLTEXT02.pdf> [Accessed 5th December 2017]
- Norman, M., Darko, E., Whitley, S., Bawakyillenuo, S. and Nyamedor, F. (2016) *Mapping current incentives and investment in Ghana's agriculture sector: lessons for private climate finance*. London: ODI. [Online] Available from: https://www.odi.org/sites/odi.org.uk/files/resource-documents/mapping_current_incentives_and_investment_inghanas_agriculture_sector.pdf [Accessed 30 November 2017].
- OECD (Organization of Economic Cooperation and Development). (2017a) *Investing in Climate, Investing in Growth: A Synthesis*. Paris: OECD Publishing. [Online] Available from: <https://www.oecd.org/environment/cc/g20-climate/synthesis-investing-in-climate-investing-in-growth.pdf> [Accessed 29th November 2017].
- OECD. (2017b) *Climate-related Development Finance in 2016*. Paris: OECD Publishing. [Online] Available from: <https://issuu.com/oecd-dcd/docs/climate-related-development-finance> [Accessed 29th November 2017].
- OECD DAC CRS. (2017). OECD Development Assistance Committee Creditor Reporting System (OECD DAC CRS). [Online] Available from: <https://stats.oecd.org/Index.aspx?DataSetCode=CRS1> [Accessed 4th December 2017].
- OECD. (2016a) *Green Investment Banks: Scaling up Private Investment in Low-carbon, Climate-resilient Infrastructure*. Paris: OECD Publishing. [Online] Available from: <http://dx.doi.org/10.1787/9789264245129-en> [Accessed 29 November 2017].
- OECD. (2016b) *Effective Carbon Rates: Pricing CO2 through Taxes and Emissions Trading Systems*. Paris: OECD Publishing. [Online] Available from: <http://www.oecd.org/tax/effective-carbon-rates-9789264260115-en.htm> [Accessed 30 November 2017].
- OECD. (2015a). *Green Investment Banks: Leveraging Innovative public finance to scale up low-carbon investment*. OECD Policy Perspectives. [Online] Available at: <https://www.oecd.org/environment/cc/Green-Investment-Banks-POLICY-PERSPECTIVES-web.pdf> [Accessed 4th December 2017]
- OECD. (2015b) *Going Green: Best Practices for Public Procurement*. Paris: OECD Publishing. [Online] Available from: http://www.oecd.org/gov/public-procurement/Going_Green_Best_Practices_for_Sustainable_Procurement.pdf [Accessed 30 November 2017].
- OECD (2015c). *Climate change disclosure in G20 countries: Stocktaking of Climate Reporting Schemes* [Online] Available at: <http://www.oecd.org/daf/inv/mne/Report-on-Climate-change-disclosure-in-G20-countries.pdf> [Accessed 4th December 2017]
- People's Bank of China, The. (2016). *Guidelines for Establishing the Green Financial System*. [Online] Available from: <http://www.pbc.gov.cn/english/130721/3133045/index.html> [Accessed 29th November 2017].
- Price, R., Thornton, S. & Nelson, S. (2007) *The Social Cost of Carbon and the Shadow Price of Carbon: what they are, and how to use them in economic appraisal in the UK*. London: DEFRA (Department for Environmental and Rural Affairs). [Online] Available from: https://mpr.ub.uni-muenchen.de/74976/1/MPPA_paper_74976.pdf [Accessed 30 November 2017].
- RISE (Regulatory Indicators for Sustainable Energy). (2016) *A Global Scorecard for Policymakers*. [Online] Available from: <http://documents.worldbank.org/curated/en/538181487106403375/pdf/112828REVISED-PUBLIC-RISE-2016-Report.pdf> [Accessed 29th November 2017].
- Schalatek, L., Bird, N. & Watson, C. (2017) *The Green Climate Fund: 11 Climate Finance Fundamentals*. London: ODI. [Online] Available from: <https://www.odi.org/sites/odi.org.uk/files/resource-documents/11851.pdf> [Accessed 29th November 2017].
- SSE (Sustainable Stock Exchanges Initiative). (2017) *How stock exchanges can grow green finance: A voluntary action plan*. [Online] Available from: <http://www.sseinitiative.org/wp-content/uploads/2017/11/SSE-Green-Finance-Guidance.pdf> [Accessed 30 November 2017].
- Skoovgaard, J. (2017) Limiting costs or correcting market failures? Finance ministries and frame alignment in UN climate finance negotiations. *International Environmental Agreements*. [Online] 17:89 – 106. Available from: <https://link.springer.com/content/pdf/10.1007%2Fs10784-016-9348-3.pdf> [Accessed 29th November 2017].
- Statista (2017). *Total assets of financial institutions worldwide from 2002 to 2015, by institution type (in trillion U.S. dollars)*. [Online] Available from: <https://www.statista.com/statistics/421221/global-financial-institutions-assets-by-institution-type/> [Accessed 4th December 2017]
- Stern, N. (2016) *The roles of financial institutions and finance ministries in delivering the Paris Agreement on climate change*. [Online] Available from: <http://www.lse.ac.uk/GranthamInstitute/news/the-roles-of-financial-institutions-and-finance-ministries-in-delivering-the-paris-agreement-on-climate-change/> [Accessed 29th November 2017].

- TCFD (Task Force on Climate-Related Financial Disclosures). (2017) *Final Report – Recommendation of the Task Force on Climate-related Financial Disclosures*. [Online] Available from: <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf> [Accessed 29th November 2017].
- Transition Pathway Initiative. (2017) *The toolkit*. [Online] Available from: <http://www.lse.ac.uk/GranthamInstitute/tpi/the-toolkit/> [Accessed 30 November 2017].
- UNEP (UN Environment Programme). (2015) *The Financial System we need – Aligning the Financial System with Sustainable Development*. [Online] Available from: <http://web.unep.org/inquiry/publications> [Accessed 29th November 2017].
- UNEP Inquiry. (2017a) *Green Finance Progress Report*. [Online] Available from: http://unepinquiry.org/wp-content/uploads/2017/07/Green_Finance_Progress_Report_2017.pdf [Accessed 29th November 2017].
- UNEP Inquiry. (2017b). *Sustainable Insurance: the emerging agenda for supervisors and regulators*. [Online] Available from: http://unepinquiry.org/wp-content/uploads/2017/08/Sustainable_Insurance_The_Emerging_Agenda.pdf [Accessed 5th December 2017].
- UNEP Inquiry (2016). *The Financial System We Need: From momentum to transformation*. UNEP Inquiry. [Online] Available at: http://unepinquiry.org/wp-content/uploads/2016/09/The_Financial_System_We_Need_From_Momentum_to_Transformation_Chapter3.pdf [Accessed 4th December 2017].
- UNEP & WBG (UN Environment Programme and World Bank Group). (2017) *Roadmap for a Sustainable Financial System*. [Online] Available from: <http://documents.worldbank.org/curated/en/903601510548466486/pdf/1212831211-2017-15-33-33-RoadmapforaSustainableFinancialSystem.pdf> [Accessed 27th November 2017].
- UNFCCC (United Nations Framework Convention on Climate Change). (2016) *2016 Biennial Assessment and Overview of Climate Finance Flows Report*. Bonn: UNFCCC. [Online] Available from: http://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/2016_ba_technical_report.pdf [Accessed 29th November 2017].
- UNFCCC. (2015) *Paris Agreement*. Bonn: UNFCCC. [Online] Available from: http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf [Accessed 29th November 2017].
- UNFCCC. (2014b) *NDC Registry*. Bonn: UNFCCC. [Online] Available from: http://unfccc.int/focus/ndc_registry/items/9433.php [Accessed 29th November 2017].
- UNFCCC (United Nations Framework Convention on Climate Change). (2014b) *2014 Biennial Assessment and Overview of Climate Finance Flows Report*. Bonn: UNFCCC. [Online] Available from: http://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/2014_biennial_assessment_and_overview_of_climate_finance_flows_report_web.pdf [Accessed 29th November 2017].
- UNFCCC (United Nations Framework Convention on Climate Change). (2017). *The Paris Agreement*. [Online] Available from: http://unfccc.int/paris_agreement/items/9485.php [Accessed 30 November 2017].
- Vallejo, L. & Mullan, M. (2017) *Climate Resilient Infrastructure: Getting the policies right*. *OECD Environment Working Papers*. [Online] 121. Available from: <http://dx.doi.org/10.1787/02f74d61-en> [Accessed 30 November 2017].
- World Bank. (2017) *Climate Action Peer Exchange for Finance Ministries (CAPE)*. [Online] Available from: <http://www.worldbank.org/en/topic/climatechange/brief/cape> [Accessed 29th November 2017].
- World Bank Group (WBG) and Ecofys (2017), *State and Trends of Carbon Pricing 2017*. [Online] Available from: <https://openknowledge.worldbank.org/bitstream/handle/10986/26565/9781464811296.pdf?sequence=4&isAllowed=y> [Accessed 4th December 2017].
- White & Case. (2017) *2017: The year for sovereign green bonds?* [Online] Available from: <https://www.whitecase.com/sites/whitecase/files/files/download/publications/sovereign-green-bond-singles.pdf> [Accessed 30 November 2017].
- Whitley, S., Canales Trujillo, N. & Norman, M. (2016) *Mobilising private finance for climate compatible development: A diagnostic tool for mapping incentives and investment*. London: ODI. [Online] Available from: <https://www.odi.org/sites/odi.org.uk/files/resource-documents/10480.pdf> [Accessed 30 November 2017].

