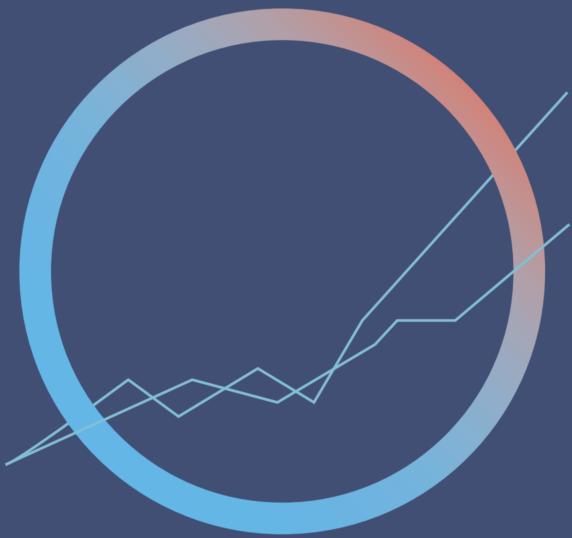

DEVELOPING 2°C-COMPATIBLE INVESTMENT CRITERIA

30 NOVEMBER 2015

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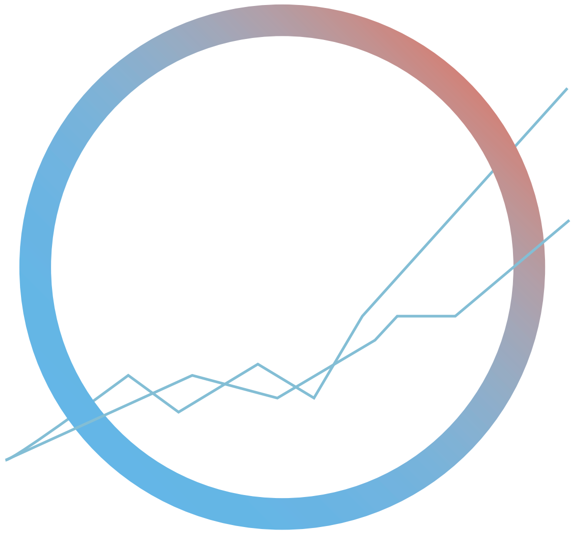

DEVELOPING 2°C-COMPATIBLE INVESTMENT CRITERIA

NEW CLIMATE INSTITUTE

GERMANWATCH

2° Investing Initiative

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ABBREVIATIONS

AFD	Agence Française de Développement
A-S-I	Avoid Shift Improve
BAAT	Best available and appropriate technology
BAT	Best Available Technology
BECCS	Bio Energy Carbon Capture & Storage
BMWi	Bundesministerium für Wirtschaft und Energie
BRT	Bus Rapid Transit
CBI	Climate Bonds Initiative
CCS	Carbon Capture & Storage
CPI	Climate Policy Initiative
CTF	Clean Technology Fund
DFI	Development Finance Institution
EIB	European Investment Bank
EPBD	European Energy Performance of Buildings Directive
ESG	Environmental Social Governance
FRR	Fonds de Réserve pour les Retraites
GCF	Green Climate Fund
GHG	Greenhouse gas
GIB	Green Investment Bank
HVAC	Heating ventilation and cooling
IAM	Integrated Assessment Model
IEA	International Energy Agency
IFC	International Finance Corporation
IFI	International Financial Institution
I4CE	Institute for Climate Economics
IPCC	Intergovernmental Panel on Climate Change
KfW	Kreditanstalt für Wiederaufbau Group
LCCR	Low carbon climate resilient
LCOE	Levelised cost of energy
LDC	Least Developed Country
LDV	Light Duty Vehicles
LULUCF	Land Use Land Use Change and Forestry
MSCI	Morgan Stanley Capital Index
OECD	Organisation for Economic Cooperation and Development
SME	Small and medium enterprise
TOD	Transit Oriented Development
UNFCCC	United Nations Framework Convention on Climate Change
UNEP FI	United Nations Environment Programme Finance Initiative
WBG	World Bank Group

EXECUTIVE SUMMARY

This report studies the development of criteria for assessing the compatibility of financial investments with the international goal to limit global temperature increase to below 2°C above pre-industrial levels. The findings are intended as a starting point and a key input for a longer term process to develop consensus-based 2°C investing criteria. The focus here is placed on investments in projects and physical assets, in particular of development and climate finance organisations.

In order to limit global temperature increase to 2°C, global greenhouse gas (GHG) emissions will have to be reduced significantly, eventually to zero, during the course of this century. This requires shifting capital from high to low carbon investments as well as significant capital mobilisation for investments in 2°C-compatible infrastructure. Given the long lifetime of physical assets, and the urgency of decarbonisation over the coming decades, this needs to begin today.

Public financial institutions can play a prominent role in contributing to aligning investment flows with the 2°C limit, as well as in closing the current infrastructure investment gap, responding to their explicit or implicit climate mandates and leadership role in the finance sector.

The majority of international financial institutions integrate climate considerations into their finance decisions to some degree, and are familiar with different types of criteria, including positive and negative lists, qualitative and quantitative benchmarks, and the use of shadow carbon pricing. However, current approaches do not link to the 2°C limit. 2°C investment criteria are therefore needed to guide investors in this regard. Such criteria may also support other purposes, including an understanding of climate risks and improved reporting and accountability.

<table>
<tr><th>2°C-COMPATIBLE POSITIVE LIST</th><th>CONDITIONAL</th><th>AMBIGUOUS</th><th>MISALIGNED NEGATIVE LIST</th></tr>
<tr><td rowspan="2">Fully aligned with 2°C consistently across all scenarios</td><td>2°C aligned only under certain conditions in all scenarios</td><td>2°C aligned in some scenarios, but not in others</td><td rowspan="2">Consistently misaligned with 2°C in all scenarios</td></tr>
<tr><td colspan="2">• Due to the fact that multiple pathways can lead to 2°C (e.g. more renewables and less efficiency or the other way around)
• Due to different assumptions on technological development
• Due to considerations of other sustainability factors</td></tr>
<tr><td>• Renewable energy
• Energy storage
• Low carbon transport fuel infrastructure
• Low carbon vehicles</td><td>• Gas fired power plants
• Energy transmission and distribution infrastructure
• Energy efficiency in heating and cooling of buildings
• Efficiency in industry
• Transport infrastructure
• Transport efficiency
• Agriculture and forestry
• Building appliances</td><td>• Biofuels
• Fossil Fuel production
• Large hydropower
• Bio energy carbon capture and storage
• Nuclear</td><td>• New coal fired power plants with unabated emissions over their lifetime</td></tr>
</table>

Table 1: Summary of categorisation of investment areas and technologies (critical sectors in bold, sectors for further consideration in this analysis in red)

Developing 2°C investing criteria

In general, it is possible to develop 2°C investment criteria for individual projects on the basis of 2°C scenarios. Despite certain limitations, scenarios are a good starting point for developing criteria. In many areas, the different 2°C scenarios are sufficiently aligned to allow the identification of projects and technologies that are unambiguously 2°C-compatible, and those that are clearly misaligned. For many technologies, however, 2°C-compatibility depends on what happens at the sector-wide level, and a straightforward statement is not possible (Table 1).

In some cases, project-based criteria need to be combined with a broader systemic perspective. It is also important to consider country-specific contexts, including aspects of market maturity, development priorities and specific system characteristics of the technology in question.

The development of concrete and incontestable project-specific 2°C investment criteria is easier in some sectors than in others. The research showed that the transport sector – due to its systemic complexities and limited availability of sector-wide decarbonisation strategies in any part of the world – is furthest away from implementation-ready, clear 2°C guidance, compared to, for example, the electricity supply sector, where political consensus on sector decarbonisation already exists, and where systemic considerations are easier to break down to the individual project level.

An immediate move to full 2°C-compatibility is, in many cases, not possible. Hence a transition approach will be needed that allows for investments in transition technologies, with the aim to achieve 2°C compatibility over time. 2°C criteria and benchmarks will also need to be adjusted as new technologies and knowledge become available.

Applicability of 2°C investing criteria

Different types of 2°C investment criteria can be integrated at various steps along IFI decision making processes. Their application is not necessarily associated with significant additional costs for those financial institutions that already employ reasonably sophisticated climate criteria. Good practice approaches suggest that climate-related criteria are best dealt with at different stages of project appraisal, including the general or strategic level, where overarching guidelines are implemented, and the project level where detailed sector – or technology-specific rules and procedures apply. In this context, a challenge is to balance the need for sufficiently robust guidance and criteria with pragmatic, implementable approaches.

STEP IN THE APPROVAL PROCESS	QUESTIONS ALREADY ASSESSED BY DEVELOPMENT BANKS	ADDITIONAL QUESTIONS WHEN APPLYING 2°C CRITERIA
Initial Screening	• Project type not on bank's exclusion list? • Safeguards likely to be impacted? • Does project fall in certain risk categories? • Project within bank's priority sectors? • etc.	• Project type not on 2°C negative list? • Project type on 2°C positive list? • Project type that triggers need to apply certain conditions?
Economic Evaluation	• Project financially viable? • Project with positive cost-benefit ratio? • Project not crowding out private finance? • etc.	• Project viable with shadow carbon price?
Development Evaluation	• Development benefits? • Aligned with bank's mandate and strategy? • Aligned with country's strategies and priorities? • etc.	• Consistent with country's climate strategy (INDC or other)?
ESG Evaluation	• Environmental and social impacts? • Respect for environmental, social and governance safeguards? • etc.	• Project meeting qualitative or quantitative conditions for 2°C?

Table 2: Integrating 2°C criteria in development banks' project approval processes

Financial institutions may choose to respond in different ways to the fact that – for some individual projects – there is a higher certainty they are 2°C-compatible than for others. Certainty of 2°C compatibility can only be achieved by limiting investments to those on the positive list and excluding those on the negative list. Investments in technologies in the conditional or ambiguous category, can use benchmarks and criteria that allow for the assessment of relative 2°C compatibility – but uncertainties remain.

A challenge development banks frequently highlight is the lack of fundable 2°C-compatible projects as well as a potential competitive advantage for those financial institutions which do not apply strict 2°C investing criteria. Clearly more support is needed to proactively develop attractive 2°C-compatible projects requiring action from both the donor and the recipient countries.

However, there is already a strong indication of investment needs and interest in low carbon technologies by developing countries as expressed, for example, in the many emerging low carbon development strategies as well as climate commitments under the UNFCCC. The scale of the challenge and current investment gap suggest that sufficient investment opportunities are likely to become available and in many cases, ought to be available today.

Interventions at a policy level are also needed to steer investment decisions to achieve the transition to a 2°C pathway. Such policies must address the multiple barriers to low carbon development and create an enabling environment for investments in low carbon technologies. Continued effort is needed to create detailed, sector-based 2°C pathways for specific countries, coupled with politically endorsed investment plans.

2°C-COMPATIBLE POSITIVE LIST	CONDITIONAL		MISALIGNED NEGATIVE LIST
	QUANTITATIVE CONDITIONS	QUALITATIVE CONDITIONS	
Energy source: Wind PV Small hydro	Energy source: e.g. natural gas Criteria: Shadow economic price of carbon	Energy source: e.g. natural gas Decarbonisation based approach. Simple: Prove that project fits into a path towards 0 gCO_2/kWh in 2050 Advanced: Prove that the project fits into a national sector-based decarbonisation strategy including lifetime, operation mode and capacity requirements	Energy source: New coal fired power plants with unabated emissions (no CCS) over their lifetime

Table 3: Overview of proposed 2°C investing criteria for the energy sector

2°C-COMPATIBLE POSITIVE LIST	CONDITIONAL QUANTITATIVE / QUALITATIVE CONDITIONS	MISALIGNED NEGATIVE LIST
(Near) zero emission buildings (new and renovation) below 10 kWh/m^2	**Quantitative benchmark (simple)** • Specific energy use between 10 and 150 kWh/m^2 • Gradual phase in and increased stringency based on BAT or country average **Sector based decarbonisation (advanced)** Buildings with their lifetime emissions have to fit into a decarbonisation of the building stock during the course of the century Benchmark of energy use per floor space (x kWh/m^2) determined at a country level, considering • Market maturity for low energy buildings and capacity for low energy buildings • Current energy use of buildings and local BAT levels • Annual growth and lifetime of buildings, renovation rates and levels, demolition rates • Climatic zones	Specific building energy use above 150kWh/m^2 (with exceptions for few, specific building uses)

Table 4: Overview of proposed 2°C investing criteria for the building sector

Proposed 2°C investing criteria for the power sector

Positive and negative lists work well with energy sources that can be clearly classified as compatible with the 2°C limit (wind and PV) or misaligned, e.g. new coal-fired power plants with unabated emissions over their lifetime. For other fuels, in particular natural gas, more sophisticated approaches are necessary either during the economic or environmental, social and governance (ESG) appraisal process.

Efficiency-floor values and carbon-ceiling values per technology can incentivise the use of best available technology (BAT), however, these approaches are not enough to ensure 2°C compatibility. Adopting a shadow economic price of carbon proves effective if the price is set at a high level that is compatible with 2°C scenarios. The most appropriate approach involves a systemic perspective based on linking the investment to a (national) decarbonisation path toward zero carbon in 2050.

Proposed 2°C investing criteria for the building sector

Positive lists are the only way to ensure full 2°C compatibility at the project level in the building sector. These include near zero energy houses, a concept that has been proven, but may be difficult to implement at large scale in many country contexts. Shadow carbon prices will likely provide only a limited incentive in the building sector.

The benchmark indicators kWh/m^2 and gCO_2/m^2 are broadly accepted indicators, so make a useful tool for the building sector. As a simple approach, at the individual building level a benchmark range between 10 kWh/m^2 and 150 kWh/m^2 can be used to determine relative 2°C compatibility of individual investments. The project-based benchmark approach could be combined with an approach to allow for gradual tightening of the benchmark based on existing BAT in the specific country context to reflect the market maturity and the country's development status.

SUB-SECTOR	2°C-COMPATIBLE POSITIVE LIST	CONDITIONAL		MISALIGNED NEGATIVE LIST
		QUALITATIVE CONDITIONS (EXAMPLE)	QUANTITATIVE CONDITIONS	
Air, Water, Rail	Inland waterways Rail network and assets (passenger and freight) Mass rapid transit/ Light Rail Transit (LRT)	Airports with transport interconnectivity plan/ bio-fuelling stations	*Quantitative criteria for transport infrastructure are difficult to set given the indirect link of infrastructure to GHG emissions. Quantitative criteria may be set for vehicles (e.g. fuel efficiency, penetration of electric/ hybrid vehicles) and linked as sub condition to infrastructure investments.*	Rail networks dedicated to fossil fuel transportation New airports in developed regions
Road	Non-motorised infrastructure High quality Bus Rapid Transit (BRT)	Road renewal to include strategic plan Electric vehicle charging infrastructure linked to RE plan		New road network in developed regions*

Table 5: Overview of proposed 2°C investing criteria for the transport sector (examples)

A more advanced approach which provides greater certainty of 2°C compatibility is to apply a national decarbonisation pathway for the building sector. This can be used to benchmark individual buildings against the national decarbonisation requirement, where buildings with their lifetime emissions have to fit into the decarbonisation pathway. A simple tool could be developed that allows the setting of country-specific benchmarks (pathways) for the building sector. Alternatively, standards could be developed that allow for a flexible, country-specific approach towards decarbonisation.

Proposed 2°C investing criteria for transport

The transport sector requires a systemic approach due to the interdependence of technologies and solutions within this and other sectors, in particular energy, land use and buildings. A low carbon transformation is unlikely to be achieved through technology change alone. “Avoid and shift” strategies are needed: they require policy change and must address behavioural aspects.

An approach based on sector-wide decarbonisation targets is most effective and necessary in the long term to drive transformation. However, in practice, given the universal lack of transport decarbonisation strategies and lack of political consensus on transport decarbonisation, it is considered premature.

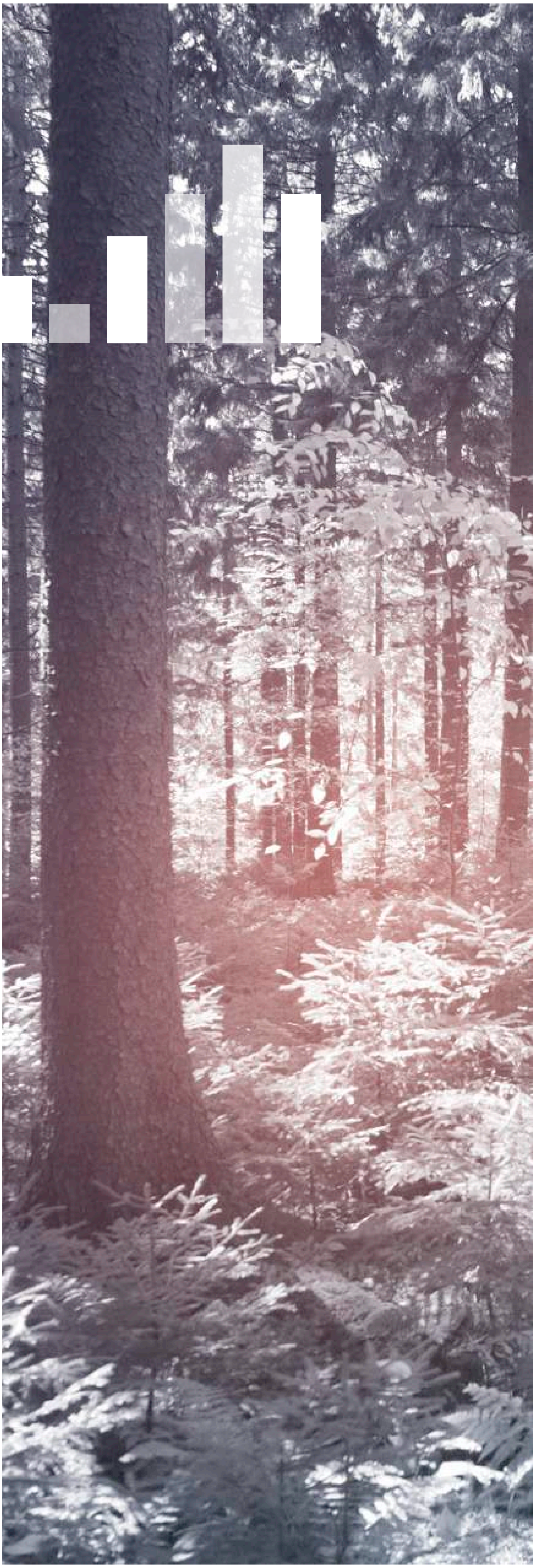
It is recommended to apply positive and negative lists in combination with a requirement to demonstrate how the planned infrastructure investment fits into a low carbon transport strategy. Setting infrastructure investment targets at the strategic level is also recommended in order to address the pronounced investment gap in the sector.

Way forward

Additional research is needed to further develop 2°C investment criteria in the key sectors identified in this report. Comprehensive 2°C investing criteria for all sectors and technologies that build on the initial results of this project can, in principle, be developed in the future. Given the lack of available guidance and tools to inform investment decisions on 2°C compatibility, as noted in this report, extending the research to additional key sectors is essential to enable the long term alignment of investment flows with international climate goals. Such work will require a larger process. The development of consensus-based criteria should involve a variety of stakeholders already active in the field to lift available expertise and ensure that criteria are grounded in the reality of different types of investors.

The formation of a coalition of "early adopters" could bring together interested bilateral development banks and governments. Such a coalition could support and accelerate the development of criteria and road test the proposed criteria for key sectors through a bottom up approach.

Beyond the scope of this project, more work is necessary on processes and criteria applicable to private banks and private investors as well as to financial assets and portfolios. Additional research will also be necessary to identify criteria that could be used to determine whether investments make a positive contribution to a community's or a country's resilience to climate change impacts. Such criteria should become an integral part of banks' social impact assessments for any project.



1. INTRODUCTION

The German government, through the German Federal Environment Agency, commissioned a consortium consisting of NewClimate Institute, Germanwatch and the 2° Investing Initiative to study the development of criteria to understand the compatibility of financial investments with the goal of limiting global warming to below 2°C. This short-term research project is meant to serve as a starting point for a wider and longer term debate on tools and guidelines that help investors to align their investment decisions with the international goal to limit global temperature increase to below 2°C above pre-industrial levels.

In 2010, at the Cancun UN climate change conference, world governments committed to keeping the rise in global average temperature to below 2°C. This objective has been reiterated many times since, yet global investment flows are still fundamentally misaligned with it. Too much is still being invested in activities that will lead to emissions inconsistent with 2°C pathways, while too little investment is going into the sectors, infrastructure and technologies necessary for the transition to 2°C-compatible development. The long lifetime of many assets increases the urgency to shift investment patterns.

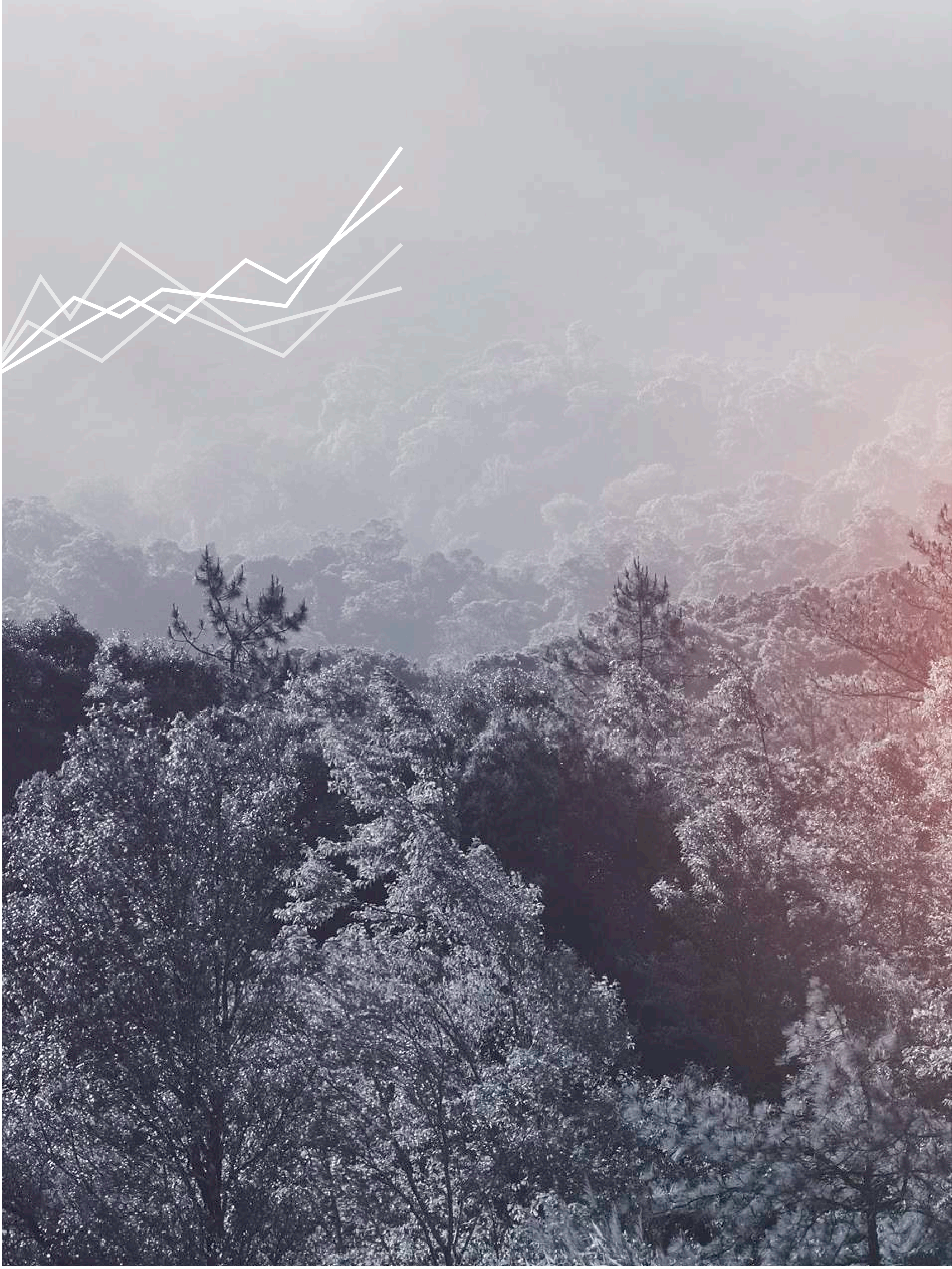
Echoing the globally-agreed 2°C limit, at the last G7 Summit in June 2015 in Elmau, Germany, G7 leaders emphasised that "deep cuts in global greenhouse gas emissions are required, with a decarbonisation of the global economy over the course of the century" (G7, 2015). The agreement sends a strong signal to the business and investment community to rethink and change current practices to achieve the decarbonisation objective. In order to allow for this change to happen, investors need clear guidance and tools to help them understand which investments are in line with the global climate goal, and to enable them to adjust their strategies accordingly. Beyond guidance on the more general climate friendliness of investments, no specific guidance on the compatibility of investments with the 2°C goal is available.

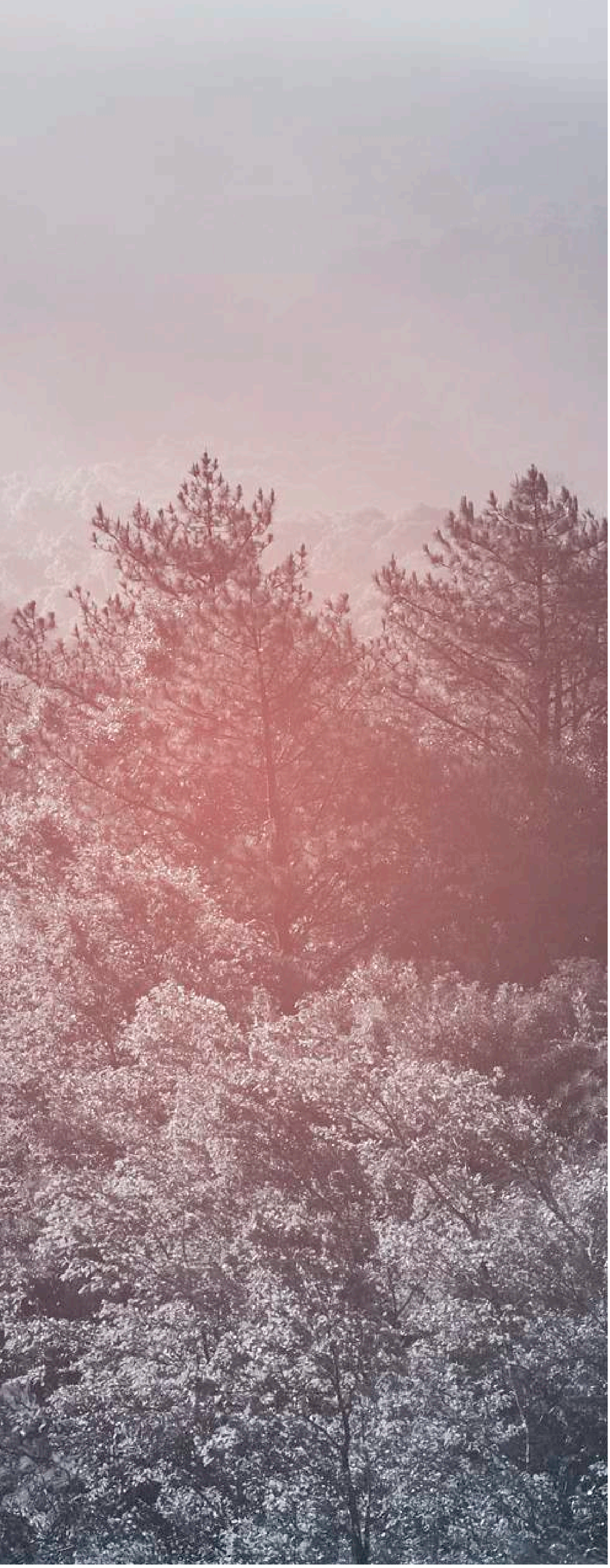
This project is placed against this backdrop and seeks to address this gap. The selected focus of the research is on the development of criteria to support 2°C-compatible investment decisions at the individual project level, i.e. direct investments in or financing of physical assets. Secondly, the research specifically addresses public financial institutions, given their implicit or explicit climate policy mandates. It is clear that there's a necessity for a wider discussion on aligning all investments with the global climate goal, including all financial products and investor types. This goes beyond the scope of this project. Equally, the conclusions presented here are meant to feed a continuous process to develop, test and implement 2°C-investing criteria which is expected to stimulate debate and the interest of stakeholders, especially the investment community, to actively engage in this process going forward.

The research builds on – and links to – ongoing related research activities and investor actions, which seek to understand climate performance and to embed climate considerations into investment decisions and processes. Whilst the ongoing investor initiatives particularly focus on responding to existing and future climate-related investment risks, this project takes the perspective of linking climate policy objectives and investment flows beyond the question of investment risks.

The point of departure is the current landscape of climate-related metrics and their application. A growing number of financial institutions already apply climate-related criteria, and public financial institutions are leading the way. Some private financial institutions have also started integrating these criteria into investment decisions.

Following the general introduction and context for 2°C investing criteria in sections 1 and 2, section 3 looks at existing criteria and approaches public banks use to guide investment decisions, and assesses their appropriateness with respect to the 2°C objective. This is followed by general considerations on the development of 2° investing criteria investment processes and a first general framework around the development of 2°C investing criteria from the mitigation perspective using 2°C model scenarios as a basis (section 4). Section 5 then looks at how 2°C investment criteria could be integrated into investment processes and some of the associated challenges. This framework integrates the insights from an extensive consultation process realized in the course of the project. Section 6 discusses specific 2°C investment criteria in three of the most relevant sectors for achieving climate change objectives: power supply, buildings and transport infrastructure. Lastly, the concluding outlook synthesises the key messages and highlights questions to be addressed in future research (section 7).





2. THE NEED FOR 2°C INVESTING CRITERIA

KEY CONCLUSIONS

In order to limit global temperature increase to 2°C, global greenhouse gas (GHG) emissions will have to be reduced significantly, eventually to zero during the course of this century.

Given the long lifetime of many physical assets, it is today's investment decisions that will determine the GHG intensity of our future infrastructure and, with that, our ability to meet the global climate goal.

2°C investment criteria are needed in order to guide investments towards those that are in line with the globally agreed 2°C limit.

2°C investment criteria can also serve other purposes, including informing on climate-related risks, as well as improving transparency and financial reporting.

In addition to shifting investments from high to low carbon technologies and infrastructure, significant mobilisation of capital will be needed to close the current investment gap

The international community has agreed to limit global temperature increase to a maximum of 2°C above pre-industrial levels. An increase beyond this limit would have deep and unpredictable impacts on our communities, ecosystems and the global economy. The IPCC suggests that for a likely chance of meeting the 2°C limit, global emissions of all greenhouse gases need to be reduced to net zero or below by 2100 (full range over all scenarios is 18% below zero to 22% above zero as a percentage of 2010 emissions). For full decarbonisation, emissions of CO_2 from fossil fuels, industry and land use will have to decline to around zero earlier, i.e. during the second half of the century, in order to be compatible with the 2°C limit (example scenario in Figure 1).

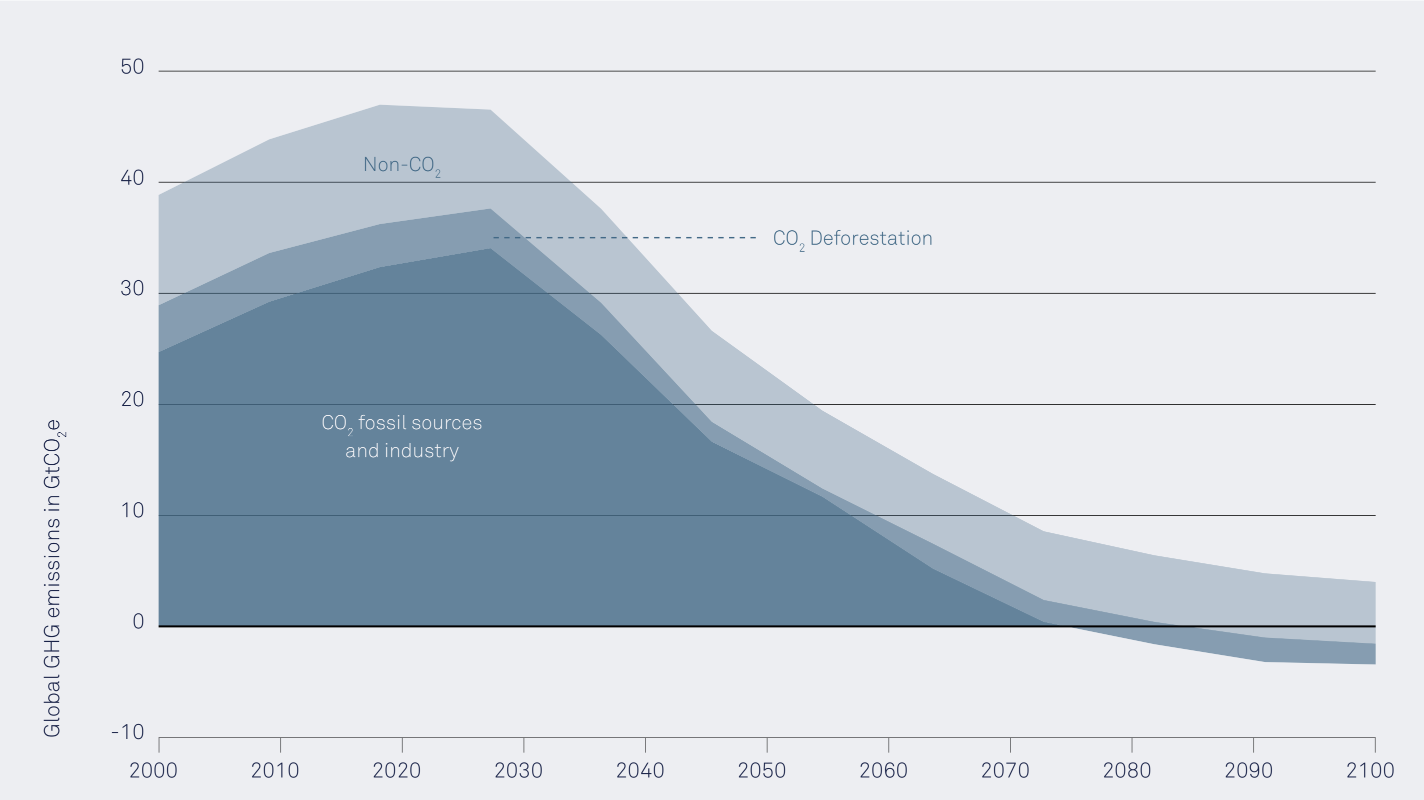


Figure 1: Illustrative 2°C scenario. Data source: marker scenario RCP 2.6 of the IPCC (IIASA, 2015)

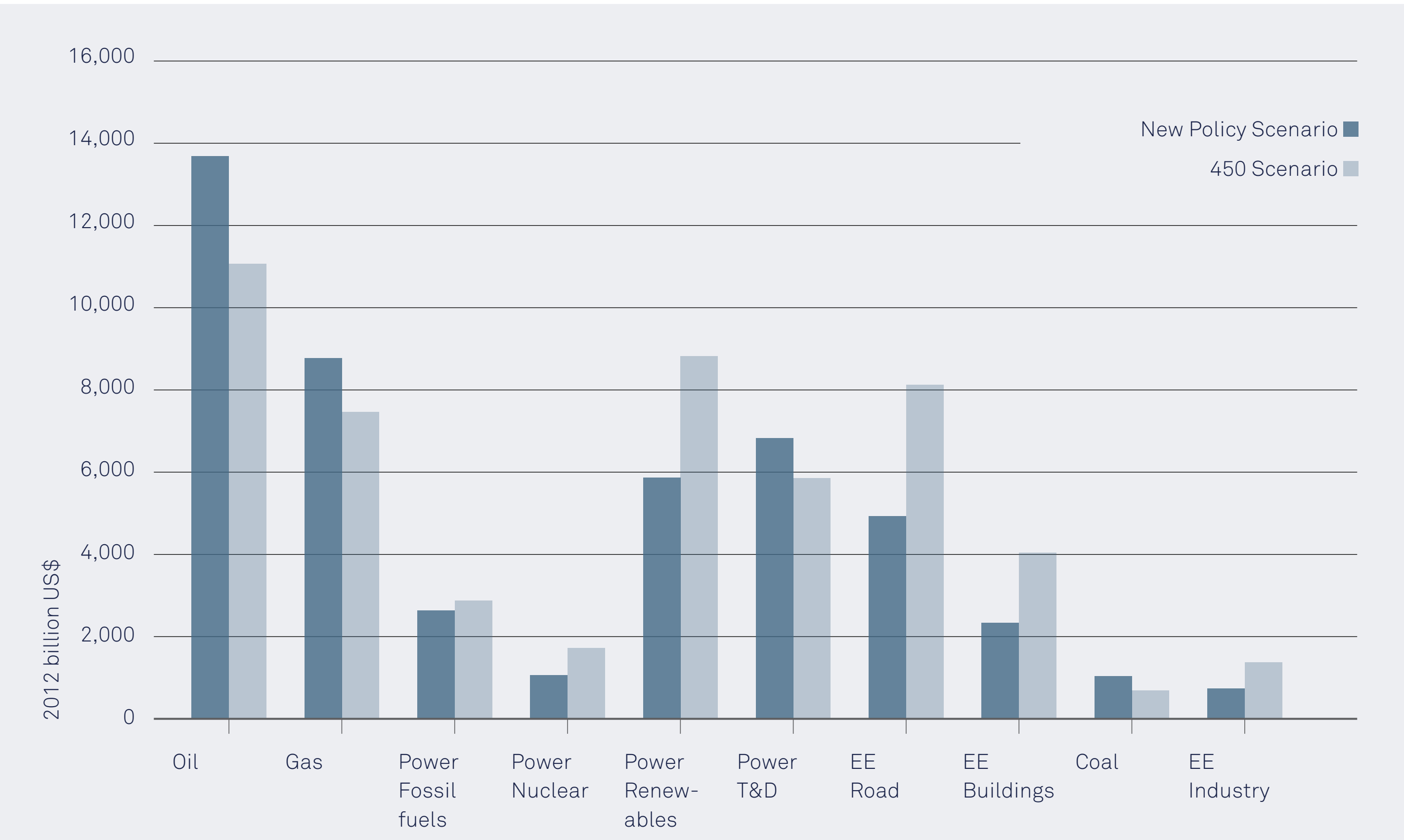


Figure 2: Investments in key sector under different scenarios (IEA, 2014a)

Current investment flows are misaligned with the 2°C limit (see e.g. Harnisch et al., 2014). Aligning these flows requires a reallocation of capital from high-carbon to climate-friendly investments, as well as a broader capital mobilisation in low-carbon, climate-resilient assets. Investment and financing decisions today will have a large impact on the ability for the world to achieve the required deep cuts in GHG-emissions.

The 2°C limit has several implications for investment and financing:

- **Shifting of capital to climate-friendly investments:** the International Energy Agency (IEA 2014a) estimates that limiting global warming to 2°C requires an additional annual investment from current levels of $ 1 trillion in '2°C technologies' by 2050.

- **Reducing high-carbon investment:** limiting global warming to 2°C will require a gradual decrease in investments in technologies involving unabated GHG-emissions. The IEA estimates a reduction of $ 2 trillion in investment in the oil & gas sector by 2035 in a 2°C-compatible scenario ("450") relative to investment levels under the "New Policy Scenario" (e.g. the IEA business-as-usual scenario) as shown in Figure 2 below.

- **Avoiding high carbon lock-in:** both high-carbon and climate-friendly investments frequently involve infrastructure with a long expected lifetime. Long lifetimes can lock in certain infrastructure that may, in the long-term, be misaligned with climate objectives. The time horizon of these investments implies that, to a significant degree, it is today's investment decisions that will determine the nature of our infrastructure and associated greenhouse gas emissions in 20, 30, or 40 years. Understanding whether an investment is compatible with limiting global temperature increase to below 2°C thus requires assessing the project's lifetime climate impact.

- The 2°C warming objective involves not only a challenge of capital reallocation, but also of capital mobilisation. In addition to the incompatibility of current investments with the 2°C limit, there is a significant infrastructure investment gap to reach even business-as-usual development objectives. (Bhattacharya et al., 2015) attribute this investment gap to several factors, including missing infrastructure investment plans at the national level as well as inherent financial and regulatory disincentives associated with infrastructure investments. The authors highlight the need for clear criteria to enable sustainable, 2°C compatibility of infrastructure investments, as well as the need to expand the central role of development banks for infrastructure investments.

Public and private financial institutions are a key source of financing for meeting the capital mobilisation and allocation challenge.

The Climate Policy Initiative (CPI) estimated in its 2014 "Climate Finance Landscape" report that external financing accounted for nearly half of all climate mitigation investment in 2013 (Buchner et al, 2014). The role of public financial institutions is particularly prominent: they account for roughly one third of global climate finance in 2013 (Buchner et al, 2014).

In terms of both high-carbon and low-carbon investments, the IEA 2014 World Energy Investment Outlook (IEA 2014a) estimated that debt and equity financing provided over 40% of the project finance of OECD publicly listed power companies. Public and private financial institutions influence investment decisions in the real economy. They determine both the access to capital and its cost. When public and private financial institutions discriminate between high-carbon and low-carbon investment, they can influence the relative profitability of projects and the ultimate investment decision.

2°C investing criteria are a useful tool to support investment decisions. They respond to several key objectives:

a) Inform climate mandates of public financial institutions

Apart from dedicated climate funds such as the Green Climate Fund that directly reference the 2°C limit in the investment framework (GCF, 2015), climate mandates form a core part of the remit of a significant number of public financial institutions, including public banks and public pension funds. For example:

- In France, the Banque Publique d'Investissement (Public Investment Bank), created in 2012, has a specific mandate to finance the "ecological transition" (Art. 1).

- The German Kreditanstalt für Wiederaufbau (KfW) Group has a mandate focused more broadly on environmental protection and, for distinct business areas on development, export finance or support of SMEs, respectively (KfW, 2013, Art. 2.1).

- The United Kingdom created a national Green Investment Bank (GIB) in 2012 with a specific climate and environmental mandate. From 2015, the GIB will also invest internationally.

- The French Pension Fund Act from 2000 explicitly requires the French Pension Fund (Fonds de Réserve pour les Retraites, FRR) "to report on the way the general guidelines of the Fund's investment policy took into account social, environmental and ethical considerations."

The consultations with public financial institutions in the course of this project demonstrated that it is still unclear how climate mandates can be operationalised in line with the 2°C limit. 2°C investing criteria would help ensure the financing activities under these mandates are aligned with the 2°C climate goal.

b) Inform on financial risk associated with the transition to a low-carbon economy

A growing body of research demonstrates the potential financial risk associated with the transition to a low-carbon economy:

- Mark Carney, Governor of Bank of England and chair of the financial stability board has argued that rising global temperatures will impact not only on society but also on the financial performance of institutional investors (both on the asset and liability side), in particular insurance companies, and that carbon asset risks are currently poorly managed by the industry. (Bank of England, 2015)

- The Carbon Tracker Initiative and academic research[1] have demonstrated the potential for the economic stranding of fossil fuel reserves.

- Equity research reports from Kepler-Cheuvreux, HSBC, Societé General and others have highlighted the risk of the energy transition to fossil fuel companies.[2]

- Mercer's research on climate change has begun to highlight the risk to financial portfolios and across asset classes.[3]

Financial institutions, both public and private, are increasingly starting to explore and respond to these risks. Infrastructure and project finance, the first link of the investment chain, are likely to be particularly exposed to these risks, given the long-term nature of these assets and their direct economic link to climate policies. Although not a focus of this research, 2°C investing criteria can help inform whether assets may potentially be stranded in a 2°C economy, both for public and private financial institutions.

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1 http://www.collectif-scientifique-gaz-de-schiste.com/fr/accueil/images/pdf/texteschoisis/McGlade_et_al-2015-Nature.pdf

2 For a comprehensive review, see 2° Investing Initiative (2015) "Financial Risk and the Transition to a Low-Carbon Economy"

3 Ibid.

c) Potential to drive private capital for 2°C-compatible investment

Beyond public banks, 2°C investing criteria may also be material for institutional investors and private sector banks. Developing 2°C investing criteria can contribute to mobilising private capital, through improving climate accounting standards of institutional investors and private sector banks. Over 40 institutional investors have signed the Montreal Carbon Pledge, committing to reporting the carbon footprint of segments of their portfolio. This commitment can be strengthened through reporting on how financial portfolios are aligned with the 2°C limit. The French government has recently passed legislation requiring all large French investors to report on their alignment with climate goals. 2°C investing criteria can thus help inform private sector reporting, create transparency around investing practices, and mobilise 2°C-compatible capital as part of voluntary initiatives and public-private lending practices.

3. CURRENT USE OF CLIMATE RELATED CRITERIA BY INTERNATIONAL FINANCIAL INSTITUTIONS

KEY CONCLUSIONS

The criteria currently adopted by IFIs, including negative and positive lists, as well as quantitative benchmarks and qualitative guidelines, are insufficient to allow financial institutions to align their investments with the 2°C limit.

However, to the extent that IFIs have already implemented environmental criteria in their investment decision process, such criteria can form the basis for intensified work focused on the development, adoption and application of 2°C investing criteria.

There are a number of advantages and disadvantages attached to the climate-related criteria currently in use. However, the methodology behind these criteria seems well-suited to frame the discussion around the conceptualisation of 2°C investment criteria.

Good practice approaches suggest that climate-related criteria are best dealt with at different stages of project appraisal, including the general or strategic level where overarching guidelines are implemented, and the project level where detailed sector or technology-specific rules and procedures apply.

All international financial institutions (IFIs) reviewed in this study define and incorporate climate-related aspects in their decision-making processes. While some have an explicit mandate to do so, others focus on these issues following an implicit mandate or a policy objective defined by their governing bodies. For a number of institutions it is common practice to perform this exercise within the framework of environmental and social risk assessment. However, climate-related issues can also influence financing decisions at other stages of project appraisal. In short, 'climate change' has become part of the standard, multi-step project appraisal and approval process in one way or another.

Often, environmental and other objectives are on equal footing. To cite a case in point, the World Bank Group states that while its guiding principle is to alleviate poverty, it also aims to foster income growth and access to sustainable energy. It is for this reason that the bank balances cost-effectiveness and climate protection when assessing project proposals, which results in low cost and low emission projects being given priority (World Bank 2013: 13).

Thus, these institutions have incorporated both environmental and development norms in their activities. However, while they have taken efforts to harmonise approaches towards climate finance, for example by means of adopting common standards, principles or practices – including but, not limited to, the Equator Principles and the IFC Performance Standards – these efforts have not lead to a uniform principle of how to align financing decisions with the 2°C limit. This is not helped by the fact that there is a plethora of indicators and tools available – over 200, according to UNEP-FI and GHG-Protocol – to assess and guide climate investment.

However, to the extent that IFIs have already implemented environmental criteria in their investment decision processes, these criteria can form the basis for intensified work focused on the development, adoption and application of 2°C investing criteria.

3.1 TYPES OF EXISTING CLIMATE-RELATED CRITERIA

The results of this study suggest that IFIs apply climate-related criteria at different levels: the general, sector, and technology-specific level. At each level, different sets of criteria can be employed that can be categorised as positive, negative, quantitative, and qualitative. IFIs also often define national frameworks within in which country-specific guidelines and priorities apply. In general, the criteria adopted differ in terms of scope and depth:

- **General institution-wide criteria** are applied across all funding areas.

- **Sector-specific level criteria** are applied only for specific sectors.

- **Technology-specific level criteria** are only applied for investments in specific technology.

Four **types of criteria** can be distinguished:

- **Positive lists** determine clear investment priorities. They involve creating a category of low-emission technologies, industries, or sectors. Examples include solar PV, wind power, and electric vehicles.

- **Qualitative conditions** determine conditions under which projects with (potentially) adverse effects on the climate may still receive financing.

- **Quantitative conditions** include indicators that usually refer to baseline or other numeric values and similarly determine conditions under which projects with (potentially) adverse effects on the climate may still receive financing.

- **Negative lists** determine technologies, industries, or sectors excluded from financing, as they are inconsistent with the bank's guiding principles.

For example, as seen in Box 1, France's AFD has integrated different types of climate relevant criteria in its overarching general and sector-specific strategies ("upstream") as well as into its assessment of individual projects' climate impacts ("downstream").

POSITIVE LISTS	QUALITATIVE CONDITIONS	QUANTITATIVE CONDITIONS	MISALIGNED
• Funding for renewable energy	• BAT/BAAT/BAAAT • CC-/CCS-readiness • National climate strategy • Country groups (LDCs, small islands) • Others (development impact, energy access, system reliability, etc.)	• Efficiency-floor values in x (net) % • Carbon-ceiling values in x gCO_2 per (net) kWh • Shadow economic prices of carbon in $ x per t/CO_2 • Others (incremental costs of alternatives, etc.)	• Exclusion of coal greenfield (technology-specific, exceptions apply)

Table 6: Selection of climate relevant criteria used by examined banks

General institution-wide criteria

General funding criteria are related to the economic feasibility of financing operations, and centre on the objective of commercial soundness and, optionally, on environmental sustainability (e.g. WBG's 'twin goal'). Often, these criteria also refer to regional, sectoral or investment priorities, including climate-related investment targets applicable to the whole portfolio, and usually apply to all projects proposed. General funding criteria include, among others, exclusion or negative lists.

- **Example negative list (IFC)**: the list defines the types of projects the IFC does not finance. The list includes "production or trade in any product or activity deemed illegal (...) or subject to international bans (...), (...) weapons and munitions, (...) alcoholic beverages (...), (...) tobacco, gambling (...), (...) radioactive materials (...)". However, the IFC states that "[a] reasonableness test will be applied when the activities of the project company would have a significant development impact (...)." (IFC 2007)

Sector-specific criteria

Sector-specific criteria apply to single sectors only, for example, the energy sector. At this level, IFIs often incorporate climate aspects in their cost-benefit analyses of financing operations. That is, low-carbon projects have to compete with high-carbon projects on the basis of costs. To this end, financial institutions assess the environmental externalities and carbon costs associated with pollutants in the overall cost analysis. Depending on the assumptions made regarding shadow carbon prices or technology learning curves, such an approach can help incentivise financing for low-carbon alternatives, and rule out projects that are neither economically nor environmentally justified.

Some financial institutions assess the CO_2-reduction potential of projects and set this in relation with baseline values or GHG emission trajectories, as is the case with the Clean Technology Fund (CTF/TFC 2009: 4 – 7). Other metrics considered, including qualitative criteria, are development impacts, energy supply and access, technology diffusion potential and relevant principles, standards and regulation if applicable. A potentially powerful instrument is to introduce carbon-ceiling values for one or all fossil fuel-intensive technologies that effectively restricts financing for these projects.

- **Example quantitative criteria 1 (EIB):** the European Investment Bank has defined an "Emission Performance Standard" (EIB 2013b) of 550 gCO_2/kWh, which applies to all power sector projects and rules out financing for projects exceeding the benchmark. The EIB states it will revise the EPS before 2020.

- **Example quantitative criteria 2 (EIB):** in 2010, the bank has also introduced a shadow economic price of carbon of €25 per tonne of carbon dioxide equivalent, plus a high and low estimate of the damages associated with emissions of €40 and €10 respectively, and has increased €1 each year ever since (EIB 2013c: 25). As of 22 September 2015, the EIB has revised its policy, which means its central estimate of currently €30 will rise by €1 per year to 2040 and €2 per year thereafter, until 2050.

Technology-specific criteria

A number of IFIs, including the WBG and KfW, have defined technology-specific criteria, which include metrics and indicators specifically applying to coal projects. The criteria applied, both quantitative and qualitative, are different for single bank subsidiaries and vary depending on project type, as is the case with the KfW.

- **Example negative list (KfW):** in late 2014, Germany's KfW had updated its coal financing guidelines "[i]n order to further strengthen the transformational nature of energy projects in German development cooperation, development policy will cease to promote the new construction of coal-fired power stations and the modernisation of decommissioned coal-fired power

	Financial institutions						
Technology	**WB**	**EIB**	**KfW**	**ADB**	**Exim**	**CTF**	**Research standards (examples)**
Coal fired power plants	(N) ✓ ✓	✓ ✓	(N) ✓ ✓	✓	✓ ✓	✓ ✓	OECD-criteria for ECAs
Natural gas	P	✓		P		✓	EPA regulation
Transmission and distribution		P				P	
RE feedstock (bioenergy)	✓ ✓	✓ ✓					
Fossil fuel production					✓ ✓		Carbon tracker initiative
Buildings HVAC/EE		✓	✓				Climate Bonds Initiative; building standards
Industry efficiency (steel)	✓	✓		✓	✓		
Transport infrastructure	P	P				P	BRT Climate Bonds Initiative
Transport energy efficiency							Vehicle standards
Agriculture (palm oil1/forestry2)	✓ ✓ P		P/N[2]				

P/N Positive / negative list
✓ Quantitative Benchmark
✓ Qualitative

Figure 3: Climate relevant criteria currently applied by financial institutions

stations in partner countries"[4] (BMWi 2014: 4). This applies to financing operations supported by KfW Development Bank.

- **Example qualitative criteria (KfW):** in contrast, KfW IPEX, the export financing subsidiary, states it will continue financing coal-fired power plants "only (...) in countries which have a national climate mitigation policy and strategy which is supported by a targeted policy to expand renewables and/or to enhance energy efficiency. The projects must be compatible with this climate mitigation policy"[5] (BMWi 2014: 3). In addition, the project must comply with EU regulation IED-RL 2012/75/EU (Industrial Emissions Directive defining best available technologies, BAT). Furthermore, additional criteria apply for coal greenfield projects, which vary depending on project characteristics including power output (less or more than 500 MW), type (lignite or hard coal), technology (conventional vs. cogeneration), and carbon sequestration readiness (with or without CCS) (BMWi 2014: 3). In the case of KfW Development Bank, additional criteria apply for

4 Original quote: „Um den transformativen Charakter von Energievorhaben in der deutschen Entwicklungszusammenarbeit weiter zu stärken, werden in Partnerländern der Entwicklungspolitik künftig keinerlei Neubauten von Kohlekraftwerken sowie auch keine Ertüchtigung bereits stillgelegter Kohlekraftwerke mehr unterstützt."

5 Original quote: „Vorhaben werden nur in Ländern verfolgt, die über eine nationale Klimaschutzpolitik und Klimaschutzstrategie verfügen, die von einer gezielten Politik zum Ausbau erneuerbarer Energien bzw. zur Steigerung der Energieeffizienz flankiert wird. Die Vorhaben müssen mit dieser Klimaschutzpolitik kohärent sein."

coal brownfield financing operations (modernisation) (BMWi 2014: 4).

Figure 4 provides an overview of some of the technology-specific criteria currently used by financial institutions as well as examples of existing or emerging research and standards. This figure does not entail a ranking. While data is inconclusive, and information is imperfect, the present findings suggest that only for few technologies, one of them coal, have banks developed technology-specific lending criteria. This suggests that IFIs tend to adopt a holistic approach to criteria-setting as described above.

A similar approach to criteria setting is adopted by France's AFD (see Box 1). The AFD has integrated different types of climate relevant criteria on two levels: as part of its "upstream" over-arching general and sector-specific strategies, and part of its "downstream" assessment of the climate impacts of individual projects.

BOX 1: INTEGRATION OF CLIMATE CHANGE INTO THE OPERATIONAL ACTIVITIES OF THE AGENCE FRANÇAISE DE DÉVELOPPEMENT

This box is a synthesis of the study by Eschalier et al (2015) that examines the Agence Française de Développement (AFD)'s integration of climate change into its activities and the upstream and downstream decision making processes. It also explores avenues in which these tools and processes could be further developed to allow for a more qualitative assessment of a project's contribution to a "low-carbon, climate resilient transformation" of the economies of countries where AFD is active.

Upstream level

At the upstream – or strategic – level, AFD defines geographic objectives in its Climate Action plan. The quantitative objectives of climate-related activities set at 50% of AFD's total activity in foreign countries are also defined at the regional level: 70% in Asia and Latin America, 50% in the Mediterranean zone and 30% in Africa and 30% of Proparco's activities. These objectives are mainstreamed in the portfolio through sectoral intervention frameworks (which include indicative sectoral objectives) and regional intervention frameworks. With project screening, AFD ensures that projects with extremely negative climate impacts are usually screened out. AFD's group decided in 2013 to formally exclude the financing of coal power plants without an effective Carbon Capture and Storage (CCS) system in place.

AFD introduces thresholds of climate impact to facilitate project screening according to the recipient countries' level of development. It uses a selectivity matrix that ensures highly emissive projects, –or projects emitting over a million tonnes of CO2e per year – are not funded in emerging countries, or in middle-income countries (unless the project forms part of an acceptable national or sectoral GHG mitigation policy).

Downstream level

Once a project has passed the initial screening phase, it undergoes a detailed appraisal process. The benefits of the climate-related assessment are twofold. Firstly, it serves to assess and validate the climate co-benefits of projects that can be classified as contributing to AFD's objectives in this area.

Based on more detailed carbon footprint estimations and climate co-benefit definitions, this process drives the tracking of AFD's contribution to its climate objectives. The processes also serve to identify how projects can be optimised to improve their climate co-benefits.

Case by case expertise is applied in the optimisation of project-specific choices in order to reduce climate impact throughout the lifespan of each project. The carbon footprint measurement tool is one of the tools applied in this process, a tool that is transversally integrated in AFD's operating procedures and its requirements for technical assessments. To date, AFD has implemented a formal procedure to systematically address 'climate screening' at downstream level. Climate vulnerability is considered on par with other risks during the appraisal phase of a project, as part of the technical and economic analysis (see Box 4). The final outcome of the "climate screening" procedure is a vulnerability identification among projects and, when high exposure is assessed, will lead to in-depth vulnerability and adaptation option identification studies during the appraisal process. The process seeks not to facilitate decision-making, but rather to encourage downstream optimisation through a selection of the best alternatives in terms of climate risk exposure.

At the final phase of investment decision-making, the AFD has included specific internal control procedures: second opinion and second sustainable development opinion that feed the final investment decision stages. Six criteria are reviewed, including the contribution of the project to the fight against climate change and the preservation of the atmosphere.

Taking stock and next steps to ensure that 'climate-smart' and 'transition-smart' decision-making

The tools and standards implemented by AFD constitute a solid base for mainstreaming climate considerations into its activities. However, there is potential to develop a more qualitative assessment of a project's contribution to 'low-carbon transformation' of a given country's economy. Whether used in upstream or downstream decision-making, the lists of eligible technologies and emission performance standards could evolve and tighten as countries progress to a low-carbon, resilient model. Volumetric approaches – measuring GHG emissions and consolidating total or avoided emissions at the level of the portfolio – could be assessed in terms of a transition-coherent emission trajectory estimated to be necessary to achieve long-term goals. The necessary development of "common LCCR-compatible development pathways" shared by recipient governments, DFIs, private investors, and public and private companies is stressed and constitutes an important area for future collaboration between DFIs and national governments.

Source: Eschalier C., Deheza M., Cochran I, (2015) Integration of Climate Change into the operational activities of the Agence Française de Développement, Institute for Climate Economics (I4CE) Paris. http:www.I4CE.org

3.2 ASSESSING EXISTING CLIMATE-RELATED CRITERIA

Little is known about the actual climate impact of environmental criteria, despite their role "in allowing companies to access international credit markets" (Rojas &Pratt 2010: 2), and this will not change unless such criteria are directly linked to an underlying climate goal, i.e.

the 2°C limit. The present findings suggest that the existing climate-related criteria vary considerably in terms of scope and depth.

One tool that is particularly compelling – yet requires further discussion – is the shadow economic price of carbon (also discussed in section 6.1)**. While political leaders across the globe have made pledges in support of the 2°C limit, political action towards an effective carbon price is lacking.**

A carbon price should, in theory, reflect the cost of mitigating CO_2 emissions. In practice, however, effective price instruments are lacking, for example emissions trading schemes, which could help shape carbon prices, work poorly and fail to send the desired price signals.

As a result of this, a number of financial institutions and companies have started operating with a non-static shadow economic price of carbon – or a dynamic price corridor, which increases over time – in order to incorporate climate objectives into their investment decisions. This voluntary approach is meant to be a strategic tool for risk and opportunity assessment in the context of energy transition.

For it to exert any meaningful impact, however, a carbon price has to be set at a "right" level, which shapes investment behaviour and which, in turn, depends heavily on individual cost assumptions and the expected price curve in the future. A second drawback of this tool is its limited applicability. In sectors, for example, where split incentives occur (e.g. buildings) or where no direct carbon impact is generated (e.g. infrastructure), carbon pricing proves unsatisfactory. With infrastructure, a carbon price may send a signal affecting an individual project rather than the embedding system, which may be either low or high-carbon. Lastly, investment decisions are made not only on the basis of cost, but also on the basis of risks. Thus, additional instruments may be necessary in order to limit the risks associated with necessary investments in a 2° scenario.

A carbon price can either reflect the social costs of carbon, that is, the avoided damage ("damage costs") by mitigating climate change – or the costs of mitigating emission reductions ("mitigation costs"). To this end, models such as IAM which compute 2°C-compatible global least-cost pathways, can help estimating price levels for mitigation costs.

Different cost estimations are available. According to the IPCC WG3, IAM models that modelled 430 – 480 ppm scenarios returned average carbon prices ("mitigation costs") over the period 2015 – 2100 of between 20 and 55 USD/tCO_2. Over the years, the carbon price is set to increase from 34 – 61 USD/tCO2 in 2020, 58 – 118 USD/CO2 in 2030 to 114 – 275 USD/tCO_2 in 2050 (Akimoto et al., 2014).[6]

The UBA recommends using a mix of "damage costs" and "mitigation costs". They recommend using the following price ranges: 40 to 120 €/tCO_2 by 2010, 70 to 215 €/tCO_2 by 2030, and 130 to 390 €/tCO_2 by 2050 (Umweltbundesamt, 2014). Price projections by Mercer, a consulting firm, suggest that one tonne of CO_2 will cost roughly 200€ by 2030, due to political regulation. These estimates vary widely from the current prices with which both private and public institutions operate. Oil and gas company BP, for example, is operating with a price of 36€ per t/CO_2, and the EIB is operates with a dynamic price of 30€ per t/CO_2 (central estimate), set to increase annually.

The increase of projected prices reflects the fact that mitigation options will become more costly over time. Any financing operation will therefore need to include dynamic price projections over its lifetime, so as to ensure 2°C compatibility.

6 The min and max numbers presented are based on the 25th and 75th percentile of the range of the results reported

It is worth noting that there is a difference between the average carbon price and the carbon price that is the marginal price of carbon. Marginal carbon prices reflect the cost of the most expensive mitigation measure modelled (lower price estimates will yield different measures). Both are important in the context of developing 2°C investing criteria: the carbon price indicates the price level required to achieve all relevant mitigation options, and the average carbon price shows how much a typical option will cost.

The issue and applicability of carbon prices in specific sectors is discussed further in sections 6 to 8.

The range of current practice suggests that IFIs are equipped with a number of different climate-related criteria, which all have advantages and disadvantages.

Table 7 provides an overview of the key advantages and disadvantages associated with the criteria adopted by IFIs. The existing landscape of climate-related investing criteria already allows for a relatively sophisticated integration of climate objectives into investment and financing decisions. At the same time, none of the existing criteria are currently applied in a way that they inform the alignment of financing decisions with the 2°C limit.

For example, while positive and negative lists can intuitively be linked to 2° technology scenarios (e.g. solar PV is 2°C-compatible), large shares of investments are needed in areas that are not "black and white." One example is the building sector. In this case, quantitative criteria provide an interesting alternative, allowing for a 'sliding' assessment (see section 6.2). Challenges associated with quantitative criteria, however, relate to the increased effort needed to measure quantitative alignment. Moreover, it seems generally more challenging to connect these criteria to the 2°C limit. Both qualitative and carbon shadow pricing indicators used by IFIs today can be complementary in this regard.

The discussion suggests that none of the criteria act as a 'silver bullet,' and can only be utilised in a complementary way.

The current use of climate-related criteria is either limited to certain sectors, associated with technical challenges, or subject to data availability and accountability. Banking experts consulted during the conception of this report share this view. At the same time, flagging these criteria as complementary can already overcome a number of these challenges today. Jointly, these criteria can inform on the climate-related performance associated with a financing decision. Subsequently, the question arises as to how these criteria can form the basis for 2° investment criteria setting. This question will be discussed in the next section.

The existing landscape of climate-related criteria informs financial institutions on climate benefits related to financing activities, but is not connected to the 2°C limit.

Many IFIs now have a focus on climate benefits as part of their mainstream practice. The existing landscape of climate-related criteria generally informs these climate benefits, particularly when used in complementary fashion. At the same time, these criteria only measure the climate benefit relative to no investment. They do not ensure alignment of the investment with the 2°C limit. In other words, investment criteria start from the assumption of 'no activities' and then seek to measure the positive benefits or use categorisation to determine whether an investment is 'better' or 'worse' than no activity. The approach of developing 2°C investing criteria, in turn, seeks to assess whether an investment does not just involve climate benefits but whether these climate benefits are aligned with the 2°C limit in terms of the scale of their impact.

	POSITIVE / NEGATIVE LISTS	QUANTITATIVE CONDITIONS		QUALITATIVE CONDITIONS (BAT / OTHER CONDITIONS)
		SECTOR SPECIFIC (BAT/ EMISSION CEILINGS)	CARBON SHADOW PRICING	
Advantages	Act as intuitive, "low-cost" criteria, which are relatively easily connected to 2°C technology roadmaps	Allow for a high-level of granularity between different projects and can be applied across sectors.	Allow for a comparison between financing and policy frameworks	Can account for non-quantifiable aspects related to climate change.
Challenges	Cannot easily be applied across all industries. Do not distinguish 'shades' of climate friendliness.	Lead to more challenging, cost-intensive application than mere positive / negative criteria. Creates challenges around defining 2°C compatibility.	Cannot be applied to all sectors: • Sectors where split incentives occur • Infrastructure which does not have a carbon impact itself. Might allow for high carbon investment in some sectors if • Low carbon alternatives not available • Investors lack information on alternatives • Price incentives too low to consider alternative options	Do not allow for a direct tracking of the compatibility of the project with the 2°C limit. Can lead to lower accountability
Usefulness for 2°C investment criteria	**High** Clear guidance which is straightforward to implement	**Medium** A ceiling could be set according to global 2°C pathways e.g. from IAM models. However, modelling exercises often return a broad variety of future pathways.	**Low** Difficult to set the right price level for 2° alignment; Does not provide a signal for technology substitutes but only decreases feasibility of individual projects	**Low** BAT levels are often far from being 2°C-compatible and say little about technology choice / substitutes Other qualitative criteria difficult to operationalise in a robust / objective way

Table 7: Advantages and challenges to the existing landscape of climate-related metrics

4. DEVELOPMENT OF 2°C INVESTING CRITERIA

KEY CONCLUSIONS

2°C investment criteria for physical assets can generally be developed on the basis of 2°C model scenarios.

Based on underlying model assumptions, technologies and investment areas can be grouped into those that are consistently 2°C-compatible , and those that are consistently misaligned across all scenarios.

The majority of technologies and investment areas fall into the group of "conditional" or "ambiguous", i.e. they are only aligned under certain conditions or according to certain scenarios. This category in particular requires detailed criteria.

Criteria may take the form of positive/ negative lists, where clear 2°C-consistency or inconsistency can be defined. Or they may be formulated as qualitative or quantitative benchmarks or investment guidance, for example based on decision trees.

2°C investment criteria may not be universally applicable in all national contexts. Differentiation may be required depending on aspects such as development priorities, market maturity and system considerations.

Also, investments need to be embedded in a larger context of system change toward 2°C compatibility. In some contexts, to achieve 2°C-compatibility may require a stepwise approach – over time – based on transition technologies..

This section outlines how 2°C scenarios have been used for the purpose of this research to categorise and prioritise investment areas according to their 2°C relevance. It further illustrates how criteria can be defined, and highlights key aspects that need to be considered in the process.

To determine whether an individual project is 2°C-compatible is not straight forward, as the 2°C limit is a global goal and it always requires the distribution of a finite carbon budget to individual entities. There have been several proposals on ways to do this, particularly for countries (IPCC AR5 and Höhne et al. 2014, Meinshausen et al 2015), or companies (Krabbe et al. 2015). In essence, these approaches translate global emissions pathways to smaller entities, and determine the speed of the necessary reductions from the present emission level.

Two fundamentally different approaches are used: one shares the budget (mainly among countries) based on moral grounds, e.g. their historical responsibility or economic capability. These approaches indicate moral responsibility to pay for reductions. Other approaches share the reduction on the basis of what would be the globally most cost effective solution; indicating where reductions would be preferable, in order to keep globally aggregated costs as low as possible, leaving open the question of who ultimately pays.

For this study, we chose the second approach (sharing the reductions so that globally aggregated costs are minimised), because we consider the global investments, many of which are – to some extent – supported by international cooperation. The question of who pays is beyond the scope of this work.

Analysing 2°C-compatible scenarios that are modelled on a basis that minimises global aggregated costs, one finds certain characteristics:

- Massive shifts away from fuels towards electricity are necessary, as based on current knowledge; electricity can be produced sustainably, while fuels cannot. Such an early shift does not reduce GHG emissions in the short term, but is essential for a 2°C-compatible transition

- Significant transitions are necessary with a very long-term perspective. For example, low carbon industrial solutions have to be developed today so they are available in the long term to reduce emissions

Determining 2°C-compatible investments based only on their greenhouse gas emissions would not ensure the complex specific transformations necessary. For example, an approach could be a uniform, high enough carbon price. We show below that this may be feasible in some sectors, but by no means sufficient in other sectors to make the transition, due to split incentives. Another alternative would be to use an indicator like "lifetime greenhouse gas emissions per US$ invested." Again, focussing only on greenhouse gas emissions will not incentivise the necessary transformation, e.g. the early move towards electrification.

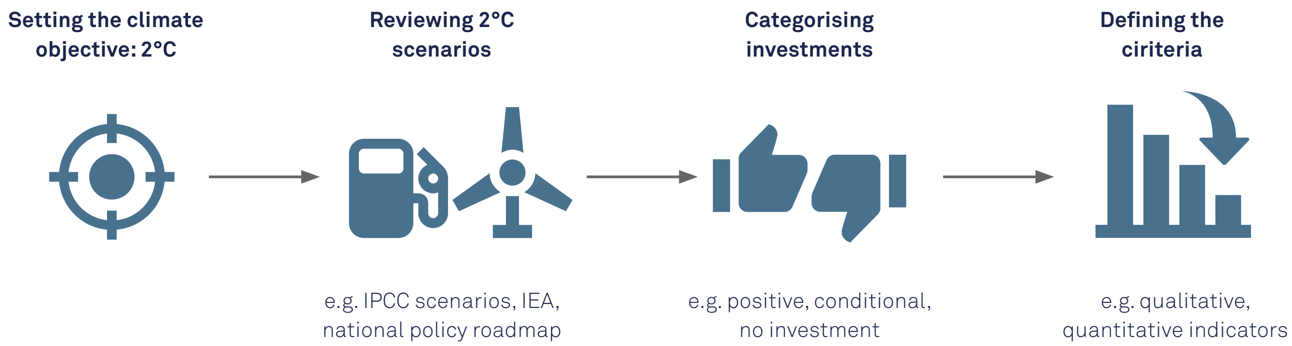
We therefore propose a systematic review of the 2°C-compatible scenarios to which sectors and technologies investments should – and should not – flow if the climate goal of a 2°C limit is to be achieved, and to use this as a basis for defining 2°C investment criteria.

4.1 REVIEWING 2°C SCENARIOS

Very different technological pathways could be perceived that are compatible with the 2°C limit. It is, in essence, the cumulative CO_2 emissions over the lifetime of all investments that must not exceed the remaining carbon budget. This cumulative limit could, in theory, be reached using technological and behavioural options (e.g. using less energy services, using less energy for the same services or using more low carbon energy sources) to varying extents. Despite the fact that there are hundreds of scenarios in the literature, the degree of freedom is limited, as the remaining carbon budget is already exhausted to a large extent. At the same time, all scenarios rely on existing technologies and cannot foresee unexpected technological developments that may occur in the future.

As a first step to derive 2°C-compatible investment criteria, the approach involved a comprehensive review of available 2°C model scenarios to capture the full range of different perspectives and assumptions on potential low carbon trajectories. In particular, these included:

- Scenarios from **Integrated Assessment Models** which are based on cost optimisation over a broad scope of sectors, but which lack resolution on energy demand options, assume large amounts of Bioenergy



CCS (BECCS) and Land Use Land Use Change and Forestry (LULUCF), e.g. as in the IPCC report;

- **Energy sector models** such as those by the IEA which include option level details but still lack resolution on certain technologies;

- **Renewables and efficiency scenarios** focus on certain technologies and exclude others (esp. CCS and nuclear), e.g. WWF Energy Report, Greenpeace Energy [R] evolution;

- **Sector specific bottom up scenarios** such as the IPCC Working Group 3 report, which provide detailed analyses of mitigation potentials and costs but lack the integral approach across sectors.

The analysis of 2°C scenarios focussed on four elements in particular:

- **Contribution to emission reductions** – which describes the sector where most emission reductions are needed under the different 2°C scenarios

- **Asset lock-in** – defines the lock-in potential of the technology considering lifetime as well as size of the asset. More lock-in is generated if the asset is likely to operate for a long time and if the asset is larger. This may include negative carbon lock-in but also positive lock-in in climate friendly technologies.

- **Value of future investments** – describes where investments need to flow according to available 2°C scenarios

- **Regional hotspots** – combines the sector perspective with a view on where in the world major reductions will be necessary

Table 8 shows the results from the scenario analysis. The different investment options are rated as high, medium and low in terms of materiality or significance of the individual aspects considered. The rating is based on a mix of quantitative information where data at the technology level is available, and expert judgement. In some cases, the lack of granularity of available data prevented a more detailed view, for example, on the role of individual technologies under a 2°C scenario or future investment needs for individual options. Especially for the waste and agriculture sectors data availability is poor. There is also no granularity on transport infrastructure options.

As can be seen in the table, the energy sector shows the highest contribution to emission reductions under the 2°C scenarios. Of key relevance for the achievement of the 2°C limit are also efficiency in buildings, industry and transport. Unsurprisingly, infrastructure-related investments show the highest lock-in potential, and energy and transport in particular are the two sectors where most investments need to flow. The analysis of regional hotspots shows very similar patterns for most investment areas – mainly China, the USA and India as well as the EU for buildings. This is a reflection of the size of the economies.

Categorising investments

Each investment area was categorised into one of four investment groups, 2°C-compatible, conditional, ambitious and misaligned – always from the perspective of alignment with the 2°C pathway. The categorisation of the technologies is based on the consistency of their role across the different scenarios.

The category of "2°C-compatible" describes all investment areas/technologies in line with the 2°C limit, in all scenarios. On the other end of the spectrum are those technologies which are consistently misaligned with the 2°C limit. The majority of investment options fall in the category of conditional or ambiguous where "conditional" investments are 2°C aligned in all scenarios under certain conditions and "ambiguous" are aligned in

INVESTMENT OPTIONS	EMISSION REDUCTIONS		ASSET LOCK-IN RISK (POSITIVE AND NEGATIVE)	FUTURE INVESTMENTS		REGIONAL HOTSPOTS
	% EMISSION REDUCTIONS OF TOTAL	ROLE UNDER 2°C SCENARIOS		PER SECTOR	PER INDIV. OPTION	
Renewables		High	Medium		High	
Coal		Low-Medium	Medium-High		Low-Medium	
Natural gas		Low-Medium	Medium		Low-Medium	
Bio energy CCS		Low-Medium	Medium		Low-Medium	
Nuclear		Low-Medium	Medium-High		Low-Medium	
Energy transmission infrastructure	29% – 65%		High	High	Medium-High	China, United States, India
Energy storage			Medium-High		Medium	
Energy supply manufacturing			High			
Biofuels feedstock			Low			
Fossil fuel production			Medium			
Building energy efficiency		Medium	Medium		Medium-High	
Building renewables		Medium	Low		Medium	
Building appliances	2% – 9%	High	Low - Medium	Medium	Medium	China, European Union, United States
District heating			High			
Buildings appliances manufacturing			Medium-High			
Industry Energy efficiency		High	Medium-High		Low-Medium	
Industry renewables		Medium	Low-Medium		Low	
Industry manufacturing	11% – 24%		High	Low		China, India, United States
Industry process emissions		Medium	Medium-High		Low-Medium	
Industry non-CO_2			Medium			
Transport infrastructure			High			
Transport fuel infrastructure			Medium		High	
Transport energy efficiency	8% – 22%	High	Low	High	High	China, United States, India
Transport renewables		Medium	Low			
Transport hybrid and electric		Medium	Low			
Transport urban planning		Medium	Medium			
Waste management		Medium-High	Medium			
Waste other			Medium			
Agriculture		Medium-High	Medium			
Forestry		Medium-High	Medium			

Table 8: Results from the scenario analysis and investment categorisation

some but not in others. The conditional and ambiguous categories reflect the fact that multiple pathways can lead to 2°C assuming different technology choices. Also some scenarios exclude certain technologies because of other considerations that may relate to assumptions of economic feasibility, or sustainability issues. A summary of the categorisation of investment areas is shown in Table 9.

For the purpose of this research, ten of the most relevant investment areas and technologies for limiting global warming to a maximum of 2°C were selected for further analysis on their existing criteria and approaches. Of these, three – power supply (specifically gas fired power plants), buildings (energy efficiency in heating and cooling) and transport infrastructure – were chosen for development of detailed investment criteria (highlighted in red). Given the scope of this report, a focus on a smaller number of the most 2°C relevant sectors was necessary, notwithstanding the relevance to also develop 2°C criteria for other the other sectors identified here. The selection was based on the scores of each area in the scenario analysis, in relation to its relevance for achieving the 2°C limit, in particular mitigation potential and lock-in risk.

Defining criteria

For the categories "2°C-compatible" and "misaligned", no specific investment criteria need to be developed as these categories can effectively be translated into positive and negative lists. It is important to note that technologies on the positive list do not automatically qualify as climate finance. The positive list is a tool to understand 2°C-compatibility. Other criteria are necessary to define what may be accounted for as climate finance.

With regard to the "conditional" and "ambiguous" categories, more specific guidance is needed. Existing criteria and standards used by financial institutions provide a useful starting point. As shown in section 3 of this report, many investors are familiar with the use of criteria and benchmarks to guide investment decisions, albeit not yet directly related to a specific climate objective. Apart from positive and negative lists, criteria may fall into two main categories building on current practice outlined in section 3:

- **Quantitative benchmarks** include indicators that usually refer to baseline or other numeric values and similarly determine conditions under which projects may still receive financing.

- **Qualitative guidance** determines conditions under which potentially non 2°C-compatible projects may still receive financing. These may include decision trees as well as scoring methodologies.

How these criteria can be integrated into investment processes will be discussed in section 5 of this report.

4.2 SPECIFIC CONSIDERATIONS FOR DEVELOPING 2°C INVESTMENT CRITERIA

For the development of specific sector-based 2°C investing criteria, a number of key general considerations are worth highlighting. These considerations will be discussed in general terms here, and picked up again in the more detailed exploration of sector based criteria for energy supply, buildings and transport infrastructure (section 6).

Criteria may not be applicable uniformly across all national and regional contexts but some degree of differentiation is needed depending on specific national circumstances. A number of aspects are relevant in this context:

- **Development and other policy priorities**. In many parts of the world, poverty reduction and improving access to basic services is a core priority. Achieving these

<table>
<tr><th>2°C-COMPATIBLE</th><th>CONDITIONAL</th><th>AMBIGUOUS</th><th>MISALIGNED</th></tr>
<tr><td rowspan="2">Fully aligned with 2°C consistently across all scenarios</td><td>2°C aligned only under certain conditions in all scenarios</td><td>2°C aligned in some scenarios, but not in others</td><td rowspan="2">Consistently misaligned with 2°C in all scenarios</td></tr>
<tr><td colspan="2">• Due to the fact that multiple pathways can lead to 2°C (e.g. more renewables and less efficiency or the other way around)
• Due to different assumptions on technological development
• Due to considerations of other sustainability factors</td></tr>
<tr><td>• Renewable energy
• Energy storage
• Low carbon transport fuel infrastructure
• Low carbon vehicles</td><td>• Gas fired power plants
• Energy transmission and distribution infrastructure
• Energy efficiency in heating and cooling of buildings
• Efficiency in industry
• Transport infrastructure
• Transport efficiency
• Agriculture and forestry
• Building appliances</td><td>• Biofuels
• Fossil fuel production
• Large hydropower
• Bio energy carbon capture storage
• Nuclear</td><td>• New coal fired power plants with unabated emissions over their lifetime</td></tr>
</table>

Table 9 Summary of categorisation of investment areas and technologies (priority sectorsin bold, sectors for further consideration in following sections in red)

key development objectives may require trade-offs. While the concept of green growth suggests that countries can embark on a low carbon trajectory through leap frogging, this is not always the case in reality. Often, low-carbon options require higher upfront investment, although lifetime costs may be lower, which then compete against investments in other areas exacerbated by a general lack of investment capital in many countries, especially in the public sector. Despite often clear prevailing mid to long-term benefits of low carbon technologies, such as reduced fuel dependency, this short-term view prevails with many investors. At the same time, no low carbon alternative may be available to achieve certain development objectives (e.g. motorways, airport).

- **Capacity and market maturity** needs to be considered globally, but also at the national level. Technologies differ largely with regard to the extent to which they are driven by global markets, versus what can be supplied by local markets. For instance, LDVs are a global product that, at least as long as they do not require investment in new infrastructure (e.g. electric vehicles), can be sold globally. On the other hand, building materials, in particular insulation material, are typically sourced locally. As a consequence, many low-carbon technologies require building up local markets and associated capacities to ensure supply, installation and maintenance.

- The **systemic nature** of the challenge at hand. Technologies are embedded in socio-technical systems composed of actors and institutions. Existing institutions create a lock-in into existing technologies (Unruh, 2000). This lock-in must be overcome and requires not only investments into the technologies themselves, but also the support of the institutions surrounding the investment, i.e. the "enabling environment." The strength of this enabling environment differs largely from country to country and influences heavily the ease and success of implementing a particular technology. These enabling environments tend to be very weak, especially in least developed countries, and investment interventions need to be accompanied by capacity and institution building programs.

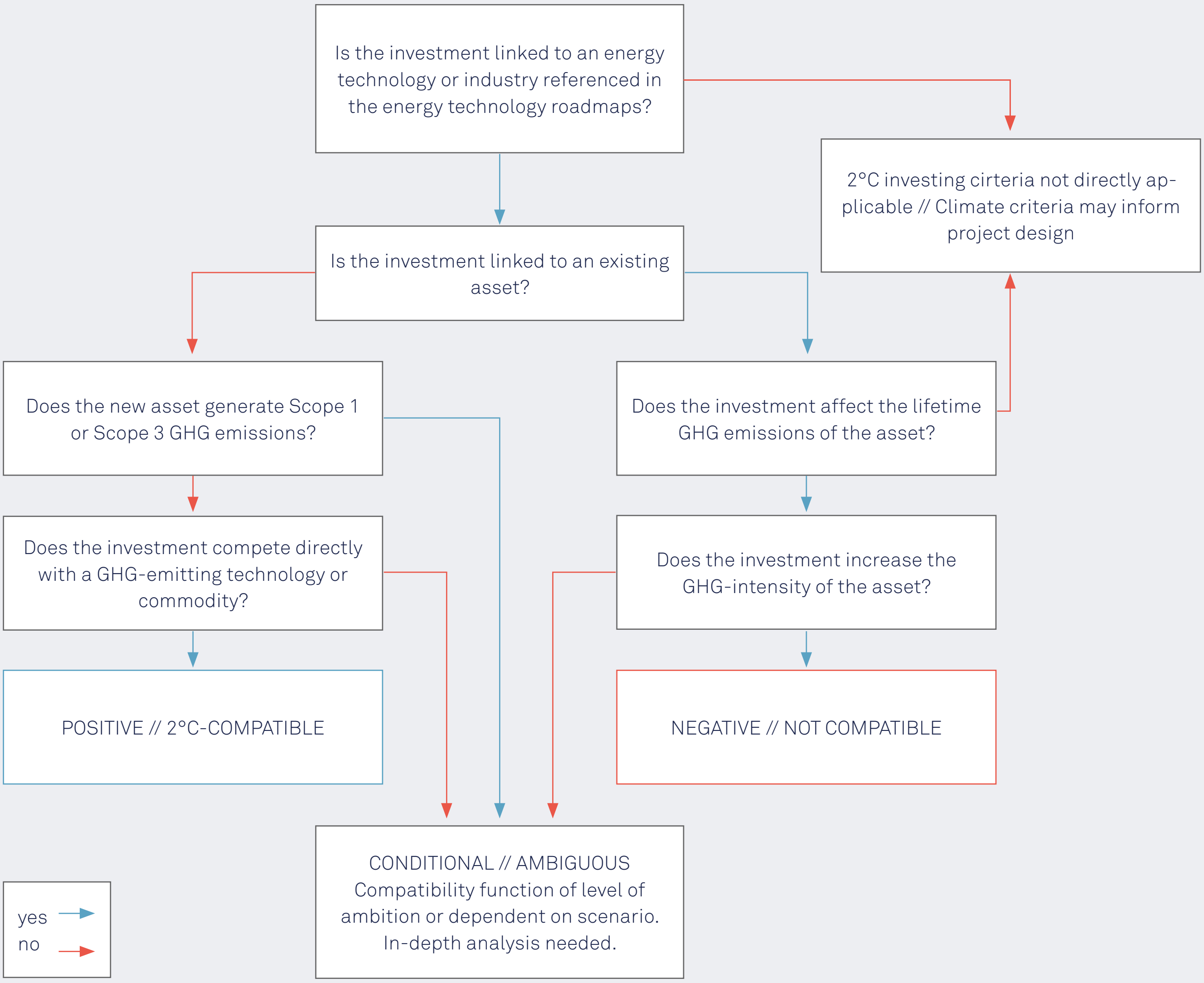
- **Technical system characteristics**. Low carbon technologies are often embedded in complex technical systems that need to be transformed. This takes time and requires the use of intermediary technologies as well as investment in supporting infrastructure. Depending on the point of departure and availability of technologies, this might take more or less time. A prime example is the electricity system that, in many countries, is currently structured around large centralised units that provide base load electricity. Renewable energy systems require decentralised and flexible structures. Another example is transport systems that could be structured around different modes of transport (e.g. road vs. rail). In all cases large investments in infrastructure are needed to enable new systems and transition technologies.

ASPECT	GENERAL CONSIDERATIONS IN THE CONTEXT OF 2°C INVESTMENT	SPECIFIC CONSIDERATIONS FOR DEVELOPING 2°C INVESTMENT CRITERIA
Development objectives	Important to align 2°C investments with development priorities. The aim is to look for synergies between the two goals.	Already taken account of by banks. Development aspects inform the local context which may determine the speed of transitioning to 2°C compatibility. Development priorities may override 2°C investing criteria in certain cases.
Market maturity	Important technologies in sectors may not be fully matured in the global or in the local market.	In markets/ sectors where low carbon technologies are very immature, 2°C investment criteria should guide investments towards maturity over time.
Systemic nature	Investments should not only focus on the development of 2°C-compatible technologies and infrastructure but also develop the socio-technical system in which they are embedded.	If the socio-technical system is not conducive to 2°C-compatible technologies, 2°C-compatible criteria may not be effective in driving change.
Technical system characteristics	Financing is needed for all parts of a technological system including investments in supporting infrastructure.	Depending on the local context, 2°C investment criteria need to consider bridging technologies that enable a transition towards low carbon development over time.

Table 10: Summary of key aspects in the context of 2°C investment criteria

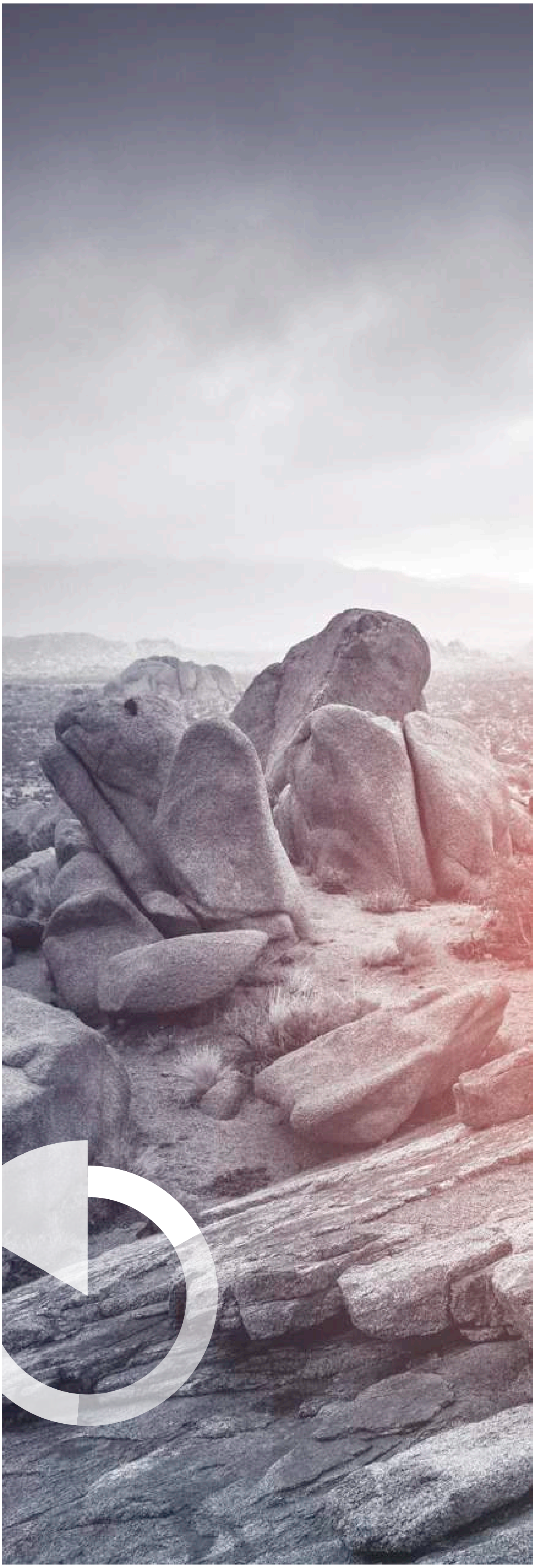
BOX 2: DEVELOPING 2°C INVESTING CRITERIA – A SIMPLE MODEL

The following figure shows an approach of how technologies and assets can be assessed in terms of their categorization into the categories of positive (2°C-compatible), negative (2°C-incompatible) and conditional/ ambiguous



The model demonstrates the relative simplicity with which assets and technologies can be classified as 2°C-compatible or 2°C-incompatible at a macro level. Its application, however, will lead to a result where the majority of assets are classified as 'conditional' or 'controversial.' There are various ways to increase the complexity of this simple model in order to provide a more comprehensive result.

The above-mentioned aspects are in no way new considerations for development banks, as Section 3 has shown. They all underline the relevance of **country and context-specific investment decisions**. In many contexts, immediate investment in 2°C-compatible infrastructure may not be possible, but rather requires embarking on a **transition pathway including investments in transition technologies**. Table 10 summarises the relevance of the individual aspects discussed above in the context of 2°C investment in general and for the development of 2°C investment criteria in particular.



5. APPLICATION OF 2°C INVESTING CRITERIA

KEY CONCLUSIONS

2°C criteria can be integrated into development banks' existing decision making processes, which already use a number of criteria at different steps of the project preparation, appraisal and approval process. This suggests that it should be possible to apply most new criteria within existing processes, with no significant additional costs.

The need for sufficiently robust guidance and criteria needs to be balanced with pragmatic, implementable approaches. The earlier in the process the criteria can be integrated, the more they will have an effect.

2°C criteria can be reflected in guiding documents at different levels, namely, institution-wide strategies, country frameworks, sector policies and guidance for individual project types.

Different types of 2°C criteria are related to different aspects of the project preparation, appraisal and approval process. Positive/negative lists can be used in the initial screening, shadow carbon pricing can be included in the economic evaluation and different qualitative and quantitative criteria can become a part of the environmental, social and governance (ESG) evaluation.

In order to ensure that there are opportunities for 2°C-compatible investment, support for appropriate country strategies and policy frameworks is necessary, along with capacity building and explicit proposal development support for 2°C-compatible investment projects.

As discussed in section 3 above, development banks already use a number of criteria in their project appraisal and approval processes, including climate-related criteria. However, these criteria are usually not informed by the 2°C limit and therefore not sufficient to ensure development banks do their part in staying below the internationally agreed temperature threshold. As was shown in section 4, it is possible to derive criteria for individual projects from the global temperature limit. The following section will discuss how such criteria can be integrated in development banks' existing practices. Criteria for 2°C-compatibility are not meant as a replacement of any of the existing criteria and processes used by development banks and similar institutions. It is crucially important that, in line with their mandate, they continue to assess their investments against a set of criteria to ensure they are financially viable, contribute to development objectives and respect the full range of environmental and social safeguards. The suggested 2°C criteria would simply be an addition to the existing frameworks in order to strengthen the robustness of the climate-related assessments.

5.1 INTEGRATING 2°C INVESTING CRITERIA IN DEVELOPMENT BANKS' DECISION MAKING PROCESSES

Below, we present a simplified summary of the different documents informing investment decisions by development banks and similar public institutions and of the different steps leading to the approval of an investment decision. These steps are structured differently at different institutions and might also be further differentiated within an institution, depending on the sector, scale and type of investment (concessional loans, commercial loans, equity, export credit, guarantee) etc. The findings and recommendations formulated below – as to how to apply 2°C criteria – apply across these different institutions and forms of investment. However, depending on the specific institutional context, they would need to be further specified.

Integrating 2°C considerations into existing processes has many advantages. Building on tried and tested approaches makes implementation easier and thus increases the likelihood that criteria will have an impact in practice. It also makes implementation less costly. In order to make their investments 2°C-compatible, banks would need to add additional elements to a process they undertake anyway. While the definition of criteria would require a one-time investment of effort and resources, their application would, in most cases, not add significant costs. If a bank already uses relatively sophisticated climate-related criteria, as an increasing number do (see section 3), only the underlying metrics or definitions might have to be adapted with no change to the actual assessment and appraisal process. In such cases, the additional costs would be zero.

There are a number of guiding documents where 2°C considerations could be reflected. Ideally, 2°C investment criteria would be made binding for the entire institution through policies at all levels. However, to gain experiences it could also be a useful starting point to make 2°C investment criteria a best practice in some sectors. The documents where 2°C investment criteria could be reflected include:

- **Institution-wide strategies.** A development bank will usually have an overall strategy that defines priorities and objectives. An objective to invest in a way that is consistent with the 2°C objective could be reflected there. A bank might also set itself targets, e.g. to invest a given percentage of its overall portfolio in climate-friendly areas. The institution will usually have a bank-wide exclusion list, where the technologies/kinds of projects identified as misaligned with 2°C scenarios could be included. Finally, a bank will also have environmental and social safeguards with underlying policies, where some of the qualitative and quantitative conditions discussed in this report could be reflected.

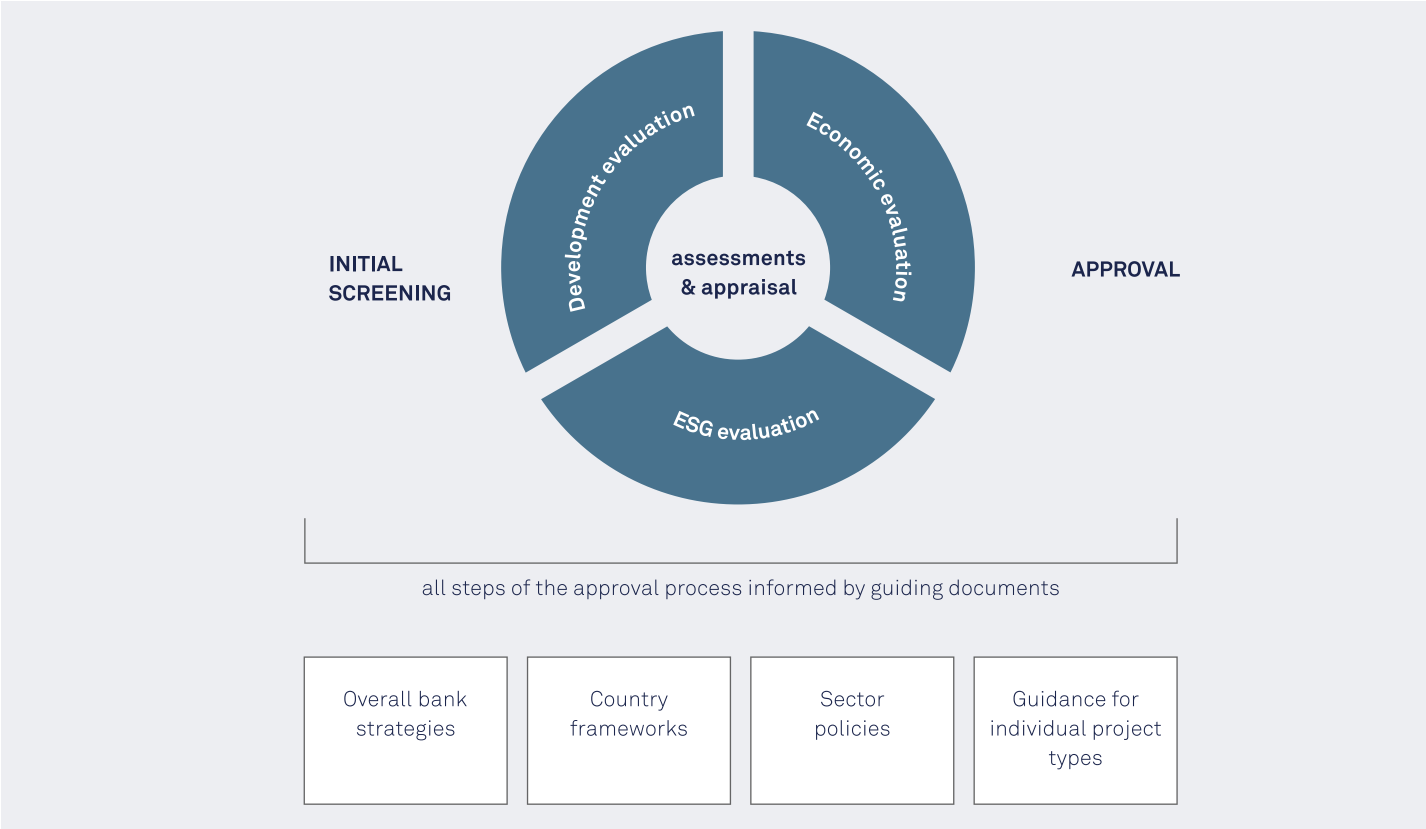


Figure 4: Schematic representation of development banks' approval process

- **Country frameworks.** The engagement with a given country is usually defined in a national framework document that is developed together with the government every few (3 – 5) years. These frameworks don't prejudge individual investment decisions, but they inform them and set priorities. Ensuring that the vision formulated in national frameworks is compatible with the 2°C limit will make it much easier to develop and approve 2°C-compatible investment projects in the following years.

- **Sector policies.** Most development banks have guiding documents for their engagement in individual sectors, e.g. an energy sector policy. Such policies can set investment targets for certain technologies and they can include sector-specific positive and negative lists as well as qualitative and quantitative benchmarks.

- **Guidance for individual project types.** For some of the more complex project types, where qualitative and quantitative criteria play a larger role, detailed guidance notes will be necessary. Many banks already have such rules around coal projects, for example. Similar guidance could be developed for, say, gas-fired power plants.

These documents will inform the project appraisal and approval process. These processes are structured in different ways in different institutions,[7] but always include a consideration of the following four aspects (see Figure 4):

- **Initial screening.** Before the beginning of a more detailed appraisal, project proposals are screened against the basic safeguards and exclusion lists. 2°C positive

7 See Cochran, I. Eschalier C. and Deheza M. (2015) for an overview of how development finance institutions are integrating climate criteria into decision making. In that paper, the criteria are grouped somewhat differently into "upstream" and "downstream" phases. Cochran, I., Eschalier C., Deheza M. (2015) Lessons from the use of climate-related decision-making standards and tools by DFIs to facilitate the transition to a low-carbon, climate-resilient future, Institute for Climate Economics (I4CE) Paris. http://www.I4CE.org

STEP IN THE APPROVAL PROCESS	QUESTIONS ALREADY ASSESSED BY DEVELOPMENT BANKS	ADDITIONAL QUESTIONS WHEN APPLYING 2°C CRITERIA
Initial Screening	• Project type not on bank's exclusion list? • Safeguards likely to be impacted? • Does project fall in certain risk categories? • Project within bank's priority sectors? • etc.	• Project type not on 2°C negative list? • Project type on 2°C positive list? • Project type that triggers need to apply certain conditions?
Economic Evaluation	• Project financially viable? • Project with positive cost-benefit ratio? • Project not crowding out private finance? • etc.	• Project viable with shadow carbon price?
Development Evaluation	• Development benefits? • Aligned with bank's mandate and strategy? • Aligned with country's strategies and priorities? • etc.	• Consistent with country's climate strategy (INDC or other)?
ESG Evaluation	• Environmental and social impacts? • Respect for environmental, social and governance safeguards? • etc.	• Project meeting qualitative or quantitative conditions for 2°C?

Table 11: Integrating 2°C criteria in development banks' project approval processes

and negative lists would be applied here. We suggest that all projects that are on the negative list are excluded at this step. For dedicated climate funds, we would suggest that projects on the positive list would benefit from expedited approval, while others would first have to show their 2°C-compatibility.

- **Economic evaluation.** All banks evaluate a project based on its economic merits. This includes a financial evaluation where the viability of the investment for the bank is evaluated in a strict financial sense. It also includes a broader economic evaluation where the economic costs and benefits of an investment are considered. At this step, a shadow carbon price could be included to assess the 2°C-compatibility of the project.

- **Development evaluation.** A project is also evaluated against its development benefits. This is linked to the economic cost/benefit analysis, but will also consider whether a project is aligned with country priorities and assess other development impacts. A growing number of countries have national climate or low-carbon development strategies and almost all of them have developed official plans as a contribution to the Paris climate change agreement, to be concluded in December 2015 (so-called "intended nationally determined contributions" or INDCs). Investments should be required to be consistent with such plans. While this, in itself, will not guarantee a project is compatible with 2°C (unless a country's climate strategy is explicitly designed to be 2°C-compatible), it will help to ensure that investments are aligned with country priorities.

- **ESG evaluation.** At several points throughout the project appraisal process, a project's social, environmental and governance risks and impacts will be assessed. Most of the qualitative and quantitative conditions on 2°C compatibility discussed in this report can be integrated in this evaluation.

It is important that 2°C considerations do not only come at the very end of project appraisal, where the commitment to a project is already high and the likelihood of significant changes or cancellation is low. The earlier in the process the criteria can be integrated, the more they will have an effect. In order to increase the likelihood of 2°C-compatible investments, overall bank strategies and national frameworks play an important role, as they indicate which kinds of investments the institution will actively seek.

A clear commitment to ensure the overall portfolio of projects is 2°C-compatible, along with related indicative percentage targets for certain kinds of investments (e.g. in renewable energy or in energy efficiency above a certain level), can also provide additional orientation when decisions need to be made on investments in the "conditional" category. It can, for instance, be argued that a limited number of investments in fossil fuels or installations that do not use the most efficient technologies available, for example in a least-developed country context, would be acceptable, as long as the overall portfolio of the bank is predominantly invested in unambiguously 2°C-compatible projects to such an extent that the overall project portfolio is 2°C-compatible.

5.2 KEY CHALLENGES FOR THE APPLICATION OF CRITERIA

Consultations with a variety of development banks and other stakeholders on the application of 2°C investment criteria have produced a variety of key challenges, which are discussed in this section.

Climate-criteria involve a trade-off between complexity and practicability.

The challenge here is to balance the need for sufficiently robust and detailed guidance and criteria, which take account of the variety of investment contexts and, at the same time, produce guidance which can be feasibly implemented by financial institutions. Having a single appraisal process in place, and setting out criteria that are easy to apply to all projects, reduces complexity and makes it easier for financial institutions to incorporate these into their lending practices. Also, the scope of political influence on the overall project may be significantly reduced when binding and strict criteria apply. At the same time, universally applicable and strict criteria may not sufficiently take account of specific circumstances or potentially competing investment priorities and objectives.

For instance, defining climate criteria for the building sector may not only require outlining indicators regarding the type and age of any given building but also taking account of factors such as climate zones, urban environments, local regulations and even entire individual renovation plans. Rebound effects resulting from certain investments may also need to be considered in the analysis.

Some situations may require informed judgements together with 2° investing criteria.

Criteria may vary according to the circumstances, but also for different financial institutions, given how strongly they interpret their climate mandate.

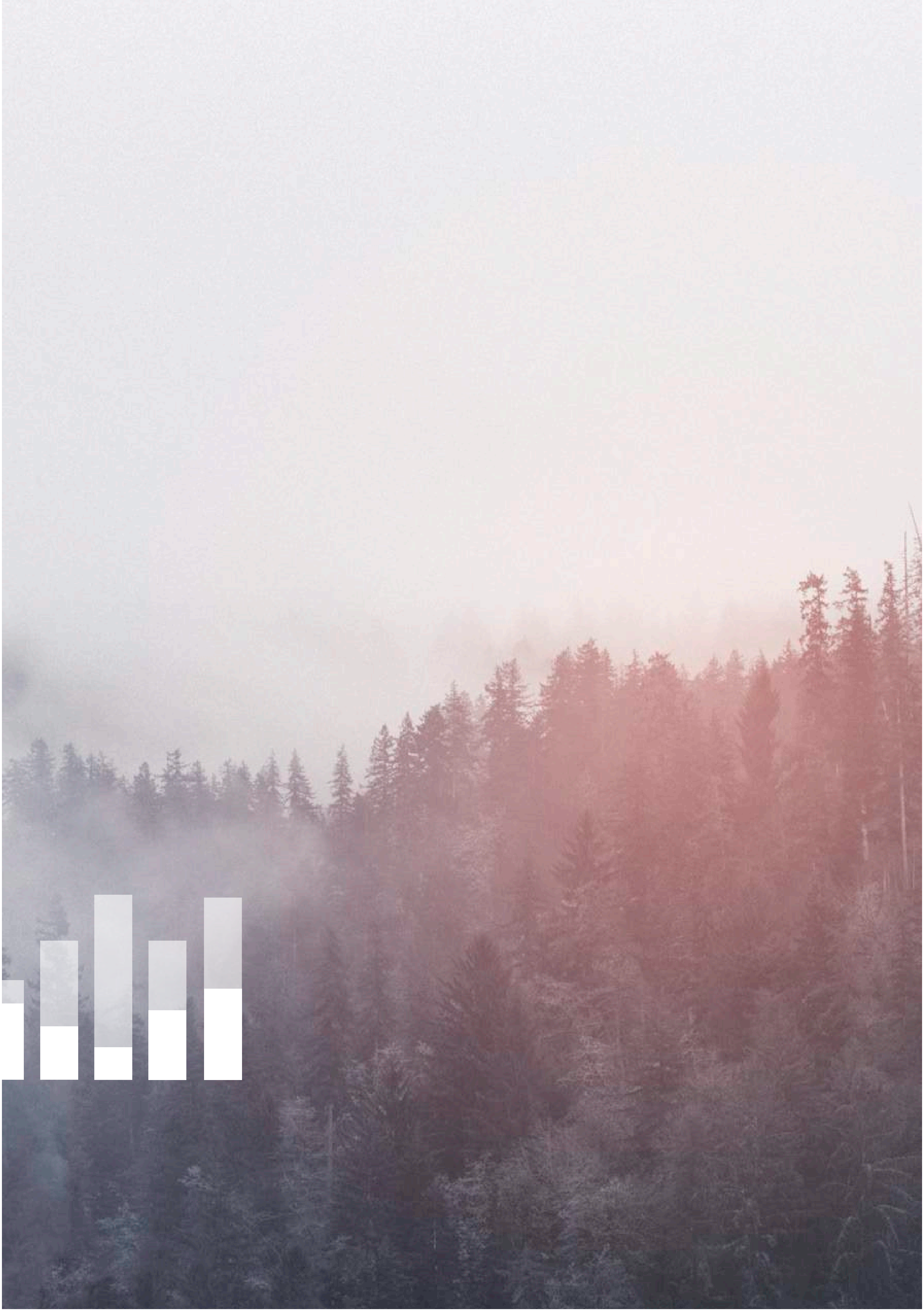
However, the largest share of investments will be located between the two extremes of "no regret" (" 2°C-compatible) and "exclusion" ("misaligned") and require informed judgements at which level they are 2°C-compatible. The further up the scale, the stronger the need for arguments as to why this investment is 2°C-compatible. Investors may need to make well-informed and reasoned judgments for themselves on:

- **Trade-offs of reductions between sectors:** an investor that chooses to rely on less mitigation actions in the buildings sector might simultaneously invest in other options such as bio energy carbon capture and storage (BECCS) to ensure that the overall portfolio is 2°C-compatible and consistent with the vision of a 2°C-compatible world. However, caution must be applied, as this "pick and choose" approach could lead to inconsistent strategies.

- **Regional differences:** due to their status of development, some regions may require more support and different investments with economic and social benefits.. If such exceptions are made, they need to be compensated for in another region; for certain regions particular circumstances may apply, responding to specific development priorities.

- **Climate mandate:** an investor with a strong climate mandate may choose to be more on the "safe side" of the scale, while an investor with multiple objectives may choose to be further on the side of uncertainty. Overall, it would be sensible for publicly owned institutions to err on the side of caution, i.e. to apply criteria strictly, to make up for – and set a precedent for – other investors who do not take 2°C-compatibility into account at all. This would be in line with the climate objective their owners – governments – have agreed to at the international level. To what extent this is applied needs to be weighed against other policy priorities and decided by governments in the mandate and guidance they give to their institutions.

The effectiveness of 2°C investment criteria also depends on the existence of a pipeline of projects. Whether the objective of staying below 2°C limit can be reached depends to a large extent on policy choices and national climate strategies. Such strategies, for example in the form of INDCs, set a framework and send signals to investors. Currently, most national strategies are not yet compatible with the 2°C limit. Alignment with the national climate strategy would therefore be a necessary, but not a sufficient, condition for 2°C investment. Development banks should provide support to further strengthen policy frameworks and increase the ambition of national strategies, as that would also increase the likelihood of there being a sufficient number of 2°C-compatible investment opportunities. In addition to this policy support, dedicated capacity building and project formulation support should be provided, so that governments and private sector actors are enabled to develop 2°C investment proposals.



6. SECTOR SPECIFIC APPROACHES

This section describes sector-specific approaches for 2°C investing criteria for three priority sectors identified in this research, power supply, buildings and transport infrastructure. For each sector, a general introduction is given on 2°C relevance and mitigation options, followed by a summary of sector specific approaches used by IFIs as well as an overview of the main sector specific considerations for developing 2°C investing criteria. Each section closes with a discussion and recommendation on proposed sector specific 2°C investing criteria along the process and investment steps outlined in section 5 of this report.

6.1 POWER

KEY CONCLUSIONS

Positive and negative lists work well with those energy sources that can be clearly classified as compatible or misaligned with the 2°C limit, including wind and PV or new coal-fired power plants with unabated emissions over their lifetime.

For other fuels, in particular natural gas, more sophisticated approaches are necessary:

- Efficiency-floor values and carbon-ceiling values per technology can incentivise the use of BAT. However, these approaches are also not sufficient.
- Adopting a shadow economic price of carbon proves effective if the price is set at a high level that is compatible with 2°C scenarios.
- Simple approach: an additional criterion could be the provision of evidence that a project fits into a path towards zero gCO_2/kWh in 2050.
- Advanced approach: an advanced version of this additional criterion would be to perform country- and system-based assessments including lifetime, operation mode and capacity requirements compatible with a 2°C pathway, i.e. towards zero gCO_2/kWh by 2050.

2°C relevance, investment needs and options

2°C relevance and investment needs

Findings drawn from the review of various climate scenarios suggest that the power sector, as a whole, is a major domain for which 2°C-compatible investment criteria need to be developed. There is significant emission reduction potential across different technologies, and a number of them, such as renewables and energy transmission, will require substantial investments for decades to come.

The latest IPCC report confirms that there is no doubt regarding the role of the power sector in limiting global warming (IPCC AR5 WG3: 516). A number of technologies, including energy transmission infrastructure, and coal, carry a high asset lock-in risk, i.e. they are upfront capital-intensive and have a long project lifetime, and thus have substantial environmental implications – either positive or negative – over the project lifetime and beyond.

Mitigation options and challenges

There is widespread agreement that CO_2 emissions resulting from the production and use of coal must peak soon and eventually reduce to zero, given that burning coal is the world's single-biggest source of CO_2-emissions, accounting for roughly a third of global emissions. However, there is no such agreement on the exploitation and use of non-coal fossil fuels, such as gas. Efficient, gas-fired power plants emit, on average, half gCO_2 per kWh than coal-fired power plants, 350 and 750 respectively.

Natural gas is therefore often considered a "low-carbon energy alternative" (MSCI 2013) and "superior to other fossil-fuel technologies in terms of investment costs, fuel efficiency, operating flexibility, rapid deployment and environmental benefits" (CTF 2009: 11). The Clean Technology Fund projects that fuel switching from high carbon technologies to "highly efficient gas" will result in significant GHG reductions – in the magnitude of between 3.95 and 7.22 GtCO_2-eq by 2030 according to the IPCC (ibid: 12). In fact, this perception of gas being a "transformational investment" (ibid: 3 – 4) among others has led banks, such as the WBG, to "scale up [their] engagement in natural gas" (WBG 2013: 23). However, IPCC scenarios suggest that, if a concentration level of 430 – 530 ppm is to be reached, the entire power sector has to be fully decarbonised by 2050. This means that, in 2050, the specific emissions will have to be reduced to approx. zero gCO_2/kWh (Bruckner et al. 2014). Given the long technical lifetime of new power plants (approx. 40 years for coal and 35 years for gas) and the limited time frame until 2050 (35 years from 2015), any new investments in these technologies – including gas – will have to be very critically reviewed.

Existing investment criteria

Most financial institutions "while being more selective on the type of technology ... and more stringent on their emissions performance" (IDB 2009: 2) are still financing fossil fuels, including coal plants. Some have restricted financing operations in the coal sector; others have introduced screening and eligibility criteria for the fossil sector as a whole. However, none of the financial institutions considered have ruled out financing for the sector or single technologies as a matter of principle.

Rather than excluding technologies from financing, IFIs have set out conditions under which funding can be granted. These conditions can broadly be categorised along four groups: ***efficiency***, ***emission intensity, carbon cost,*** and ***best available technology (BAT)*** or into quantitative and qualitative criteria. These criteria, however, are insufficient for IFIs to align their financing decisions with the 2°C limit.

Efficiency

By limiting funding for operations with a set of **efficiency-floor values,** financial institutions aim to incentivise the use of cleaner technologies, while not excluding fossil fuels from financing. Projects that do not meet respective efficiency requirements are not eligible for financing. The set value differs according to technology – coal or gas – and across banks.

It is argued that by deploying better technology, emissions will go down subsequently. For example, the IDB states "increasing thermal efficiency by 1% point decreases CO_2 emissions by about 2.5% to 3.0% (for the same power generated)" (IDB 2009: 4). However, given that the power sector would need to be decarbonised by 2050 to be in line with the 2°C limit, merely increasing the operational efficiency of new coal-fired power plants will not make these plants compatible with that goal.

Emissions intensity

A number of financial institutions have chosen to introduce **carbon-ceiling values** so as to limit financing for carbon-intensive coal plants. Carbon caps are usually designed as a "technology neutral" screening tool (see EIB 2013: v), which forms part of the environmental due diligence process or cost-benefit analysis of projects. Depending on the given value, it is likely that such an approach will incentivise the use of BAT technology, though it will not necessarily influence technology choice.

Often, standards and guidelines are consulted which, rather than specifying the level of maximum emissions or emissions intensity, remain too vague, and address environmental concerns only on a general level..

A similar, yet different, approach is adopted by private institutions, such as MSCI which, in its low-carbon indices, excludes companies based on emissions-intensity and reserves relative to market capitalisation or industry average (see Global Low Carbon Leaders Indexes).

While, in principle, an emissions-intensity standard seems well suited to ensure that financing decisions are compatible with a decarbonisation pathway, such an approach will result in only a few individual technologies being excluded from financing, given that the variation per technology is relatively low. Thus, adopting carbon-ceiling values might not incentivise a transformational change of the power sector in a way that is required to meet the 2°C limit. If, for example, a benchmark was set that would effectively exclude gas fired power plants from financing, this would neglect the fact that these plants may still have a future in a power sector with a high share of RES energy and high fluctuation. In that case, gas-fired power plants, despite potentially high emissions in gCO_2 per kWh, will be a precondition for a 2°C-compatible electricity system – if these plants run flexibly and only for a limited period of time.

Carbon costs

Banks such as the EIB have introduced a **shadow economic price of carbon**, which is taken into account during the process of economic evaluation. As touched upon earlier, however, there are a number of shortcomings attached to carbon prices, which is why some stakeholders have expressed concerns regarding the introduction of a fixed quantitative carbon price (see section 3 for discussion).

BAT

A common practice to limit fossil fuel financing is to incentivise or require loan applicants to deploy **Best Available Technology (BAT)** – similar to the best-in-class approaches – when building a new plant or retrofitting an existing plant. Often, the technical requirements are set out in national or international legislation, standards and guidelines or other common agreements. For example, best available technology may include cogeneration capacity, best-in-class technology and CCS readiness. Similarly to the approaches discussed above, BAT-based investing criteria alone are insufficient to be considered 2°C-compatible.

Other

In addition, the criteria used for financing operations in the fossil fuel sector vary depending on ***where*** the project is to be realised (e.g. low, middle or high-income countries), whether the project is a **new** or **existing** plant, on **size** and **power-output**, and often on the **technology** deployed.

Sector and context-specific considerations

Taken the power sector as a whole, sector and context-specific considerations determine the very nature of prospective 2°C investment, which is discussed below.

Development and other priorities

As touched upon earlier, a number of IFIs already put development and other objectives on equal footing, and consequently consider development issues during project appraisal. Development concerns include household electricity access, energy supply costs, security of supply and energy system reliability (or avoided interruption), as well as other 'social gains.' Most IFIs assess social impacts, among others, as part of their environmental and social risk assessments performed by either the financing institution itself, or the project client – or both.

Capacity and market maturity

A second issue is the availability, marketability and applicability of technologies, which co-determine financing decisions. While some technologies build upon well-functioning global supply markets (e.g. wind and PV), others are immature in nature and need to grow further (e.g. tidal energy). Even for those technologies that have reached maturity at the global level, they often lack local markets and capacities. To cite a case in point, a PV solar plant developed under northern European conditions (e.g. snow), cannot equally operate in the Atacama

Desert. Arguably, costs and availability of globally mature technologies therefore vary according to national contexts.

This is also illustrated by the example of natural gas which, in terms of CO_2 emissions, has a better climate performance than coal but which is not readily deployable in all countries.. While a number of IFIs state that additional gas investments will incentivise and further strengthen fuel-switching from coal to gas power, this seems limited to countries with indigenous gas reserves.

Socio-technical system nature

Numerous studies have highlighted the tremendous socio-technical and systemic barriers that exist for transforming the power sector (see for instance Negro et al. (2014) for an overview of systemic barriers for RE). The transition from an existing energy system towards a future energy system that relies heavily on renewable energy requires not only a technical transformation, but also a transformation of the actors and institutions involved. The German experience serves as a textbook case of how power struggles and institutional changes can affect such a process of system transformation (Jacobsen, Lauber 2006). In the context of developing countries, scholars have repeatedly argued that the transfer of the technological artefact from the north to the south alone (as facilitated by FDI) is insufficient. This is why some suggest that developing countries require a socio-technical transformation above all (Byrne et al 2011).

Therefore, developing 2°C investing criteria is an exercise best done in a broader political context. Particularly in the power sector it is very important that support is also provided to political institutions to build capacity and solid understanding of these new technologies. To effectively help develop a conducive socio-technical environment, support should also be provided to promote advocacy work. Investing criteria can only be effective within such (a receptive?) environment – experience with the power sector has shown this repeatedly.

Vested interests and structures are likely to prevent immediate system change in some countries. This is particularly true in the case where promoting renewable energy requires transforming the energy system from a centralised to a decentralised system which, however, may not only have environmental, but development co-benefits. One telling example is grid connectivity. Often, household electricity access rate does not increase significantly, despite new fossil fuel power plants being built. In fact, home solar systems may prove better compared to centralised energy supply in countries where infrastructure needs are high. This suggests that even though building a new fossil fuel plant may fit well with established systems, they often lack environmental and development co-benefits.

The technical system characteristics

Power plants or other energy technologies should not be assessed in isolation from each other, but should be screened as individual parts of the energy sector as a whole. The power sector, that is, electricity supply, in particular requires a system-integrated solution that balances supply and demand at all times, given the very nature of this sector (highly complex, interdependent and interconnected). Again, the German example provides insightful experience (Agora Energiewende 2013). A system designed to accommodate baseload power plants will need to be replaced with a flexible system where conventional power plants are required to start operating "part-time." This requires technical adjustments, as well as changes in the market, and has important implications for the economic feasibility of such power plants. This example highlights the need for a sector-wide rather than a technology-specific 2°C strategy.

2°C investment guidance

Building on the previous discussion, we suggest placing emphasis on developing 2°C investment guidance for energy systems rather than individual energy sources. To ensure that the proposed criteria can be readily applied within existing processes with no – or no significant – transaction costs attached, we categorise the criteria along three groups (see section 5 for discussion). It is noteworthy that all of the subsequent screening stages are interlinked and should not be regarded in isolation from each other.

Initial screening

In terms of GHG emissions, renewable energy – in particular wind and PV – can be well classified as 2°C-compatible, earning these technologies positive list status. This group of technologies would also include small-scale hydropower projects. Projects that do not (unconditionally) fall within this category include large-scale hydropower, geothermal and biomass projects. Coal-fired power plants with unabated emissions over their lifetime receive "negative list" status and are therefore not eligible for financing if the project is meant to be 2°C-compatible. While gas may be classified as sensitive technology, it does not, however, fall within the negative list category.

Economic evaluation

One tool that can be included in the economic evaluation of a project is a shadow economic price of carbon (on the installation and operation of fuels), which is likely to influence financing decisions and incentivise fuel switching, depending on the price assumptions made. Such a tool has advantages over emission thresholds. A carbon price could, for example, ensure gas-fired power plants are built in situations where they are needed, to provide support to fluctuating renewables, if electricity prices are high enough.

It is noteworthy, however, that a shadow economic price of carbon, unlike a 'real' carbon price (e.g. ETS schemes), will affect financing decisions regarding a power plant, rather than its actual operation. Similarly, a shadow economic price of carbon will not, in itself, incentivise fuel-switching. One effect such price would have would be to include considerations about a potential future carbon pricing scheme implemented in the region or country in question, for example at the project development stage.

While it is widely recognised that a shadow economic price of carbon is likely to have an effect on the energy sector as a whole, as well as on individual energy sources, the magnitude of this effect remains contested, and depends on individual circumstances. For example, the IEA found that if in China a carbon price of $30 were to be introduced, solar "would be about the same cost or cheaper than coal (...) by 2020." They conclude that "tripling the carbon price [would result] in an approximately 53% increase in the levelised costs of electricity (LCOE) for coal, with the implication that Chinese coal power costs would be $51/MWh at a $10 carbon price" (IEA 2015). Carbon prices aligned with the 2°C limit would be significantly higher and they would have a significant effect on financing decisions.

ESG evaluation

All of the above suggests that, in principle, energy projects are best aligned with the 2°C limit when they form part of a sector planning strategy that aims to decarbonise the energy system by 2050, and when this strategy is drafted by national regulators, and developed

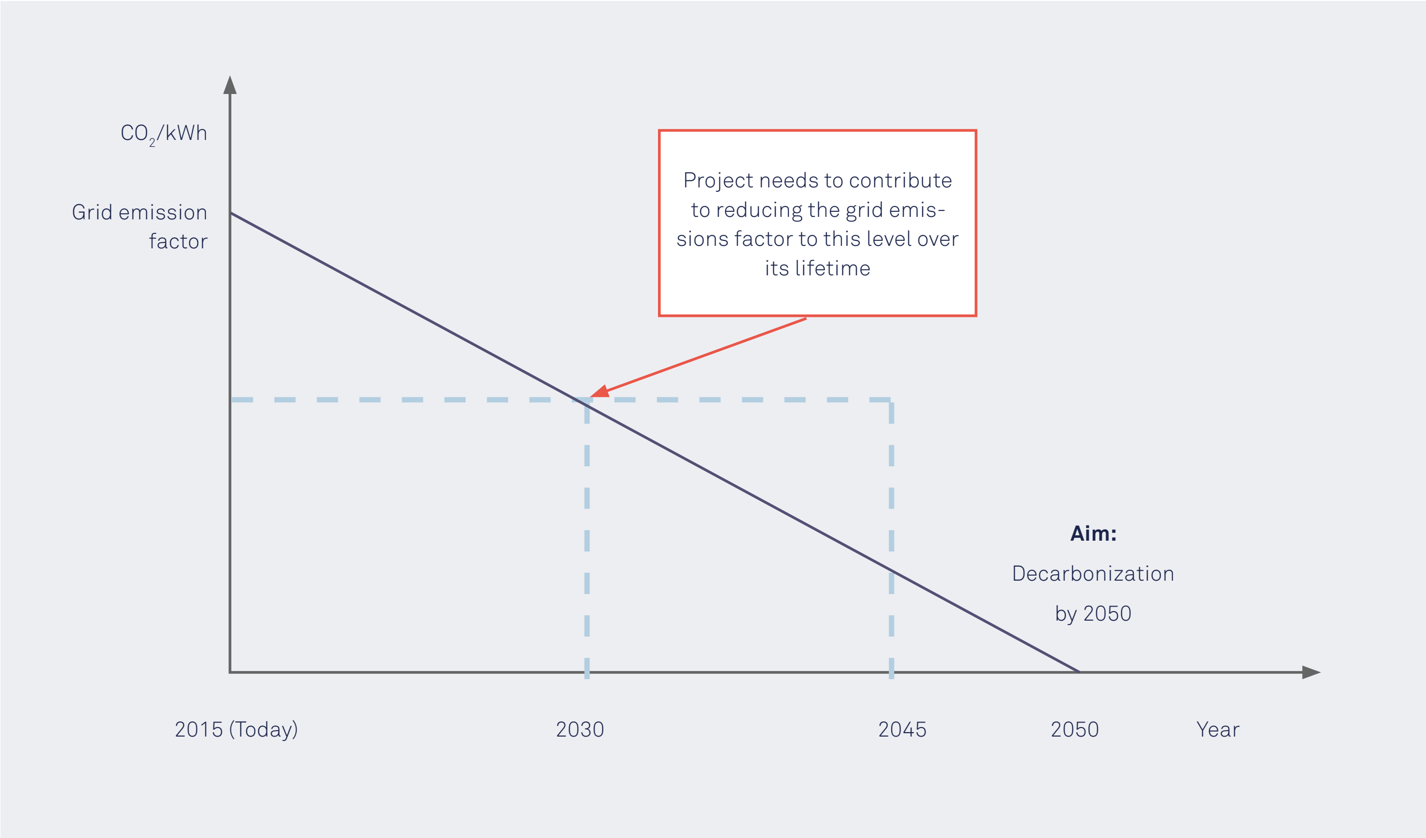


Figure 5: Lifetime considerations of a project that would comply with a decarbonisation approach

with the assistance of lending institutions. However, where this is not feasible, **the simple approach would be to set general criteria at the project level. The project developer would have to prove that project fits into a path towards 0 gCO_2/kWh in 2050 (Figure 5).**

An advanced national sector-based approach starts from the premise that the sector needs to be decarbonised by the middle of the century implying zero emissions per kWh. As outlined above, this is not only consensus among modelling practitioners, but has also been included in recent political debates, such as the G7.

Figure 6 illustrates the idea that a 2°C assessment is best done at the sectoral, not at the individual, project level, with an exemplary comparison of a coal dominated country (left) and a hydro dominated country (right). While the two countries utilise different sources of energy, they both manage to decarbonise their energy system until 2050 by adjusting their respective energy mix.

The second row in Figure 6 shows what this means in terms of greenhouse gas emissions. Some countries (especially developing countries) are likely to increase their energy use. Even if the intensity (emissions per kWh) declines (top panel), the absolute emissions may grow temporarily. In essence, existing plants will slowly be shut down and can be replaced by new plants. If new coal-fired plants are built, they have to use abatement (CCS) during their lifetime, so that the system stays within the limits. The rest could be filled by gas-fired power plants, which would eventually run very little in 2050. New fossil fuel power plants have to comply with other restrictions if a true transformation is to be achieved. These are mainly imposed by the growing share of fluctuating renewable energy sources, such as wind or solar energy.

The 3rd and 4th row of panes in Figure 6 show the electricity produced from all sources. Renewable energy power plants are slowly phased in over time. Existing plants could keep running until the end of their lifetime.

If lending institutions were to assess the compliance of an individual project application, e.g. a gas-fired power plant, with the sectoral decarbonisation target, they would have to consider the following points:

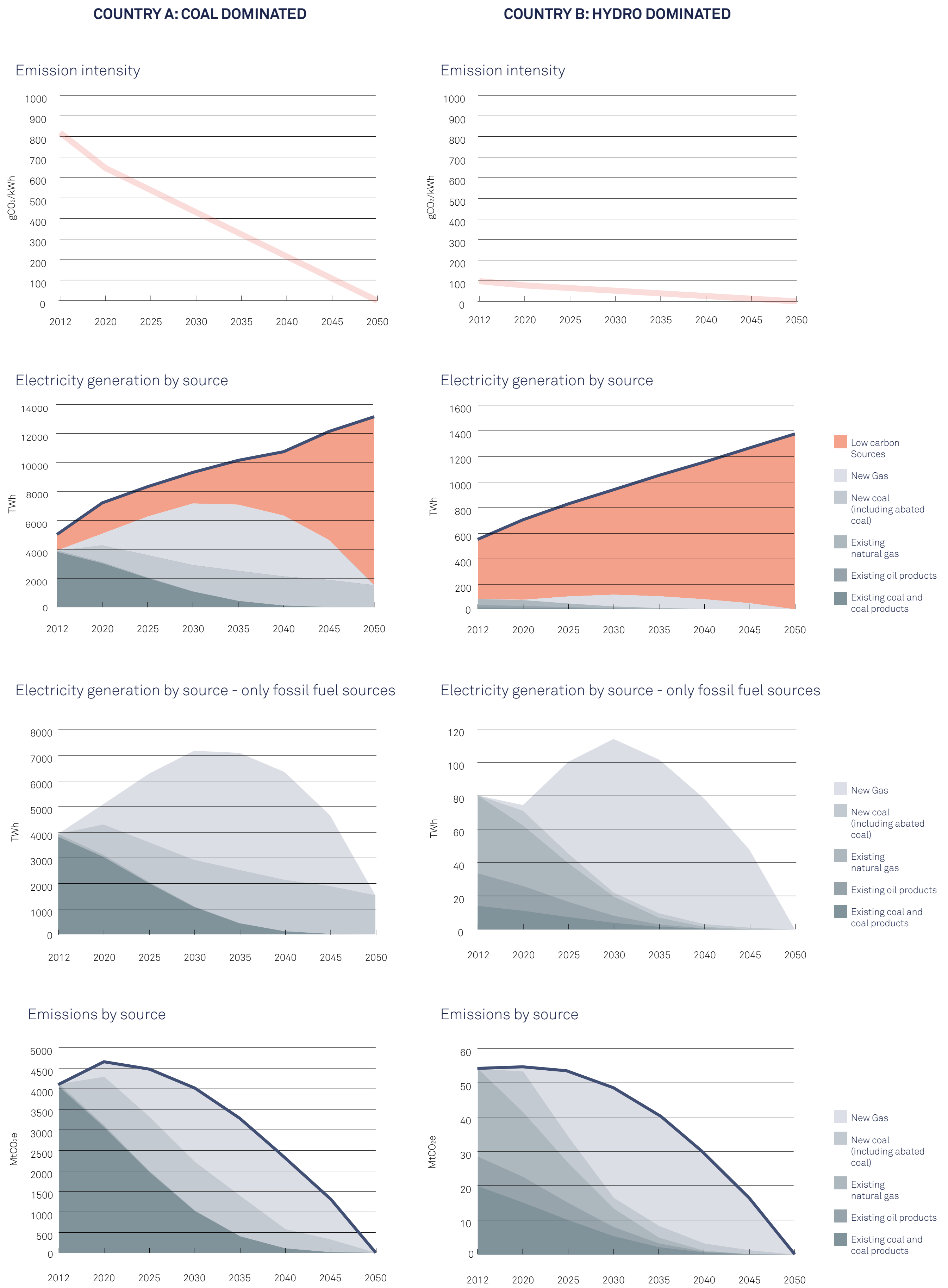


Figure 6: Illustrative decarbonisation approach in the power sector for a coal-dominated country and a hydro dominated country. From top to bottom, the graph exemplifies the logic of a decarbonisation target and how this target plays out in terms of emissions and energy use

2°C-COMPATIBLE POSITIVE LIST	CONDITIONAL QUANTITATIVE / QUALITATIVE CONDITIONS		MISALIGNED NEGATIVE LIST
Energy source: Wind PV Small hydro	Energy source: e.g. natural gas Criteria: Shadow economic price of carbon	Energy source: e.g. natural gas Decarbonisation based approach. Simple: Prove that project fits into a path towards 0 gCO_2/kWh in 2050 Advanced: Prove that the project fits into a national sector-based decarbonisation strategy including lifetime, operation mode and capacity requirements	Energy source: New coal fired power plants with unabated emissions (no CCS) over their lifetime

Table 12: Overview of indicative criteria for the energy sector

- One is the **expected lifetime** of the power plant (see Figure 5). Given that a newly-built plant will be under operation for years and decades to come, illustrated by the linear curve, this plant will have to comply with emission benchmarks all through the target year. To this end, IFIs would be well-advised to set intermediate targets, so that project developers can include these in their economic and financial planning.

- Another issue is the **operation mode** of the power plant in question. One way to ensure that a newly-built plant can still operate under future and more stringent system emission requirements is to technically equip the plant in a way that allows it to run flexibly in future years. This way the plant would emit less over time (as share of grid emission) and it would likely comply with future market conditions (see 6.1.3.).

- The third issue is the **capacity requirements** of the electricity system, which are due to the fluctuating nature of RES. In such a system, the peak capacity needed is well above average capacity, which could mean that some power plants would need to stand idle at times. However, there are arguments against expanding backup capacity. First, much of this capacity could be provided by existing power plants. Second, the needed backup capacity is less pressing in an electricity system, which becomes increasingly interconnected. Third, demand-side innovation can arguably provide similar system flexibility. Put simply, the core question is whether additional 'peak' capacity is really needed.

In short, there a number of factors worth considering during the 2°C assessment of energy projects:

- What is the decarbonisation pathway defined for the country or sector in question, and what are the key energy system characteristics (power plant stock, type of energy market, etc.)?

- Drawn from the decarbonisation pathway, what is the carbon budget for the country or sector in question, and how does this budget fit with projected emission performance of the project?

- Is the proposed project likely to comply with current and future technical and market requirements (flexibility, power quality, etc.)?

- How do these considerations affect economic and financial planning (additional risk premiums due to market uncertainty, future demand, etc.)?

To this end, it is recommended to have in place a national climate policy and / or energy sector strategy and/or INDC, which is compatible with an internationally or nationally-agreed 2°C pathway (e.g. 450 Scenario resembling the highest limit of global climate efforts). Arguably, though, such policy will be the exception rather than the rule.

In short, all of the above is an outline of a 2°C guidance note, which can be readily included in the existing screening processes, in particular in the ESG evaluation most of the IFIs considered in this study undertake.

6.2 BUILDINGS

KEY CONCLUSIONS

In the building sector, positive lists are the only way to ensure 100% 2°C-compatibility at the project level. These include near zero-energy houses, a concept that has been proven globally, but which might be difficult to implement on a large scale in many national contexts.

Shadow carbon prices will likely only provide a limited incentive in the building sector as other barriers prevail and low energy buildings are often already feasible from an economic perspective today.

The benchmark indicators kWh/m² and gCO2/m² are a useful tool for the building sector as they are broadly-accepted indicators, and can be implemented relatively easily.

While the former is closer to the thinking of practitioners in the sector, the latter better reflects decarbonisation considerations.

Simple approach: at the individual building level, a benchmark range between 10 kWh/m² and 150 kWh/m² can be used to determine the relative 2°C-compatibility of individual investments. The project-based benchmark approach could be combined with an approach to allow for gradual tightening of the benchmark based on existing BAT in the specific national context to reflect the country's market maturity and development status.

Advanced approach: apply a national decarbonisation pathway for the building sector that provides greater certainty of 2°C-compatibility. This can be used to benchmark individual buildings against the national decarbonisation requirement, where buildings with their lifetime emissions have to fit into the decarbonisation pathway.

A simple tool could be developed that allows to set country specific benchmarks (pathways) for the sector. Alternatively, standards could be developed that allow for a flexible, country-specific approach towards decarbonisation.

Emissions from the building sector made up approximately 18% of global greenhouse gas emissions in 2010 (IPCC 2014). A large share of the emissions (12%) stem from the use of electricity and heat in buildings. The sources of emissions can be split into heating or cooling demand, cooking demand, hot water demand, and appliances. Measures to reduce heating and cooling demand can be applied to either new buildings or the renovation of existing buildings. This section focuses on the reduction of heating and cooling demand, especially in new buildings, as these are likely to constitute a large share of investments in buildings.

2°C relevance, investment needs and options

2°C relevance and investment needs

The contribution of the building sector towards achieving 2°C-compatible pathways varies significantly among 2°C scenarios. While a number of integrated assessment models suggest that the contribution is relatively small (as low as 6% reduction below reference scenarios in 2050), a number of sectoral models suggest that there is a large potential in reducing final energy demand in buildings – as high as a 46% reduction below reference (Lucon et al., 2014, p. 712). According to the sectoral models, especially the heating, cooling and hot water demand, can be reduced by between 66% and 75% below the reference scenario in 2050. Investment lock-in is high, with the lifetime of buildings between 25 years and more than 100 years.

Investment needs are very high in the sector, especially for new buildings in developing countries and renovation of existing buildings in developed countries. The IEA WEIO indicates that 14% of the cumulative, energy-related investments needed between 2015 and 2035 under a 450 ppm scenario, or 30% of the investment in energy efficiency, will need to take place in the building sector (IEA, 2014).

Mitigation options and challenges

Energy efficiency measures to reduce heating and cooling demand in buildings can be either taken in an integrated manner, comprising the entire **building envelope**, or on **individual measures/appliance** level such as energy efficiency heating, ventilating, and air conditioning devices (HVACs). The building envelope plays an especially important role, as there is a high interdependence among measures. For instance, increasing the insulation will reduce the demand for energy and hence the size of the heating system. At the same time, individual energy efficiency measures also need to be taken into consideration, as, in many cases, investments may only focus on parts of the envelope. These could include retrofitting of buildings with new HVAC systems. Furthermore, energy use patterns differ between commercial buildings and residential buildings.

Energy efficient ***new*** buildings are likely to play a major role in developing countries, whereas industrialised countries have a substantial existing building stock that requires upgrading and renovation to improve energy performance:

- Near zero energy buildings can be considered a proven and mature technology option that, in many cases, is cost-effective to implement (Lucon et al., 2014). However, they face many other barriers, including the use of complex technologies or split incentives between landlords and tenants. The concept has mainly been proven in industrialised countries, and investors are rarely familiar with these types of buildings in developing countries.

- Renovation of existing buildings faces a set of other, additional challenges, including slow renovation rates and the fact that renovations are often undertaken stepwise, and require renovation roadmaps to ensure the individual steps are 2°C-compatible .

A building's use and location affects its energy use. Generally, one distinguishes between residential buildings, that mainly require heating in the evening and morning hours, and commercial buildings, for which heating is required during the day. In addition, buildings in hotter climates mainly require cooling, while buildings in colder climate require heating. Even though the use differs, interestingly, the specific energy use of these types of buildings is very similar (Lucon et al., 2014). For this reason, it is possible to use one benchmark across all of these building types. There are near zero energy building designs for all of these types of buildings, as demonstrated by the passive house standard. The standard prescribes energy use of less than 15kWh/m² across all types of regions (Lucon et al., 2014).

Existing investment criteria

Existing investment criteria

To date, and according to this research, no institution has developed 2°C-compatible criteria specific to the building sector. Existing criteria often focus on generic requirements for energy efficiency, such as the requirement to use best available technologies, but do not provide any further, specific detail. An exception is the IFC EDGE standard ("EDGE Standard," n.d.), developed in 2012. Grown out of the realisation that existing certificate schemes are often too complex, IFC developed a simplified certificate for green buildings that achieves an at least 20% reduction in energy use (among other targets), and claims to reduce the cost of the building. However, like the other criteria, the standard does not make specific reference to 2°C, and is therefore unlikely to be sufficiently ambitious.

The Climate Bonds Initiative (CBI) developed a set of approaches to develop climate-compatible standards for the building sector, in particular for the residential and commercial sector, and the retrofitting of existing buildings. CBI research concluded that existing green building standards are not well suited as they a) have a broader focus than emissions and b) are difficult to implement and incur high additional costs. As a consequence, they have developed their own, flexible approach that depends on a city-level emission baseline being available for a particular region. While the approach focuses on assets, it is designed for climate bonds and therefore emphasises the performance of a building portfolio. As such, it is only of limited use to development banks. Similar to the EDGE standard, it is not clear how the approach relates to the 2°C limit.

Existing labels, standards and codes

There are a large number of other sources that could be used as a basis for the development of 2°C investing criteria. Firstly, many countries have implemented building codes, although most are not 2°C-compatible, as they do not include stringent energy efficiency stipulations. An exception is the target under the European Energy Performance of Buildings Directive (EPBD) which requires new buildings to use near zero energy from 2020 onwards (European Commission, 2010). Secondly, there is an even larger number of building labels and certificates that have been developed by a range of independent institutions. They are, however, very diverse in nature, and often only have a secondary focus on greenhouse gas emissions. Similar to the building codes, the large majority are not ambitious enough for 2°C-compatible development, with the exception of a few, such as the passive house standard.

It is the same case with heating and cooling appliances. There are national or regional-specific standards, as well as unified labelling systems that could be used to benchmark investments. However, they make no reference to 2°C-compatibility and are not likely to be ambitious enough. Similar to the building codes, existing standards provide a useful starting point for the development and integration of 2°C approaches in the sector.

Sector and context specific considerations

The building sector has a number of unique characteristics that are important to consider for the development of 2°C investment criteria:

Development and other priorities

Development priorities also play a major role in the building sector. In many countries there is a need to develop and install buildings in short time periods to reduce informal dwelling and provide shelter to growing urban populations. Energy efficient buildings may not be constructed fast enough, as they require additional work that will prolong the construction period.

In addition, increased energy efficiency typically means higher up-front investment costs. This leads to longer payback periods. For developing countries, this can be an important consideration, as capital that could be reinvested elsewhere is bound up for a longer period of time. However, from a mid to long-term macro-economic point of view, such short-term thinking is not necessarily beneficial, especially as energy efficient buildings reduce the need for fuel use, which is often imported and therefore saves money in the long run.

Capacity and market maturity

While on the global level zero energy buildings are a proven concept, this is rarely the case in developing countries. The building sector is typically very locally driven as 1) materials are often sourced locally 2) cultural preferences influence building designs and 3) building design responds to climatic conditions. This calls for local solution,s and points towards a more gradual phase-in of energy efficient buildings in national or regional markets.

Socio-technical system nature

The building sector's socio technical systems are likely to change very slowly, as incumbent actors (construction companies and building owners) are often powerful. Short-term profit considerations often override longer-term sustainability (both environmental and economic) considerations. Architects and building engineers need to be re-trained as they often have limited knowledge of energy systems, especially in developing countries. This requires larger capacity building efforts on a national scale.

The technical system characteristics

Buildings are only embedded in complex technical systems to a limited extent, i.e. a zero energy house can be built in isolation. Exceptions are district heating or cooling networks. However, these are more relevant in northern heating dominated regions and only appropriate for developing countries to a limited extent (Lucon et al., 2014). In addition, there is a likely trend to electrification of the sector; heat pumps and electric appliances will play an increasingly important role. Models show that electricity use in buildings will reach approximately 50% of final energy use in 2050 (Lucon et al., 2014). This will require growth in electricity production and an even stronger effort to increase low carbon fuels in the electricity sector.

Building energy performance is linked to urban planning: greater compactness leads to a reduction in floor space and will, in turn, result in a reduction in energy use per capita.

2°C investment guidance

Building on the previous discussion, we propose to emphasise the development of 2°C investment guidance and specific criteria for entire buildings rather than single technologies. The proposed approach includes the application of a positive list which provides full certainty on 2°C-compatibility. In addition, a quantitative benchmark based approach can be used to assess relative 2°C-compatibility of individual projects, combined with a gradual approach of achieving 2°C-compatibly over time, depending on the individual national context. In the most advance form and for greater 2°C compliance of individual projects within the wider sector, individual investments should be benchmarked against a national decarbonisation pathway for the building sector.

1. Initial Screening

Technologies on a 2°C positive list include zero or nearly zero energy buildings. These could be identified by using existing certification schemes or, alternatively, using an energy or emissions-intensity benchmark that is clearly in line with 2°C-compatible development. As outlined above, it is very important that these certification schemes have a clear focus on energy use and emissions. There are very few standards that have such a strong requirement (e.g. German passive house standard).

If a region/country has developed national legislation that only allows buildings that are (near) zero energy (as is the case for the EU after 2020), all buildings in the sector are likely to fall in this category. However this is not likely to be the case in many countries.

Simple, positive lists will not be able to support a gradual phase-in or gradual improvement of the standard of buildings to allow for capacity building etc. If investors only allowed investments in buildings on the positive list, the distribution of finance would be slanted towards more advanced countries that already have more experience with low carbon buildings..

2. Economic evaluation

The use of a shadow carbon price in the building sector is likely to only have a limited effect on investment decisions. The reason is the so-called landlord tenant dilemma: while owners bear the costs of the investment, they do not directly receive the benefits from a reduction in energy use: that is typically accrued by the tenant. The owner may partially pass the higher investment costs through to the tenant by increasing rents. However, this effect is only indirect and has proven to be small. Hence it is necessary to artificially include the shadow carbon price of the fuels used during operation in the feasibility calculation of the owner.

Marginal abatement cost curves (MACCs) suggest that zero energy buildings are, from the perspective of the social planner, already cheaper over the building's whole lifetime than in conventional buildings, i.e. abatement costs are lower than 0 USD/tCO_2.[8] Many mitigation options are already cost effective today without a carbon prices (Lucon et al., 2014). The low actual rate of implementation of energy efficient measures shows that there are many non-cost-related barriers that need to be addressed through policy interventions.

In summary, a shadow carbon price to shift investment is likely to be of very limited use in the building sector. The main challenges in the sector for financing zero energy buildings are not of a financial nature, but rather a problem of split incentives and inertia among actors who do not actively search for alternatives – or who have other priorities. Non-financial barriers prevail that are unlikely to be overcome by using pricing instruments.

3. ESG evaluation

Since neither positive lists nor carbon pricing are suitable to incentivise transformation, another approach based on energy-use benchmarks is proposed. Figure 7 shows an approach that applies the energy intensity indicator kWh/m² to define 2°C compatibility. Investments at the left end of the scale are unambiguously 2°C-compatible: these include near zero energy buildings that generally use 10 kWh/m² or less. Investments at the right end of the scale are misaligned with 2°C. The calculation based on 2°C-compatible IPCC scenarios for 2050 suggests that, in 2050, the average building stock should use between approx. 95 and 135 kWh/m².[9] In general, buildings that are above the upper end of this range in 2050 are therefore clearly misaligned, or need to be compensated for by emission reductions in more efficient buildings, or through other measures. Note that there might be exceptions for some buildings with special heating and cooling demands, such as data centres. For such buildings, exceptions might need to be applied.

The question is how to determine which projects within the conditional range of between 15 and 150 kWh/m² are 2°C-compatible . This will likely be influenced by the

8 While such calculations take a social planner perspective (i.e. very low interest rates are assumed) that does not reflect the investors perspective, it nevertheless shows that, compared to other sectors such as the electricity sector, mitigation options are much more feasible.

9 Own calculations based on IPCC scenario database (IIASA, 2015) and IPCC WG3 report (Lucon et al., 2014). The benchmark is measured in terms of energy use. It implicitly includes the varying carbon intensity of energy supply as covered in the scenarios.

Figure 7: Illustrative categorization of buildings energy efficiency for 2050[10 11]

circumstances in the country where the project is implemented.

Figure 8 illustrates this by relating the efficiency ranges in Figure 7 to the status of the building performance at the global and national level in a conceptual way.

Figure 8 shows that there are currently buildings that are fully 2°C-compatible (BAT globally). However, in many nations, particularly in developing countries, best in class buildings are likely to be less energy efficient, and may even increase their energy-intensity as the country continues to develop, and new appliances such as air conditioners (HVACs) become more widely applied. This indicates that, in many countries, the experience with low energy buildings will be limited, while technology is readily available in the global market.

The lack of experience, accompanied by an immature market environment and lack of capacity, leads to a regional mark-up on the price of low energy buildings and complicates project implementation. Instead, phasing in of low-energy buildings (as illustrated by the arrow in the figure) by starting from the current best available technologies in the country will minimise this effect. This could be done, for example, by requiring new buildings to be to a certain degree (x%) more efficient than the existing best available standard in the country. Nevertheless, even the best technologies may be beyond a country's current level of capacity and knowledge at a broader scale.

10 For the upper threshold: since the literature estimates presented are average figures across existing building stock as well as new buildings, it is difficult to estimate what this means for new buildings. Given the current lack of information, we have assumed 150 kWh/m² as an upper threshold, which represents a conservative estimate. The number was chosen to be clearly above the average building stock in 2050. Since existing buildings will likely use more energy than new buildings, 150 kWh/m² represents a safe threshold, above which buildings are clearly misaligned with 2 °C. Furthermore barely any typical buildings are already today above this threshold, with few reaching up to 200 kWh/m² (Lucon et al., 2014).

11 For the lower threshold: similar to the higher threshold, since the literature estimates present averages that cannot be used to derive threshold values, we have used a different approach. Instead of stating what has to be done to reach 2°C, the number states the current threshold levels of what is possible. The number is derived from the passive house standard which has been certifying buildings across a broad spectrum of uses and which has required all of these buildings to be lower than 15 kWh/m². (Lucon et al., 2014)

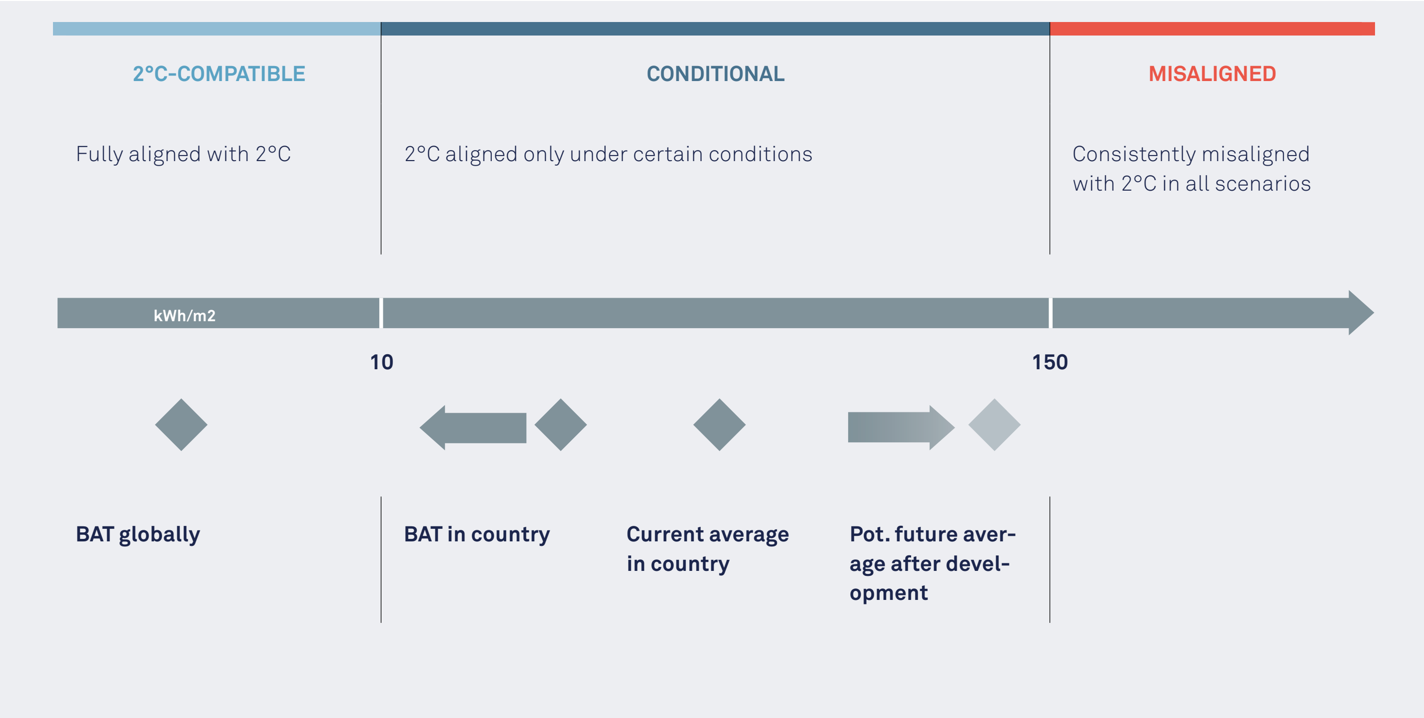


Figure 8: National and global building performance in the context of 2°C compatibility (illustrative example)

Decarbonisation based approach

A further aspect that is important when determining whether a project is 2°C-compatible is the point in time when the project is implement, as well as its lifetime. As time progresses, 2°C-compatibility requires a decrease in specific emission and energy levels towards full decarbonisation. According to modelling under the IPCC, the energy intensity of buildings will have to reduce to global average levels of between 95 – 135 kWh/m², assuming that house sizes in 2050 will be equal in both developed and developing countries at today's developed levels.

This will have to apply to existing buildings, as well as new buildings. The benchmark will therefore not only be influenced by the energy use of new buildings, but also by the development of the energy use of the existing stock. The development of the energy use in existing buildings, in turn, depends on two important factors: the renovation rate and the level of energy improvements applied during the renovation process. While setting criteria at a project level could influence the latter, only government interventions can influence the former, for example through incentives or other regulations.

When setting a 2°C-compatible level for energy use in new buildings in a particular country, it is therefore important to understand the existing building stock. For example, if a government has implemented a policy that aims to reduce the energy use from existing buildings AND includes incentives/regulations for increasing the renovation rate, then new buildings are likely have to reduce their emissions/energy to a lesser extent than countries where no such policy is in place. The implications of this future performance of existing stock on the level of energy use required from a new building is illustrated in Figure 9. The left side of the graph represents a situation with high renovation rates. In such cases, new buildings can start from a higher energy-intensity level today and slowly decrease it over time. The right side represents a situation where national renovation rates are low. In such a case, new buildings already have to comply with lower energy standards today.

Figure 9: Illustrative calculations of high renovation rates and an ambitious energy standard (left) vs low renovation rates and un-ambitious energy standard (right) on the possible energy level of new buildings to be 2°C-compatible .[12] Both graphs assume the whole building sector achieves 2°C-compatible benchmarks of 93 kwh/m² in 2050 and 145 kWh/m² in 2030.

Figure 10 illustrates how a country-specific national benchmark aiming for decarbonisation over time can be used to determine new building compliance. Here, the new building's lifetime energy use has to be compatible with the benchmark trajectory. This could be achieved by gradually improving the building's energy efficiency, or by complying with future benchmarks today.

It is important to note here that the indicator of energy per m² used focuses on energy efficiency only, while excluding the effect of low-carbon fuels. The indicator was chosen as sectoral stakeholders use it more widely than

12 Assumptions for low renovation rates: 1.5% of buildings stock renovated per year with 10% improvement in energy use; Assumptions for high renovation rates: 4.5% buildings stock renovated per year with 40% improvement in energy use

the emissions-intensity indicator gCO_2/kwh. However, the latter could provide an alternative, and might even be more appropriate as a decarbonisation metric, as it directly relates to emissions. Given the large decarbonisation foreseen for the energy supply sector, the indicator gCO_2/kWh would result in a stronger downward trend in a 2°C-compatible world than the energy-intensity indicator presented here.

In summary, a number of country-specific factors determine what energy benchmarks can be regarded as appropriate for a particular country:

- The current level of energy use in the building sector
- The baseline (typical) level for new buildings in the building sector
- The current BAT level for buildings in the country
- The renovation rate as well as the level of energetic renovation incentivised by policies
- The demolition rate of the average technical lifetime of buildings
- The annual growth of buildings in the sector

Additional factors that were also discussed and that are also important for 2°C-compatibility are:

- The number of heating and cooling degree days in the country / region – the energy requirements for heating and cooling will largely depend on the climatic region where the project is located. While the energy use

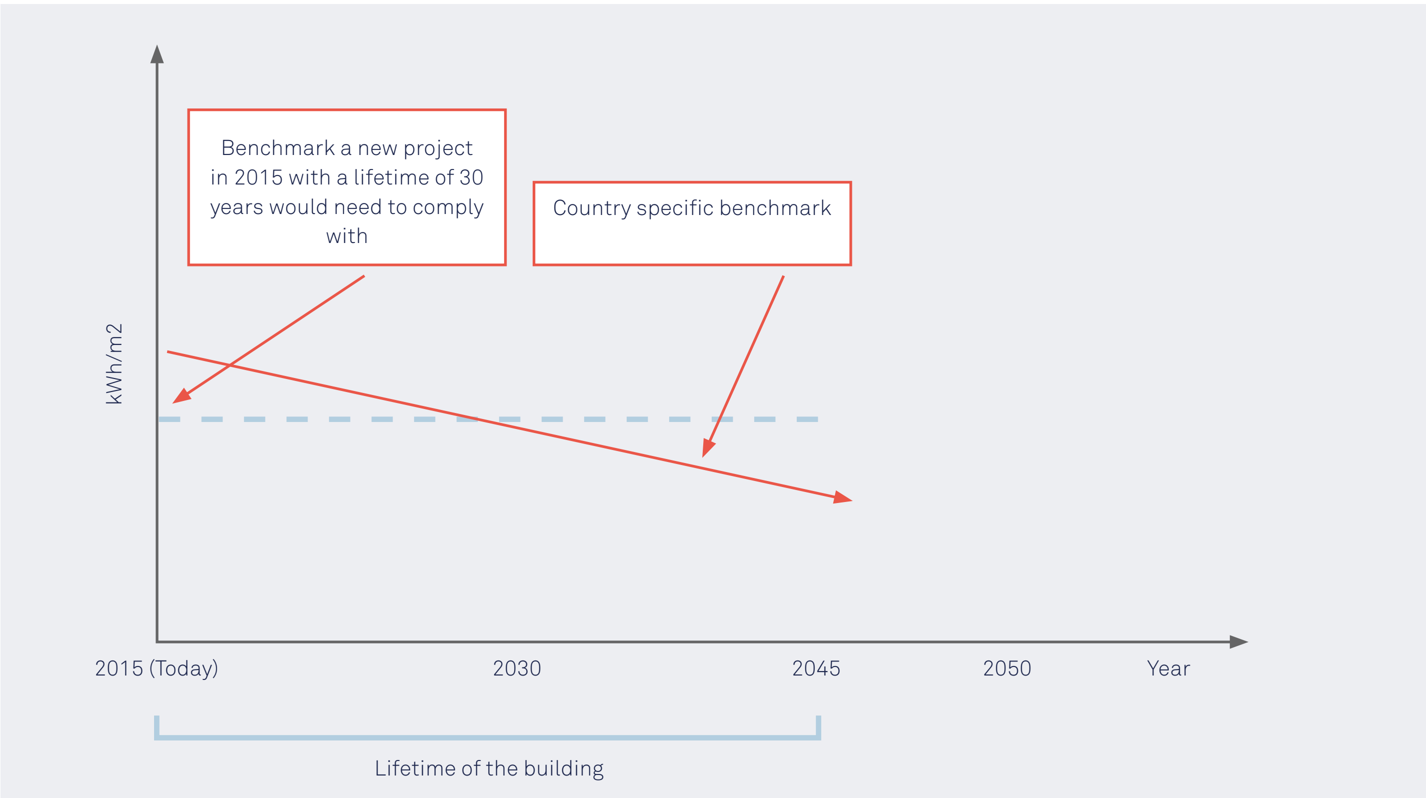


Figure 10: Decarbonisation approach to determining appropriate energy benchmarks for a particular building based on a country specific benchmark approach

2°C-COMPATIBLE POSITIVE LIST	CONDITIONAL QUANTITATIVE / QUALITATIVE CONDITIONS	MISALIGNED NEGATIVE LIST
(Near) zero emission buildings (new and renovation) below 10 kWh/m²	**Quantitative benchmark (simple)** • Specific energy use between 10 and 150 kWh/m² • Gradual phase in and increased stringency based on BAT or country average **Sector based decarbonisation (advanced)** Buildings with their lifetime emissions have to fit into a decarbonisation of the building stock during the course of the century Benchmark of energy use per floor space (x kWh/m²) determined at a country level, considering • Market maturity for low energy buildings and capacity for low energy buildings • Current energy use of buildings and local BAT levels • Annual growth and lifetime of buildings, renovation rates and levels, demolition rates • Climatic zones	Specific building energy use above 150kWh/m²

Table 13: Summary of proposed 2°C investment criteria in the building sector

between heating and cooling regions does not differ per se (Lucon et al., 2014), higher energy benchmarks could be set for countries with especially high heating or cooling requirements.

- The existence and stringency of building codes for new buildings – the investments undertaken by banks will only make up a marginally small share of the total investments in the building sector. It is thus important to also influence the rest of the building stock. This can best be done through supporting national building codes. A strong integration with the national building codes is therefore recommended.

- Commercial vs residential buildings – as mentioned above, residential and commercial building have different heating and cooling requirements. However as also mentioned this does necessarily have an influence on the level of energy benchmarks.

While the calculations above are illustrative but based on real data, they provide a first indication of such benchmark development. With respect to the implementation of such an approach at a bank level, a simple calculation tool could be developed for the use in banks that allows to determine appropriate energy benchmarks for a particular country/ situation. Such tools should allow to insert country specific parameters along the approach discussed above.

Given the large uncertainty connected with the exact level of energy renovation needed according to the scenarios, it is especially important to focus on improving energy efficiency gradually over time. This should become an integral part to any investment in developing countries, as it minimizes the burden of banks and ensures that the right steps are undertaken. For this approach to become 2°C-compatible it is essential to closely link it to an appropriate decarbonisation pathway.

Alternatively, the above described standards could be used as a basis for defining what building are appropriate. As outlined however, they are very divers in nature, are often too complex as they have many more priorities than just climate and are often not stringent enough to be 2°C-compatible . Furthermore they would have to be differentiated by country and would need to be adjusted and improve over time. New standards would thus have to be developed. While such approach might standardize the approach, it remains questionable whether such standard system is not simply too complex to implement.

6.3 TRANSPORT INFRASTRUCTURE

KEY CONCLUSIONS

The transport sector requires a systemic approach due to the interdependence of technologies and solutions within the sector, as well as with other sectors, in particular energy, land use, buildings.

A low carbon transformation is unlikely to be achieved through technology change alone. Avoid and shift strategies are needed that require policy change and need to address behavioural aspects.

IFIs currently do not use 2°C-related investing criteria for transport infrastructure. Development and other sustainability aspects override climate considerations.

An approach based on sector-wide decarbonisation targets is most effective and necessary in the long term to drive transformation. However, in practice, given the universal lack of political consensus on transport decarbonisation and associated strategies, it is considered premature in most contexts.

It is recommended to apply positive and negative lists in combination with a requirement to demonstrate how the planned infrastructure investment fits into a low carbon transport strategy. The latter is particularly relevant for investments in the "conditional" category.

Setting infrastructure investment targets at the strategic level is also recommended in order to address the pronounced investment gap in the sector.

With a share of 23% of energy-related GHG emissions, the transport sector is a major contributor to global emissions (Sims, 2014). Its contribution is expected to increase significantly considering economic and population growth projections. The selected focus for the development of 2°C investment criteria is on transport infrastructure, including road, rail, air and water, principally because transport infrastructure presents one of the highest lock-in risks across all sectors. At the same time transport fuels and vehicles will also need to be considered as the main GHG impact of transport infrastructure occurs through its use.

2°C relevance, investment needs and options

According to the 2°C scenarios, the transport sector's mitigation potential is between 8% and 22% below the reference scenario in 2050. Integrated models usually provide little detailed data for the sector. Typically scenarios consider the entire sector, with only some IEA technology scenarios providing more granular data on vehicle efficiency, fuels and modal shift (IEA, 2014). Transport infrastructure has a very high lock-in potential as its lifespan ranges from 30 to over 200 years. Investments in infrastructure are also often very capital-intensive and typically require a strong public sector element. The IEA estimates cumulative investment needs in land transport infrastructure alone to reach USD 45 trillion by 2050 under current policies (IEA, 2012). The majority of investment in developing countries is needed for new transport infrastructure; in

SECTOR	BUSINESS AS USUAL INVESTMENT NEEDS		2°C SCENARIO INVESTMENT NEEDS		SOURCE
	CUMULATIVE 2010 - 2030	ANNUAL AVERAGE	CUMULATIVE 2010 - 2030	ANNUAL AVERAGE	
Road	8,000	400	8,000	400	OECD
Rail	5,000	250	5,000	250	OECD
Airports	2,300	115	2,300	115	OECD
Ports	800	40	800	40	OECD
Transport vehicles	16,908	845	20,640	1,032	IEA
	33,008	**1,650**	**36,740**	**1,837**	

Table 14: Transport investment needs in US$ billion in 2010 rates (World Economic Forum, 2013)

developed countries it is mainly the replacement or upgrading of existing infrastructure.

Table 14 shows estimated investment needs under a business-as-usual and 2°C scenario for the different transport sub sectors.

GHG reduction strategies in the transport sector should follow the "avoid – shift – improve" hierarchy, i.e. reducing the need to travel through, for example, urban planning, shifting or maintaining cleaner modes of transport (e.g. mass rapid transit) and, lastly, improving the efficiency of transport modes (e.g. transport management systems) and vehicles (Huizenaga, 2014). The A-S-I framework follows the logic of moving from a systemic (avoid) to an individual technology based perspective (improve). Given current technologies and projected growth patterns, a 2°C pathway is unlikely to be achieved by shift and improve measures alone, and will require avoidance strategies. Disruptive technologies may change this outlook to some extent. From a purely technological perspective, a decarbonisation of the transport sector may be possible by, for example, full electrification of road and rail transport (linked to scaled-up renewable energy capacity) as well as innovation in airplane technology, as shift options are limited in this segment. However, even under the assumption of full, clean electrification, avoid and shift strategies are necessary, given the volume of transport and its impact on cities as well as the scale of renewable energy capacities required.

The key determinants for GHG emissions are changes in the mode of transport, technology choice and routes. In turn, these choices depend on a number of factors, including income levels (for passenger transport), travel costs, time costs, and the quality of service. In freight transport, options for technical substitution are more limited than for passenger transport. Cost impacts for modal shift, for example, can be prohibitively high (both in terms of actual cost and time cost), and compounded by the key role of transport for trade and development. (Kopp, 2015)

Existing investment criteria and approaches

According to the research undertaken as part of this study, none of the financial institutions reviewed apply sector specific 2°C-relevant investment criteria for transport infrastructure. Existing sector specific criteria mainly refer to the application of best available technology (BAT) and consider vehicle-related assets. A standard developed by the Climate Bonds Initiative for Bus Rapid Transit (BRT) is a notable exception of a detailed sector specific standard based on a rating system, albeit without specific reference to 2°C.

Transport infrastructure typically falls outside of climate specific ESG appraisals as these are often based on GHG emissions or energy use thresholds. For example the KfW IPEX Bank (KfW, 2015), which undertakes significant investment in transport infrastructure including airports, seaports, roads and rail, requires an assessment of alternative technology options only in cases where the asset emits more than 100,000 tCO_2 p.a. in direct (Scope 1) or indirect energy related (Scope 2) emissions. As transport infrastructure emissions are mainly use related (Scope 3), they fall outside this requirement.

Some banks (e.g. EIB) state a strategic focus on sustainable transport, or have set an investment target (e.g. EBRD). The World Bank prioritises investment in "modal shift" infrastructure and technologies. They have tested the application of shadow carbon pricing during the economic appraisal process. However, even elevated carbon prices do not send a sufficient price signal to drive investments into modal shift as the links are only indirect. Also, when evaluating transport investments, other sustainability aspects, such as local air pollution, health, land use, safety and climate resilience, play a much more significant role.

Sector and context-specific considerations

Development and other priorities

Efficient transport systems are key for economic development and growth. Realising trade opportunities and industrial competitiveness strongly depend on the efficiency and quality of the transport system. Transport also strongly impacts development aspects including, for example, health, access to jobs, household income and the associated social implications.

Many countries and regions still lack basic transport infrastructure. Within countries there can be significant development differences between urban and rural areas, where the latter are often severely underdeveloped. Low emission substitutes (e.g. rail) are usually not a feasible alternative to roads in rural areas especially, as these require high demand density. Also, low carbon options typically depend on road transport for the "last mile" especially in freight transport. (Kopp, 2015)

In many parts of the developing world, transport systems in cities and emerging mega cities are near collapse, calling for fundamental, strategic interventions. Economic considerations and development needs are strong drivers for change with climate considerations, at best, secondary.

Capacity and market maturity

Many low carbon technologies and solutions are relatively well proven and mature. Exceptions are electric and hybrid vehicle technologies and systems as well as low carbon aeroplanes. The A-S-I approach especially does not require high-tech solutions, but strongly depends on influencing user behaviour. Technology itself plays a limited role for realising emission reductions. The adoption of the technology by users is key, and depends on a mix of factors including income, costs and quality (Kopp, 2015).

Markets for vehicles are still immature in many developing countries. There is a high reliance on vehicle imports, in many cases second hand, with an associated lack in vehicle efficiency and low emission standards.

SUB-SECTOR	2°C-COMPATIBLE	CONDITIONAL		MISALIGNED
	POSITIVE LIST	QUALITATIVE CONDITIONS (EXAMPLE)	QUANTITATIVE CONDITIONS	NEGATIVE LIST
Air, Water, Rail	Inland waterways Rail network and assets (passenger and freight) Mass rapid transit/ Light Rail Transit (LRT)	Airports with transport interconnectivity plan/ bio-fuelling stations	*Quantitative criteria for transport infrastructure are difficult to set given the indirect link of infrastructure to GHG emissions. Quantitative criteria may be set for vehicles (e.g. fuel efficiency, penetration of electric/ hybrid vehicles) and linked as sub condition to infrastructure investments.*	Rail networks dedicated to fossil fuel transportation New airports in developed regions
Road	Non-motorised infrastructure High quality Bus Rapid Transit (BRT)	Road renewal to include strategic plan Electric vehicle charging infrastructure linked to RE plan		New road network in developed regions*

Table 15: Overview of indicative criteria for transport infrastructure (examples)

* Note that advanced regions may also be located in developing countries; hence the distinction should be made at a regional rather than a national level. This would allow, for example, for investments in road infrastructure to occur in remote regions in an advanced economy (e.g. Brazil, Mexico) where such investment is essential for development, but not in, for example, the same country's urban or semi urban areas.

The systemic nature

Compared to the other investment areas covered in this analysis the transport sector presents particular complexities. While a systemic perspective is important for all sectors and technology areas, the transport sector is highly integrated with other sectors, in particular energy, land use, urban planning and buildings. The link to the electricity sector and the development of renewable energy capacities is particularly relevant as a significant degree of decarbonisation is likely to be achieved through electrification of road and rail transport.

A full transformation of the transport sector towards a 2°C pathway will have to move beyond a technology specific approach and take an integrated long-term development perspective. Especially for emerging cities and mega cities, transit oriented development (TOD) will be key. Also cultural and behavioural change need to be strongly considered. Ultimately, a low carbon sector transformation requires a rethinking of how people live, consume and move about. This goes to the heart of our value systems and far beyond techno-economic considerations.

Even when taking a more techno-centric view – that decarbonisation can be achieved through electrification of the sector based on renewable energy sources – it is unlikely to.

Changing income levels have a strong influence on transport choices, particularly on transport modes and technologies. Investments in low carbon infrastructure alone do not lead to change without accompanying these with policies to drive behavioural and cultural change. (Kopp, 2015)

2°C investing guidance

Table 15 provides a categorisation of different transport investment areas by sub sector, according to the categories described earlier in the report, ie. 2°C-compatible, conditional, and misaligned with 2°C scenarios. Technologies in the "2°C-compatible" category are suitable for investment positive lists; those under "misaligned" for negative lists. Those under conditional will require either qualitative or quantitative conditions to be set. Indicative criteria are included in the table. A more detailed description of the criteria and their application in investment decision processes follows below. Given the lack of granularity in particular on technology options for transport infrastructure, the categorisation is based on expert judgement and the research of available criteria in the sector (e.g. Climate Bonds Initiative). The table shows example technologies and does not claim completeness.

It is important to note here that **investment in technologies on the positive list does not equal climate finance**. For example, the investment in rail infrastructure is deemed to be compatible with the 2°C limit but the cost cannot be accounted for as climate finance.

1. Initial screening

The selection of technologies for the positive list is, to some extent, an over-simplification of the actual role of individual technologies within the wider transport system. As discussed above, emission reductions are not achieved through investment in infrastructure alone, but need to be accompanied by appropriate political interventions to drive behavioural change. Nevertheless, certain technologies may be regarded as 2°C-compatible if they are embedded within a strategic plan.

To ensure 2°C-compatibility, investments should be limited to those on the positive list. Development banks may also strategically prioritise these to address the infrastructure investment gap. However, investments in these technologies should not be standalone but rather accompanied by policy interventions that address non-financial barriers. Technologies on the negative lists should be explicitly included.

2. Economic evaluation

Given that transport infrastructure does not generate GHG emissions itself, but only through its different uses, a shadow carbon price cannot be applied directly to send the appropriate price signal.

A carbon price could theoretically be derived through a carbon footprinting exercise, and included in the economic evaluation process. For example, the calculation of an airport or a road network's carbon footprint would include modelling emissions from construction, operation and use (including scope 1 to 3 emissions). Applying a carbon price would allow the calculation of the carbon footprint cost, which could then be included in the wider cost benefit appraisal. Note that the World Bank has experience in applying shadow carbon pricing during the economic appraisal for transport infrastructure, but even elevated carbon prices (e.g. US$ 200/tonne) were not sufficient to shift the economic evaluation in favour of low carbon infrastructure (e.g. modal shift) or more efficient cars. Non-carbon impacts play a much stronger role in the transport sector.

Also, for many infrastructure investments (e.g. airports, seaports, roads) there is no alternative (technology) option. In these cases, the application of a carbon price is of limited value in informing the investment decision. Investment decisions for transport infrastructure are often driven by political considerations and are not primarily based on cost return calculations.

3. ESG evaluation

During the ESG evaluation, investments in transport infrastructure which have not been screened out in the initial screening are further appraised according to their 2°C-compatibility. In principle, both quantitative and qualitative criteria may be used, as well as process guidance in the form of, for example, decision trees.

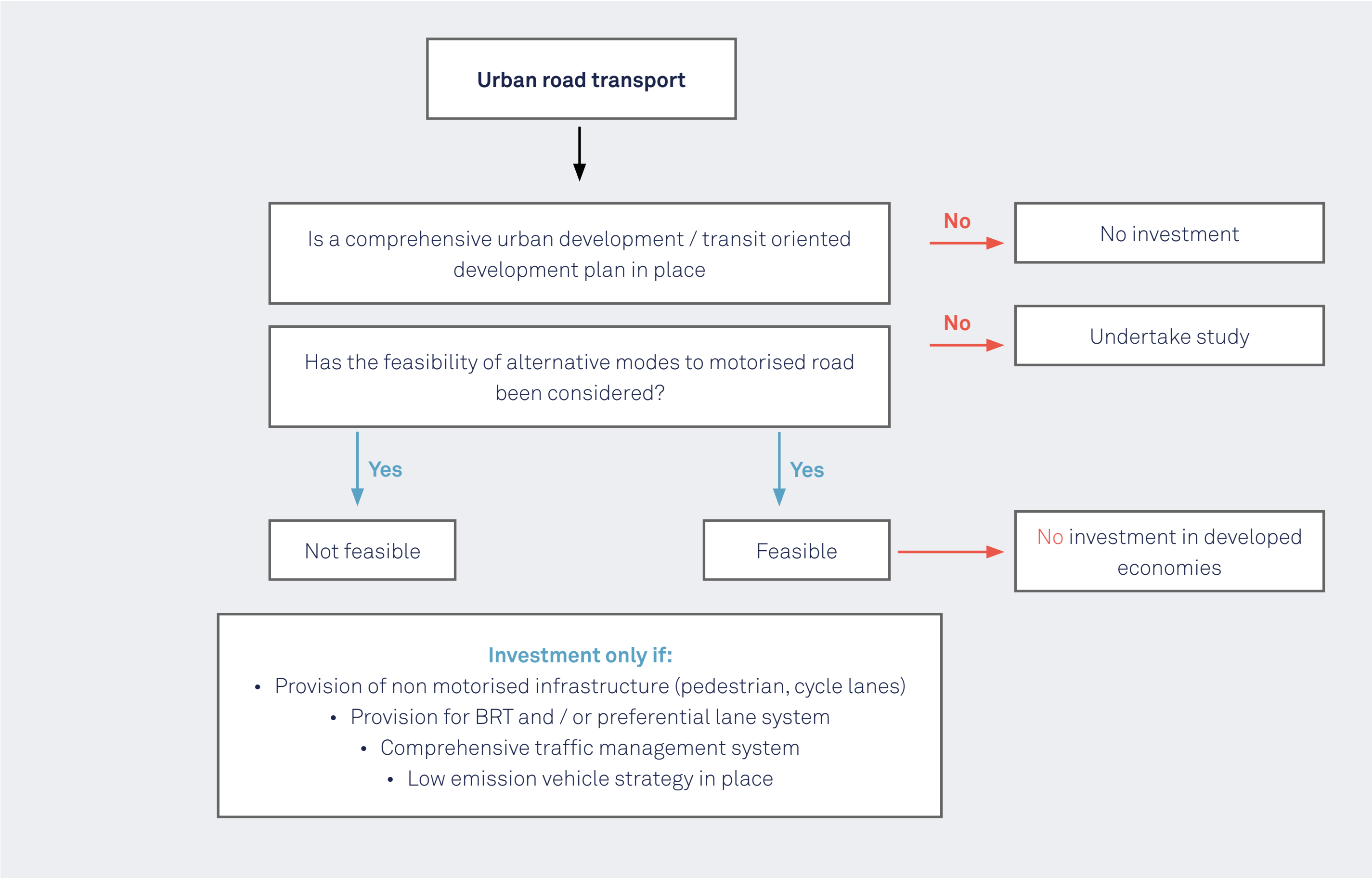


Figure 11: Exemplary decision tree for urban road infrastructure investments

Quantitative criteria: Quantitative criteria for transport infrastructure are difficult to set given the indirect link between infrastructure and energy use, or GHG emissions. Quantitative criteria can be applied for investments in vehicle fleets including for cars, HDVs, LDVs, airplane, ships and trains, using existing vehicle standards as a benchmark.

These vehicle-based quantitative benchmarks could theoretically be linked to transport infrastructure investments as sub criteria (e.g. new road infrastructure linked to penetration of low emission vehicles). However, this is not considered a feasible option given the strong development priority of many such investments. On the other hand, quantitative benchmarks may also be considered as requirements of a low carbon transport plan (see qualitative criteria).

Reflecting the systemic nature of the transport sector, one may consider an investment approach based on national or regional de-carbonisation of the entire sector. This would mean setting sector-wide decarbonisation targets (e.g. tonnes of CO_2 / person km or goods km), and developing associated strategic investment plans. While this option is, in principle, most appropriate and actually needed to drive a systemic sector transformation, it is not considered feasible at the moment, given the lack of politically-backed national transport decarbonisation plans and strategies (compared to, for example, the electricity sector, e.g. German energy transition) - even in advanced, developed countries.

Qualitative criteria: The most feasible option to guide investments towards 2°C-compatibility is the use of qualitative criteria. Most importantly, all investments in new, as well as the upgrading / renewal of existing infrastructure (including those on the positive list as mentioned above), should be in line with a low carbon transport strategy or plan. A comprehensive integrated transport strategy needs to be in place at the national level (e.g. for inter urban road development, nodal infrastructure investments such as air and seaports) or at the regional / city level for urban or suburban transport infrastructure investments.

The strategy may link to quantitative benchmarks (e.g. decarbonisation of vehicle stock) and should consider the implications of the infrastructure investment on changed transport demand and how this influences fuel use and associated emissions.

There are also some infrastructure / technology-specific qualitative criteria that should be applied. Examples include:

- investments in electric vehicle infrastructure to be linked to a renewable energy investment plan in line with additional electricity demand forecasts

- investments in new airports and seaports in developing countries to include
    - Transport connectivity plans
    - Bio fuelling stations
    - Buildings compliant with 2°C standards

A decision tree may be used as an option to implement qualitative guidance. An example decision tree for urban road transport is shown in Figure 11.

7. KEY CONCLUSIONS AND OUTLOOK

7.1 KEY CONCLUSIONS

Achieving the global climate goal of limiting temperature increase to below 2°C compared to pre-industrial levels requires shifting capital from high to low carbon investments, as well as significant capital mobilisation for investments in 2°C-compatible infrastructure. Given the long lifetime of physical assets, and the urgency of decarbonisation over the coming decades, financing decisions already need to be aligned with this goal today.

Public financial institutions can play a prominent role in contributing to aligning investment flows with the 2°C limit as well as in closing the current infrastructure investment gap, responding to their explicit or implicit climate mandates, and their leadership role in the finance sector.

The majority of international financial institutions (IFIs) integrate climate considerations into their finance decisions to some degree, but current approaches do not link to the 2°C limit. There are currently no tools available that allow investors to determine the 2°C-compatibility of their investments. 2°C investment criteria are therefore needed to guide investors in this regard. Such criteria may also support other purposes including understanding of climate risks and improved reporting and accountability.

The research showed that it is possible, in general, to develop 2°C investment criteria for individual projects on the basis of 2°C scenarios. Despite certain limitations, including the fact that scenarios rely on specific views on what will happen in future, as well as the lack of a systemic perspective and granularity of data in some sectors (e.g. agriculture, forestry, industry, transport), they are considered a good starting point for the development of criteria. In many areas the different 2°C scenarios are sufficiently aligned to allow the identification of projects and technologies that are unambiguously 2°C-compatible (such as solar PV and wind energy), and those that are clearly not (e.g. coal-fired power plants with unabated emissions over their lifetime). For many technologies, however, 2°C-compatibility depends on what happens elsewhere (e.g. energy efficient buildings) and a straightforward statement is not possible.

The development of concrete and incontestable, project-specific 2°C investment criteria is easier in some sectors than in others. The research showed that, of the three sectors studied, the transport sector – due to its systemic complexities and limited availability of sector-wide, politically backed decarbonisation strategies in any part of the world – is furthest away from implementation ready, clear 2°C guidance, compared to, for example, the electricity supply sector, where there is already political consensus on sector decarbonisation, and systemic considerations are easier to break down to the individual project level.

In some cases, project-based criteria need to be combined with a broader, systemic perspective and to consider the specific national context. The considerations here should include market maturity of technologies, development priorities, and specific system characteristics. Considerations of individual capabilities and capacities of countries also come into play here. Even for those technologies that are – in principle – fully-aligned with 2°C pathways, local appropriateness needs to be considered.

Depending on the national context, a phase-in of low carbon technologies with the use of transition technologies may be required, which would mean a gradual move towards 2°C-compatibly rather than an immediate one. The gradient may be determined by development needs and wider equity considerations, in response to the internationally agreed principle of "common but differentiated responsibilities". In this context, it is also important to continuously update criteria and guidance in light of changing circumstances, including changing assumptions on 2°C pathways and technological innovation.

Financial institutions may choose to respond in different ways to the fact that, for some individual projects, there is a higher certainty that they are 2°C-compatible than for others. Certainty of 2°C-compatibility can only be achieved by limiting investments to those on the positive list and excluding those on the negative list. Choosing these provides the highest certainty of an investment being 2°C-compatible . For investments in technologies in the conditional or ambiguous category, benchmarks and criteria can be used which allow for the assessment of relative 2°C-compatibility, but uncertainties remain. Investment decisions in these areas may also require informed decisions that also depend on the bank's interpretation of its mandate.

Different types of 2°C investment criteria can be integrated at various steps in the decision making process of IFIs. Their application is not necessarily associated with significant additional costs for those financial institutions that already employ reasonably sophisticated climate criteria. The review of existing practices demonstrates the range of criteria already used by public financial institutions. A challenge in this context is to balance the need for sufficiently robust guidance and criteria with pragmatic, implementable approaches.

A challenge frequently highlighted by development banks is the lack of fundable 2°C-compatible projects as well as a potential competitive advantage for those financial institutions that do not apply strict 2°C investing criteria. Clearly more support is needed to proactively develop attractive 2°C-compatible projects requiring action both on the side of the donor as well as recipient countries. However, there is already a strong indication of investment needs and interest in low carbon technologies by developing countries as iterated, for example, in the many emerging, low carbon development strategies and climate commitments under the UNFCCC. The scale of the challenge and current investment gap suggest that sufficient investment opportunities are likely to become available and, in many cases, should already be available today.

Interventions at the policy level are also needed to steer investment decisions to achieve the transition to a 2°C pathway. Such policies need to address the multiple barriers to low carbon development and create an enabling environment conducive to investments in low carbon technologies. Continued effort is needed to create detailed, sector based 2°C pathways for specific countries, coupled with politically endorsed investment plans.

7.2 OUTLOOK

Additional research is needed to further develop 2°C investment criteria in the key sectors identified in this research and beyond. Comprehensive 2°C investing criteria for all sectors and technologies can, in principle, be developed in the future, building on the initial results of this project. Given the lack of available guidance and tools to inform investment decisions on 2°C compatibility, as noted in this report, extending the research to additional key sectors is considered essential to enable the long term alignment of investment flows with international climate goals. Such work will require a larger process. The development of consensus-based criteria should involve a variety of stakeholders already active in the field. In particular, the involvement of practitioners from institutions such as national, bilateral, regional development banks, export credit agencies and guarantee providers as well as investment funds and sectoral experts is essential to lift available expertise and ensure that criteria are grounded in the reality of different types of investors.

A coalition of "early adopters" could be formed that brings together interested bilateral development banks and governments. Such an initiative could be placed in the context of the G7 which has repeatedly endorsed the 2°C limit, and emphasised the need for decarbonisation over the course of this century. Alternatively, a wider coalition could be formed that also involve public financial institutions and governments in developing countries. Such a coalition could:

- **Support and accelerate the development of criteria in various sectors**

- **Road-test the proposed criteria** for key sectors through a bottom up approach in a selected number of development finance institutions.

Beyond the scope of this project, more work is necessary on processes and criteria applicable to private banks and private investors, as well as to financial assets and portfolios. While the focus of this research project was on public financial institutions financing physical assets, some next steps could look at a broader set of investors and types of investments. Public financial institutions place a particular emphasis on project and infrastructure finance. Equally, project finance constitutes a small proportion of the average institutional investor's portfolio. 2°C investing criteria for physical assets then need to be adapted for other types of financial assets, notably equities and bonds, and for a cross-asset portfolio. The assessment of financial assets is particularly difficult due to data availability and the complexities involved in translating the information to the individual project level.

EXCURSUS: INVESTING CRITERIA FOR CLIMATE RESILIENCE AND ADAPTATION

KEY CONCLUSIONS

In addition to criteria for 2°C-compatible investments (mitigation perspective), criteria are needed to reduce the risks to investments from – and increase the resilience of communities to – climate change impacts. The approaches and criteria will be separate and different. The currently-expected levels of warming should inform them.

All prudent investors – including those adhering to 2° investment criteria – need to make sure their investments are not exposed to risks from climate change impacts. There is significant work underway by multilateral and bilateral development banks to "climate-proof" their investments. These approaches would benefit from further joined learning and harmonisation, as currently pursued in the working groups of the MDBs and the IDFC members.

Current risk-proofing tools do not yet rely on the newest climate scenarios. To the extent that intervention scenarios with sufficient level of granularity become available, development banks should use them as basis for their assessment. Such an assessment would ideally include a comparison of the impacts under 2°C and 4°C scenarios.

Further efforts are required to purposefully manage the wider resilience impact of investments. Additional work is needed on approaches to identify those investments that actively promote resilience. Proving a positive contribution to resilience is a prerequisite for investments to be legitimately considered climate finance.

However, regular investment activities should also strengthen resilience. For instance, assessing the climate resilience impact - current and future - of a given project should become part of the social and environmental risk screening for every project. In those cases where the assessment shows a negative impact, the project should not be pursued in its current form (“do no harm” principle). Further work is required to anchor such procedures in the investment cycle of financial institutions. In addition, development finance institutions could set themselves portfolio targets to achieve a certain share of projects that have a positive or likely positive impact on the resilience of impacted communities.

The focus of this report is on criteria that would ensure the emissions resulting from investments in physical assets are compatible with 2°C pathways – in other words, it suggests ways to evaluate investments through a “climate change mitigation lens.” However, climate change also requires an evaluation of all investments through a “climate change adaptation and resilience lens.” Climate change impacts are already being felt, and will grow in the future. Disaster losses are globally increasing; since 1980 the global disaster related losses account for $3.8 trillion USD, of which 74% can be attributed to weather extremes (World Bank 2015). Impacts are projected to grow – including major shifts in local and regional climate conditions, changes to water availability, sea level rise, heat waves, drought and inundation. All prudent investors – including those adhering to 2°C investment criteria – therefore need to make sure their investments are not exposed to risks from climate change impacts. Risk reduction, better preparation and adaptation strategies that address disaster risk drivers can substantially decrease costs of disasters, and intervention measures can protect public and private investments. Experience shows that the requirement to adapt to disaster risk and implement safer structures imply design changes that can cause 10–50% higher costs (and even higher for complex elements such as water or transport networks (ibid.).

In recent years, many development finance institutions have committed to integrating climate resilience and adaptation into their operations and have developed tools to assess the exposure of investments to (future) climate change impacts, and mainstream risks of climate change. Different approaches are being used to assess, ex-ante, the actual climate change impacts for specific investments, based on different data sources and intervention scenarios. Investors with a development mandate may also need to go one step further, by developing approaches to not only climate-proof their investments, but to actively promote increased climate change resilience of the communities or countries where they invest. Criteria can be a useful tool to inform decisionmakers on both of these aspects: is the investment climate-proof, i.e. are risks from potential climate impacts sufficiently understood and addressed? And does the investment actively contribute to enhanced resilience of the communities concerned?

Similar to the approach proposed in this study for mitigation, the approach to adaptation and resilience should be informed by temperature scenarios. However, development banks cannot base their resilience assessment on 2°C scenarios, given that currently-projected levels of warming are at least 4°C. As long as not all investors have shifted their investments to be compatible with 2°C warming from a mitigation perspective, investments need to be planned for a 4°C world from an adaptation / resilience perspective.[13] Thus, development banks need to adopt an investment strategy where the resulting emissions are compatible with a maximum of 2°C warming, while the investments and the impacted communities are resilient to currently projected warming levels, which should be regularly updated and currently stand at around 4°C.

Developing appropriate criteria and approaches to answer these questions is a separate challenge from 2°C-compatible investing criteria. In this section, we explore how development banks currently consider these dimensions in their investment decisions and suggest a conceptual framework to develop appropriate criteria.

Addressing climate risks of individual projects

Addressing the risks of climate change for investments is not new on the global agenda, but is now gaining relevance. In the context of development finance, research shows that there are several methodologies and frameworks that address climate change related risks. Many remain on a generic level, while others dive into sector specific climate risks and undertake sensitivity analyses.

The assessment of financial institutions in the field of development finance shows that climate risks are very prominently present on the agenda. All of the MDBs and DFIs reviewed as part of this research have recognised the issue and incorporated it into their processes and investment decisions.

For accounting for climate risks ex-ante, all MDBs have developed screening processes, often within their environmental impact assessments. The potential outcomes of such a dedicated 'climate risk' assessments are threefold: (i) the project design is adapted to account for identified risks; (ii) potential risk is covered through insurance mechanisms; or (iii) the project is cancelled.

The ADB applies an online model (AWARE) that generates an overall climate risk ranking of 'low', 'medium', or

13 The World Bank commissioned a research synthesis series – "Turn down the Heat – Why a 4°warmer world must be avoided". Similar to the approach by the World Bank report, 4° is chosen here for illustrative purposes and represents a range of impacts (Schellnhuber et.al, 2012).

INSTITUTION	WHAT IS THE CURRENT STATUS REGARDING (FUTURE) CLIMATE CHANGE IMPACTS IN THE INVESTMENT PORTFOLIO?	WHAT APPROACH (IF ANY) IS USED TO EX-ANTE ACCOUNT FOR CLIMATE CHANGE IMPACTS IN SPECIFIC INVESTMENTS?	WHAT IS THE DATA FOUNDATION APPLIED FOR ACCOUNTING FOR CLIMATE CHANGE IMPACTS?	ARE INTERVENTION SCENARIOS CONSIDERED?
ADB	Recognized and incorporated into investment decisions	ADB Climate Risk Assessment Process; Tool: AWARE	AWARE Model based on broader set of circulation models and databases for different areas	Unclear
EBRD	Recognized and incorporated into investment decisions	Climate Sensitivity Screening checks for relevance of climate risks for project on a case-by-case basis	Local / regional data and models are consulted	Yes, local conditions are modelled reflecting policy and climate change.
IADB	Recognized and incorporated into investment decisions	Internal screening process, based on questionnaire for climate risk assessment; if required in-depth assessment	Currently establishing internal data base; a broad mix of specific databases and suitable sources shall address the local context. In addition reflecting publicly available information such as UNFCCC National Communications.	Unclear
AfDB	Recognized and incorporated into investment decisions	Climate Safeguards Scheme	Unclear	Unclear
KfW Development Bank	Recognized and incorporated into investment decisions	No tool, but screening questionnaire for climate risk assessment, possibly in-depth assessment	Unclear	Unclear
WBG	Recognized and incorporated into investment decisions	Climate Screening Tools; Pilot Program for Climate Resilience; Environmental Safeguards and Disaster Risk Management	A broad set of sources, including IPCC AR 4, WBG´s Climate Change Knowledge Portal (CCKP) and the CCKP's Country Adaptation Profiles.	Yes, climate risk screening tools provide sensitivity analysis.
AFD	Recognized and recently systematized approach for risk screening	Climate risk screening tool applied to the overall portfolio; Climate vulnerability is considered on the same level as other types of risk, during the project screening and appraisal phase. In depth assessment of projects at risk is being tested.	So far available data for project screenings; IPCC data is envisaged to serve as the foundation of future screenings, as well as local / regional models.	So far not defined.

Table 16: Results of IFI assessment (Climate screening and climate proofing approaches)

'high' for each project. It applies data from 16 general circulation models as well as databases on temperature increase, wildfire, permafrost, sea ice, water availability, precipitation change, flooding, snow loading, tropical storms, and landslides. The World Bank offers a whole suite of tools and guidance (e.g. overarching environmental and social safeguard policies, web-based climate and disaster risk screening tools) that help decision makers on policy and project level to rank the risk of investments. With EBRD, as an MDB focussing on the private sector, it specifically screens the climate risks on profitability. For the private sector, individual risk valuation approaches are emerging – the Climate Disclosure Standards Board (CDSB) aims to mainstream standardised approaches.

Regarding the data sources for conducting assessments, ADB relies on the AWARE model, while EBRD and IDB specifically build on custom-tailored case study modelling and data sets. The World Bank backs their assessment with data from numerous sources, such as the IPCC Fourth Assessment Report (AR4) (2007). Climate projections and trends are derived from 14 of the 23 available general circulation models (GCMs), which are physically based models of projected climate change. Emissions scenarios are consistent with the IPCC´s AR4 Special Report on Emissions Scenarios (SRES) projections.

Overall, it appears that all IFI approaches for assessing climate risks comprise an initial screening for categorising risks, which is then potentially followed by deeper scrutiny. As the efforts for detailed climate risk assessments are considerable, and resources within the IFIs limited, the standardisation of such processes is a challenge. The "top down" imposition of climate risk screening processes through the World Bank for their institutions and funds however is certainly creating momentum and could serve as an example for other institutions.

Box 4 provides a case study on how adaptation is incorporated into the investment practices of the AFD.

BOX 3: ADAPTATION ISSUES INSIDE THE AFD

As described in Box 2 Agence Française de Développement (AFD) structures its Climate Change commitments through its transversal Climate Action Plan for 2012 – 2016. This plan has established three main priorities aimed at driving AFD's financing operations. One of them includes increasing the resilience of people, goods and ecosystems to climate change.

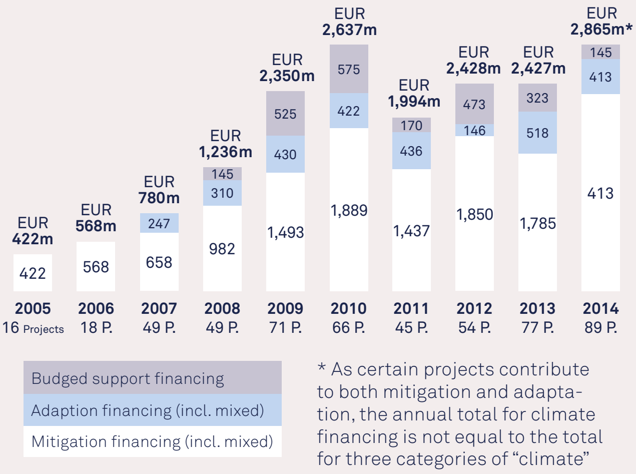
Positive list approach to identify adaptation projects counting toward the reach of AFD's climate objective

AFD identifies the investments contributing to its Climate Action Plan, and tracks annual commitments towards associated objectives. For AFD, a defining piece of classifying "climate activities" has is the concept of "climate co-benefits." Any financial commitment can contribute to AFD Group's objectives if it generates significant "climate co-benefit" through mitigation (emission reductions), adaptation (improved resiliency), or climate oriented capacity building and local policies strengthening. A project qualifies as an adaptation project if it helps reduce the vulnerability or increase the resilience of goods, people or ecosystems to the impacts of climate change in a business as usual (BaU) scenario. A comparative analysis is conducted to prove if projects effectively achieve these objectives including:

- a study of the vulnerabilities to climate change in the project's geographical area with

- an analysis of the activities planned by the project in light of a positive list of actions that can contribute to reducing vulnerability or to strengthening the resilience of communities, goods or ecosystems to climate change.

For adaptation projects, only the component that contributes to reducing vulnerability is accounted for in AFD commitment to climate action. In 2014 AFD has committed financing 23 projects that account for adaptation worth EUR 311 million and 4 projects with a mixed adaptation and mitigation component worth EUR 226 million (See Figure 12)



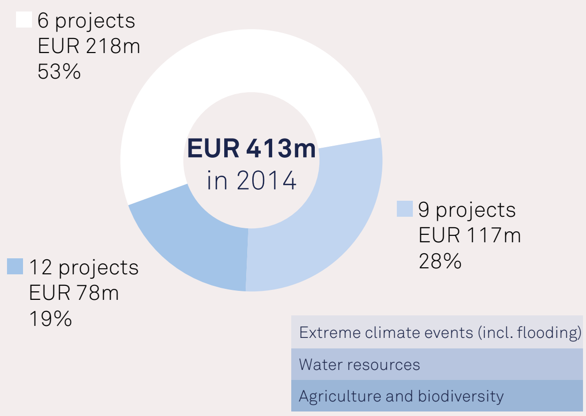


Figure 12 : AFD Group "climate" commitments since 2005 (left) and sectoral breakdown of financial commitments for climate change adaptation in 2014

Source: AFD's 2014 results of AFD Group's activity in the fight against & climate change

Climate vulnerability screening internal web-based tool

AFD addresses the screening of climate vulnerability and climate proofing through an internal web-based tool. Starting with a study launched in October 2012 to strengthen AFD's both "climate screening" and "climate proofing" methodologies, followed by a testing phase, the process has achieved the transversal integration of climate risk screening in 2015. The primary objective of the work conducted by AFD was to better address the physical risk of climate change on individual projects.

Climate vulnerability is considered on an equal footing as other types of risk during the appraisal phase of a project as part of the technical and economic analysis. This assessment is applied project by project and will eventually cover the entire portfolio. This forward-looking tool aims to allow the classification of climate vulnerability based on: i) an institutional component, ii) a climate component, iii) a technical component and iv) a context-based component. The climate component takes into account the estimated amplitude and importance of temperature and rainfall changes. The technical elements include structural and operational factors to measure sensibility to climate change. The institutional component considers the level of development of the country of implementation of the project. Finally, the context-based component allows the consideration of aggravating conditions such as geographical locations frequently exposed to natural hazards: coastal, mountain or flood-prone areas, etc.

The final outcome of the "climate screening" procedure is a vulnerability raking whereby each project classified in three categories (A, B or C), which is taken into consideration by the Project Identification

Committee. If a strong exposure to risk is identified, threatening expected outcomes and the long-term feasibility of the project, a deeper analysis of the associated risks are to be undertaken as part of the environmental assessment studies and / or feasibility studies. If deemed necessary, adaptation measures are proposed for the project's implementation phase. This in-depth analysis for projects at risk is still undergoing a pilot phase.

As part of the feasibility studies, project teams estimate the impact and the likelihood of different climate scenarios. However, uncertainties remain high because of the numerous obstacles that limit the collection and the processing of reliable data at the local level. Precise regionally aggregated information is generally difficult to obtain and may, in some cases, require additional data collection. As a consequence, AFD's first objective is to develop a methodology for collecting information that is as robust and flexible as possible, considering the resources at its disposal.

The work undertaken by AFD on climate screening is in line with progress made by the larger donor community. The importance of collaboration through a sharing of resources has been recognized. The evaluation of climate vulnerability requires specific skills and significant additional resources to facilitate the collection and processing of information.

The development of common and trusted information sources among DFIs could help limit additional costs and time. The work of the Intergovernmental Panel on Climate Change (IPCC) to update information, refine geographic coverage and elaborate different scenarios may prove particularly useful.

Source: Source: Eschalier C., Deheza M., Cochran I, (2015) Integration of Climate Change into the operational activities of the Agence Française de Développement, Institute for Climate Economics (I4CE) Paris.

Way forward

The analysis shows that accounting for climate risks is already standard practice for development finance institutions, in the sense of climate-proofing their investments. Current approaches and tools employed by these institutions vary, as well as the underlying degree of scrutiny. Development finance institutions are increasingly engaging in a dialogue process through joint working groups that to align methodologies and processes. But further work is needed to ensure that accounting for climate risk is more than a mere 'tick-the-box' exercise. In continuing their efforts for climate-proofing procedures, development finance institutions should consider the following:

- First and foremost, climate change translates into increasing uncertainties, especially in the long-term. Consequently, the objective must be to increase the robustness of investment decisions. Therefore, financial institutions need to increase their portfolio-wide resilience against climate change impacts. This can be done by, for instance, preferring, if possible, investment choices with smaller timeframes, decentralised infrastructure, or resource-efficient infrastructure that is less prone to supply disruptions as a result of climate change.

- Secondly, easy-to-operationalise approaches should not hide increasing uncertainties that result from different climate change scenarios, as well as impact modelling. As a case in point, all existing climate proofing approaches rely on old scenario inputs and not on the recent IPCC RCP scenarios, which include intervention pathways to limit global warming to less than 2°C. Development finance institutions should prepare themselves as well as their clients to the likely climate change futures. The world is not currently on track to limit greenhouse gas emissions to keep warming below 2°C, and financial development institutions should rather prepare for high-impact scenarios. Honest risk screening procedures would make visible the increased costs for capital and investments as a result of insufficient climate protection. To the extent possible, climate risk screening should be based on the newest intervention scenarios.

ENHANCING THE RESILIENCE OF COMMUNITIES

Proving resilience impact to be eligible for climate finance

Existing climate proofing approaches by development finance institutions are largely centred on ensuring the long-term viability of the respective investments. The question is, however, whether criteria should evaluate the wider contribution of investments to the resilience of communities and societies. Such a contribution to resilience is mostly discussed from the perspective of climate finance definitions.

After all, to eligibly process climate finance, a given institution needs to demonstrate the project's contribution to adaptation and resilience.

Since 2010 a group of MDBs is jointly discussing their individual approaches to climate finance in a working group, with the AfDB leading the discussion on aspects regarding adaptation finance (AfDB 2012). Since 2012 they have published joint reports on adaptation finance that lay out principles for reporting on adaptation finance, and describe the adaptation finance share of the MDB´s portfolio (EIB 2012).

According to their methodology for adaptation finance reporting (AfDB 2013), activities must state the intended improvements regarding climate resilience, and must be directly linked to the context of climate vulnerability (describing climate vulnerability, and the impacts of projects on climate resilience); this shall be included in relevant project reports. Projects also shall address adaptation categories such as addressing current drivers of vulnerability, building resilience to current and future climate risks; incorporating climate risks into investments, and incorporating management of climate risk into plans, institutions and policies.

During 2015 the group of MDBs and IDFC have held a dialogue among major development financing actors and institutions (such as IDFC, OECD, CPI, UNFCCC, and GCF) for comparing adaptation finance tracking approaches and different methodologies (Group of MDB's 2014). The adaptation discussions under the climate finance working group of the MDBs also focuses on the assessment of portfolio resilience with the aim to share their findings by the end of the year. In early 2015 the MDBs and the International Development Finance Club (IDFC) announced that they are collaborating towards a joint understanding of definitions of the different approaches and principles for climate change adaptation finance tracking. This led to the development of common principles for climate change adaptation finance tracking (Box 3), which are integrating the MDBs' joint methodology for adaptation finance tracking above.

BOX 4: MDBS AND IDFC COMMON PRINCIPLES FOR CLIMATE CHANGE ADAPTATION FINANCE TRACKING

Adaptation finance tracking relates to tracking the finance for activities that address current and expected effects of climate change, where such effects are material for the context of those activities;

Adaptation finance tracking may relate to activities consisting of stand-alone projects, multiple projects under larger programs, or project components, sub-components or elements, including those financed through financial intermediaries;

Adaptation finance tracking process consists of the following key steps:

- Setting out the context of risks, vulnerabilities and impacts related to climate variability and climate change;
- Stating the intent to address the identified risks, vulnerabilities and impacts in project documentation;
- Demonstrating a direct link between the identified risks, vulnerabilities and impacts, and the financed activities;

Adaptation finance tracking requires adaptation activities to be disaggregated from non-adaptation activities as far as reasonably possible. If disaggregation is not possible using project specific data, a more qualitative or experience-based assessment can be used to identify the proportion of the project that covers climate change adaptation activities. In consistence with the principle of conservativeness, climate finance is underreported rather than over-reported in this case.

Besides those reporting principles, which mark a further milestone for a joint multilateral methodology on adaptation finance, further actors in development finance do address the issue of adaptation. The Global Environment Facility (GEF) has defined eligibility criteria for investments in adaptation-related projects financed under the GEF´s Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF) (GEF 2014). Those criteria, inter alia, require activities to generate adaptation benefits in line with additional cost reasoning, identify relevant risks, and demonstrate adequate mitigation measures.

Development banks' current efforts to identify active contributions to community resilience

An assessment of financial institutions shows that initial efforts have been made toward active contributions to building resilience, but further work is needed: the EBRD first assesses the financial viability of its investments, as it is mainly financing private sector activities. Therefore, the profitability is at the core of the assessment of each investment decision. However, the EBRD does consider climate resilience of investments as one of several important risk factors. The World Bank is pursuing this avenue by mandate, striving to embed climate risk and resilience into internal processes (World Bank 2015b). In this regard, the WBG has commissioned studies on the need for resilience and the benefits of climate-smart policies. World Bank policies and instruments foresee building resilience through WBG funds. The IDB has been performing case studies on the costs of incorporating climate change resilience into projects, but these studies have been of limited scope and are at the pilot level (IDB 2015). For the AfDB, building climate resilience is considered highly relevant and assessed for individual project investments.[14]

14 Find project profiles with description of climate risk assessment results at: http://www.afdb.org/en/documents/environmental-social-assessments/climate-change/

	ADB	EBRD	IDB	AFDB	KFW DEVELOPMENT BANK	WBG	AFD
Does the institution consider positive contributions to building resilience in its investment decisions?	Yes	Non-Resilience is regarded as barrier, so resilience is envisaged	Yes	Highly relevant	Screening checks if resilience can be increased in project area.	Yes, by mandate	Yes, increasing the resilience to climate-change of people, goods and ecosystems is one of the priorities of AFD operations.

Table 17: Results of MDB assessment (increasing resilience)

The KfW screening process checks whether the adaptive capacity (resilience) of the people or ecosystem can be significantly increased. By anticipating the climate development in the region of the project including follow-on effects like loss of income or health risks due to malnutrition, the KfW clarifies the adaption possibilities to increase the resilience. As an example, the resilience due to rising sea levels can be increased by constructing protection systems or by adapting land use (KfW 2011). The AFD structures its Climate Change commitments through its transversal Climate Action Plan for 2012 – 2016. This plan has established three main priorities meant to drive AFD's financing operations and one of them includes increasing the resilience to climate-change of people, goods and ecosystems (AFD 2011).

Future agenda to actively promote resilience through investments

Furthering considerations of active resilience in the institution's financing cycles, it seems clear that more operational guidance is required. The EIB for instance, includes in its Environmental and Social Handbook a requirement to check for the "contribution of the project to improved resilience, and the impacts of climate change on the project." However, no mandatory steps follow that assessment.

In coordinating and harmonising the approaches to increase the resilience of investments, MDBs and DFIs could pursue the following approach.

- **Positive investment:** projects that explicitly increase the resilience and objectively address identified impacts and respective vulnerabilities. Only investments in the first category should be eligible for climate finance.

- **Likely positive investments:** investments that positively discriminate investments to regions and sectors that have high adaptation benefits for communities and societies, including investments into vulnerable populations and countries, or sectors such as agriculture, water and coastal protections. Finance institutions should further refine portfolio approaches to adaptation. Analysis and guidance for such investments should be nationally defined.

- **Neutral investments:** the criterion of 'no harm' should be extended to include future climate vulnerabilities. A neutral project does not affect climate vulnerabilities and resilience of people and communities. Concrete steps will have to be introduced and made mandatory as part of the environmental and social risk screening procedures to meaningfully enforce the criterion.

POSITIVE INVESTMENT	LIKELY POSITIVE INVEST-MENT	NEUTRAL INVESTMENT	NEGATIVE INVESTMENT
Projects designed to increase (future) resilience	Projects that give priority to vulnerable countries/ communities Projects that give priority to certain sectors	Projects that cause no harm for (future) climate vulnerability	Projects that worsen the (future) climate vulnerability of the country/ community

Table 18: Proposed criteria to increase climate resilience

- **Negative investment:** Conversely, the negative criterion refers to investments that erode existing and future capabilities of people and communities to face climate impacts. Such projects would be considered "maladaptation" and respective steps need to be initiated as part of the risk screening.

By applying the approach outlined in Table 13 above, all development finance institutions should set portfolio targets for investments that fall under the "positive" and "likely positive" investment categories, as well as adopting a 'no-harm principle', to ensure that all projects at least do not worsen the (future) climate vulnerability of the country or the targeted community. This could also be graded depending on the type of institution. For instance, dedicated climate funds could be committed to only fund projects in the "positive investment" category. Similarly to the harmonisation efforts regarding the issue of climate proofing investments, development finance institutions should develop common methodologies and approaches, e.g. to assess whether a planned investment truly increases future climate resilience.

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