Climate Investment Funds

Joint CTF-SCF/TFC.21/3
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Agenda Item 5

STRATEGIC DIRECTIONS FOR CIF

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Executive summary

1. In 2008 global leaders established the USD 8 billion Climate Investment Funds (CIF) to provide scaled-up financing for the demonstration, deployment, and transfer of low-carbon and resilient climate solutions with a significant potential for long-term transformational change. Ten years on, CIF has delivered on its founding ambitions as evidence shows signals of transformation across key markets and sectors targeted by its programs.

2. CIF has demonstrated to be a key player of the climate finance architecture, channeling and leveraging through its partner multilateral development banks (MDBs) significant levels of climate finance to developing and emerging countries. CIF-backed investments are attracting USD 57 billion in expected co-financing and are delivering notable results on the ground. They are contributing toward the generation of 26.5 gigawatts (GW) of new clean power capacity, improved energy access for 8.5 million people and over 300,000 businesses, greater climate resilience for 45 million people and 44,000 businesses, and the sustainable management of 36 million hectares of forests.

3. Despite the progress achieved to date with CIF's support and, more broadly, with domestic and international efforts, the world is nowhere near on track to limit warming to the 1.5°C target. Climate investments need to be scaled-up rapidly to enable the "rapid and far-reaching transitions in energy, land, urban and infrastructures, and industrial systems" called for by the international scientific community. A decisive shift in these systems is required in the critical two to three-year window ahead to avoid carbon and climate vulnerability lock-in for the decades to come.

4. MDBs have experience in these priority areas, and over the past years, they have deployed significant and growing levels of public and private finance for climate interventions in developing and emerging countries.[1] MDBs can build on this track record to enhance efforts by applying their cross-sectoral expertise, structuring capabilities, convening power, and ability to drive policy reforms, mobilize private capital, and create markets. Nevertheless, CIF's experience shows that they cannot do it without some concessional capital, which is also part of the broader MDBs' Paris Agreement alignment agenda.[2]

5. The decade-long experience of CIF's business model has demonstrated that flexible, predictable, and programmatic concessional capital at scale can tackle those market and institutional failures and other barriers to climate action. By lowering investment costs and risks, and by providing a collaborative platform for strategic and operational coordination, CIF's business model has enabled MDBs to address prevailing barriers to the commercialization of new technologies, engage private investors in first-of-a-kind projects, and contribute to transformational change. Further, by enabling recipient countries to draw on MDBs' varied skillsets, CIF's business model has demonstrated its relevance in helping to identify and address the root causes determining the need for concessional financing.

[1] In 2017 alone, the MDBs jointly reporting on climate finance, committed over USD 35 billion towards climate projects that attracted additional USD 52 billion in co-financing. Source: Joint-MDBs (2018), *Joint Report on Multilateral Development Banks' Climate Finance*.

[2] In 2018, MDBs stated their commitment to actively support low-emissions and climate-resilient development pathways, and "to go beyond current efforts to […] support clients' access to concessional finance, including for leveraging private capital, and provide the needed technical assistance for climate action […]". Source: *Joint Declaration* (2018).

6. The key ingredients of CIF's demonstrated success reside in the unique features of its business model, which include the following:
    - A country-led programmatic approach enabling the design and implementation of strategically linked investments aligned with national priorities
    - The delivery of finance through multiple MDBs operating together in a coordinated manner to implement a large and coherent package of interventions
    - A scaled-up, predictable, and flexible volume of concessional resources enabling a whole spectrum of development finance tools and buy-in from multi-stakeholders
7. To maximize the comparative advantages of CIF's proven business model in support of accelerated climate action in priority areas within the next two to three years, the CIF Administrative Unit and partner MDBs developed three new program proposals for consideration by the Joint Meeting of the Clean Technology Fund (CTF) and Strategic Climate Fund (SCF) Trust Fund Committees at its June 2019 meeting:
    - The Large-scale Integration of Renewable Energy Program
    - The Climate-Smart Urbanization Program
    - The Accelerated Low-Carbon Transition in Industry Program

    A fourth program proposal aimed at driving transition in land-use systems is still under development, and it will be submitted at a later stage.
8. CIF's business model is particularly well suited to deliver on these programs. This is because effective and efficient climate action in these priority areas depends on collaborative multi-stakeholder partnerships, coordinated sectoral and cross-sectoral policies, and integrated climate responses linked with broader sustainable development objectives. It also depends on the availability of flexible concessional capital at scale to pilot-test new approaches, deploy unproven technologies, and achieve risk-adjusted returns attractive to private investors.

9. CIF has experience and a functional structure in place that can help drive system transitions in these priority areas. To implement these promising program proposals, and thereby harness the unique strengths of CIF's business model to deliver on key priorities, the Joint Meeting of the CTF and SCF Trust Fund Committees can consider one and/or a combination of the following options:
    - Establish these programs as dedicated programs within the CTF's structure, much like the current Dedicated Private Sector Programs
    - Establish these programs as separate programs within the SCF's structure
    - Establish these programs under a new fund that would follow the current CIF's business model, including its policies, and take advantage of the existing structures within the CIF Administrative Unit and MDBs, but have its own dedicated Trust Fund Committee.

1 Climate investments need to shift into high gear

1. The world is nowhere near on track to avoid warming beyond the 1.5°C target. Increasing warming is projected to amplify the climate-related impacts that have already been observed on natural and human systems. Some of these impacts may be long-lasting or irreversible.[3]

2. Driven by higher energy demand, global energy-related greenhouse gas (GHG) emissions rose 1.7 percent to a historic high of 33.1 gigatons of carbon dioxide (Gt CO_2) in 2018. Global average annual concentration of GHG in the atmosphere reached an averaged 407[4] parts per million (ppm). This is a major increase from pre-industrial levels, which ranged between 180 and 280 ppm.[4]

3. Nationally Determined Contributions (NDCs) submitted by governments as contributions to global climate action under the Paris Agreement have the potential to deliver sizeable emission reductions and slow down emissions growth in the coming decade. However, these will not be enough to keep the global temperature rise since pre-industrial times to 1.5°C.[5] At the current rate of growth in GHG, concentration levels will hit and go beyond the 450 ppm "threshold", putting us on track to reach temperature boosts of more than 3°C.[6] Increased levels of warming are projected to increase risks and impacts, the extent of which will vary across geographies depending on the ability of different societal and environmental systems to mitigate or adapt to change.[7]

"This is our 'use it or lose it' moment: the decisions we take over the next 2-3 years will determine our growth and climate future."[8]

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4. **Limiting global warming to 1.5°C will require "rapid and far-reaching transitions in energy, land, urban and infrastructures, and industrial systems."[9] We have a small window of opportunity to boost climate action and shift investments away from high-carbon and climate-vulnerable industries and assets.**

5. The scientific community has identified the energy, land, urban and infrastructures, and industrial systems[10] as the priority areas where transformative change is needed in the critical two to three-year window ahead. Many of the policy and investment decisions that will shape the next 10 to 15 years will be taken in the next two to three.[11] The choices that countries, cities, and investors make today will lock-in economic and climate benefits—or costs—for decades to come. Climate science indicates that unless a decisive shift is made by 2030, the world will pass the point by which global average temperature can be limited to well below 2°C.[12] With each passing year, the risks and costs of unabated climate change mount at a faster and greater scale.[13]

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[3] IPCC (2018), *Summary for Policymakers. In: Global Warming of 1.5°C.* An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. World Meteorological Organization, Geneva, Switzerland, 32 pp.

[4] IEA (2018), *Global Energy & CO_2 Status Report 2018*.

[5] UNFCCC (2016), *Synthesis Report Update of National Climate Plans*.

[6] The IPCC's Fifth Assessment Report indicates that emissions scenarios leading to GHG concentrations in 2100 of about 450 ppm or lower are likely to maintain warming below 2°C over the 21st century relative to pre-industrial levels

[7] IPCC (2018), *Special Report: Global Warming of 1.5°C*, *Summary for Policymakers.*

[8] The NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times*.

[9] IPCC (2018), *Special Report: Global Warming of 1.5°C*, *Summary for Policymakers.*

[10] IPCC (2018), *Special Report: Global Warming of 1.5°C*, *Summary for Policymakers.*

[11] The NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times*.

[12] IPCC (2018), *Special Report: Global Warming of 1.5°C*, *Summary for Policymakers.*

[13] The NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times* .

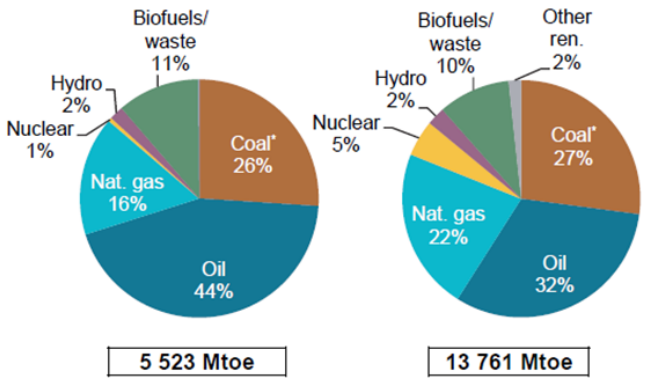
6. Rapid structural and systemic changes in financial systems and the real economy are needed at unprecedented scales to enable the transitions. The following key facts underscore the urgency for such structural and systemic changes:

7. Climate finance flows, USD 681 billion in 2016, remain relatively modest when compared to overall finance flows and needs.[14] Estimated total global investment in fossil fuel supply and fossil fuel subsidies amounted to USD 742 billion and USD 373 billion respectively.[15] In terms of stock, USD 203 billion low-carbon investment in assets under management and USD 894 billion in outstanding green and climate-aligned bonds are dwarfed by the USD 71 trillion of total assets under management, the USD 92 trillion in outstanding global debt securities, and the USD 35 trillion of real estate assets potentially at risk from climate change.[16]

   a. About 60 percent of world's total primary energy supply still comes from oil and coal. As Figure 1 highlights, over the past 45 years there has not been a major shift in the structure of energy supply systems nor in the related capital allocations. Renewable energy-based electricity generation increased at its fastest pace this decade, but still not fast enough to meet the increase in demand for electricity around the world.[17] Coal remains the largest source of electricity and the second largest source of primary energy.[18] Despite the reduction in costs of many renewable energy technologies, several barriers continue to hamper their large-scale growth, including the lack of flexibility in electricity grids to accommodate increasing shares of variable renewable energy generation. Further, energy generation is at risk from water scarcity patterns and extreme climate-related events, and the associated impacts have already been felt in many contexts.[19]

Fig. 1: A major shift in the structure of energy systems still has to happen

Total primary energy supply by fuel



* In this graph peat and oil shale are aggregated with coal.

Source: IEA (2018), World Energy Balances 2018

   b. Urban areas are central to the fight against climate change[20] and to adapt to its expected impacts. Urgent and coordinated action is needed to unleash cities' significant potential. Urban sprawl, chronic traffic congestion, emissions, and toxic air pollution are critical issues in many cities. Nearly

[14] UNFCCC Standing Committee on Finance (2018), *2018 Biennial Assessment and Overview of Climate Finance Flows Technical Report based on OECD and IEA data*. Estimates on investment in fossil fuel and subsidies refer to 2016 and 2015 respectively.

[15] UNFCCC Standing Committee on Finance (2018), *2018 Biennial Assessment and Overview of Climate Finance Flows Technical Report based on OECD and IEA data*. Estimates on investment in fossil fuel and subsidies refer to 2016 and 2015 respectively.

[16] UNFCCC Standing Committee on Finance (2018), *2018 Biennial Assessment and Overview of Climate Finance Flows Technical Report*.

[17] IEA (2019), *Global Energy and CO_2 Status Report – The Latest Trends in Energy and Emissions in 2018*.

[18] IEA (2019), *Global Energy and CO_2 Status Report – The Latest Trends in Energy and Emissions in 2018*.

[19] In Rwanda, for instance, the 2004 drought reduced hydropower capacity so much that the Government was forced to rent diesel power plants to meet domestic demand. (Republic of Rwanda (2011): *Green Growth and Climate Resilience*.

[20] IPCC (2014). *Human Settlements, Infrastructure, and Spatial Planning*. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report.

a billion urban residents live in informal settlements without access to secure tenure, decent housing, or improved water and sanitation. Urbanization is occurring at a rapid pace, with much of the expected urban growth likely to occur in developing countries where new urban areas are emerging. Over 60 percent of the land projected to become urban by 2030 in developing countries has yet to be developed.[21] Yet, a significant share of urban population growth and urban infrastructure investment continues to take place in areas vulnerable to climate change impacts, such as low-lying coastal areas, floodplains, or steep slopes.[22]

c. The industrial sector accounts for 24 percent of global GHG emissions, and these grew by 1.3 percent a year between 2010 and 2016.[23] By 2030, the International Energy Agency (IEA) estimates that industrial GHG emissions will become the biggest share of global GHG emissions, with the greatest growth expected to come from non-OECD countries.

8. Investments in climate action need to scale up significantly and as soon as possible to enable the "far-reaching transitions" and the associated structural and systemic changes required.[24] In the energy sector alone, limiting warming to 1.5°C would require an average of about USD 3.5 trillion per annum on a global basis between now and mid-century.[25] In the urban sector, the shortfall in financing available for sustainable infrastructure currently exceeds USD 1 trillion a year.[26] In the industry sector, cumulative investment needs for energy-intensive corporates in the below 2°C scenario are estimated to be USD 7 to 8.7 trillion, 34 percent of which would need to be made before 2030.

9. Scaling up and speeding up climate investments in developing and emerging countries is particularly relevant to avoid 'locking in' high-emissions development pathways and climate vulnerabilities. These countries are expected to experience significant growth in the next few decades, as well as disproportionate impacts of climate change.

2 CIF is well suited to accelerate investments for systemic climate actions

10. **The unique features of CIF's business model are particularly well suited to drive the rapid structural and systemic changes required in the priority areas where transformative change is needed in the critical two to three-year window ahead.** Over the last 10 years, the CIF has fine-tuned a highly effective and efficient business model that has delivered transformational change across many countries, regions, and sectors. CIF has experience and a functional structure in place that can continue supporting developing and emerging countries' climate change efforts.

11. The capabilities and comparative advantage of CIF reside in the unique features of its business model which include the following:

    - A country-led programmatic approach enabling the participatory design and implementation of strategically linked investments unified by a transformative vision

[21] The NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times – Cities.*

[22] See LSE (2019), *Scaling Up Investment for Sustainable Urban Infrastructure: A Guide to National and Subnational Reform;* Revi A. et al. (2014), *Urban areas. In: Climate* Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the I*PCC.*

[23] IEA (2018), *Industry Tracking Clean Energy Progress.*

[24] IPCC (2018), *Special Report: Global Warming of 1.5°C, Summary for Policymakers.*

[25] Note: Investment estimates refer to 2016-2050. Source: IPCC (2018), *Special Report: Global Warming of 1.5°C - Strengthening and Implementing the Global Response.*

[26] The NCE (2017), *Financing the Urban Transition: Policymakers' Summary.*

- Multiple multilateral development banks (MDBs) operating in a coordinated fashion to implement large-scale packages of cross-sectoral interventions and mobilize additional public and private capital
- A scaled-up, predictable, and flexible envelope of concessional resources enabling a whole spectrum of development finance tools and incentivizing high-level engagement within governments and sector ministries

12. The implementation of effective and efficient 1.5°C-consistent responses calls for a programmatic approach taking a wider systemic perspective to investments rather than a piecemeal or project-by-project view. It also calls for multi-stakeholder partnerships, coordinated sectoral and cross-sectoral policies and interventions that link mitigation and adaptation with other societal objectives.

13. The experience of CIF's business model to date, exemplified in Annex A, provides evidence on the effectiveness of CIF's key features in moving markets and producing signals of systemic change.[27] CIF has demonstrated its suitability in tackling those market and institutional failures, price distortions, and gaps in knowledge, viability, and risk that constrain pro-climate policy actions and investments.

3 CIF's proven business model can deliver impact in the short term

14. The CIF Administrative Unit and partner MDBs assessed and developed a set of new programming proposals that would allow to build on the success of the CIF's business model to deliver on emerging priorities and push technological frontiers further and faster. These programs, which are submitted to the Joint Meeting of the Clean Technology Fund (CTF) and Strategic Climate Fund (SCF) Trust Fund Committees for consideration at its June 2019 meeting, seek to drive:

    - Large-scale integration of renewable energy
    - Climate-smart urban development
    - Accelerated low-carbon transition in industry

    A fourth program proposal seeking to scale up sustainable landscape-based management solutions is still under development and will be submitted to the Trust Funds Committees at a later stage.

15. The following set of criteria guided the identification and development of these new programming proposals:

    - Current gaps in the climate finance architecture
    - CIF's model (country-led, multi-MDB, programmatic and participatory approach and flexible and predictable concessional finance at scale) holds a comparative advantage
    - Priority sector/technology requiring concessional finance to take-off
    - Frontier technologies/markets nearing tipping points or with high transformational impact potential
    - MDBs' ability to deliver a pipeline in the next two to three years
    - Potential to mobilize private capital at a significant scale

16. These three program proposals, which are summarized in the following sections and featured in their full extent in Annex B, highlight how flexible, predictable concessional capital at scale delivered in a programmatic form is needed to address major outstanding institutional and market barriers in the short-term (see Table 1). The proposals also provide an overview on the possible range of interventions which, according to relevant literature, could deliver at least USD 26 trillion in net economic benefits by 2030

[27] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds.*

compared to business-as-usual scenarios. Seizing these benefits will only be possible with bold climate action over the next two to three years.[28]

17. CIF has experience and a functional structure in place that can help drive system transitions in these priority areas. To implement these promising program proposals, and thereby harness the unique strengths of CIF's business model to deliver on key priorities, the Joint Meeting of the CTF and SCF Trust Fund Committees can consider one and/or a combination of the following options:

    - Establish these programs as dedicated programs within the CTF's structure, much like the current Dedicated Private Sector Programs
    - Establish these programs as separate programs within the SCF's structure
    - Establish these programs under a new fund that would follow the current CIF's business model, including its policies, and take advantage of the existing structures within the CIF Administrative Units and MDBs, but have its own dedicated Trust Fund Committee.

Table 1: Examples of barriers to climate action across the priority systems targeted by CIFs' thematic programming proposals

Priority areas → / Barriers ↓	Energy systems	Urban and infrastructure systems	Industrial systems
INSTITUTIONAL BARRIERS TO CLIMATE ACTION	▪ Institutional inertia and short-termism ▪ Weak institutional capacity, knowledge and skills ▪ Inadequate availability of public capital	▪ Institutional inertia including governance failures and short-termism ▪ Weak institutional capacity, knowledge and skills to initiate/develop climate-relevant projects or act as bankable counterparties ▪ Lack of upfront public capital	▪ Institutional inertia ▪ Weak institutional capacity, knowledge and skills
MARKET BARRIERS TO CLIMATE ACTION	▪ Policy and/or political risks ▪ Knowledge and capacity gaps ▪ High capital costs ▪ Technology risks & challenges ▪ Insufficient and/or uncertain risk-adjusted returns ▪ Inadequate access to finance ▪ Social barriers e.g. public opposition due to insufficient participation of local stakeholders	▪ Political risks ▪ Regulatory-related disincentives ▪ Asset–liability mismatch (liquidity requirements) ▪ Insufficient and/or uncertain risk-adjusted returns ▪ Imperfect information on investment opportunities / lack of "climate valuation" criteria and measurements	▪ Deficient regulatory and policy frameworks including mispricing of natural resources ▪ Knowledge and capacity gaps including limited awareness on or ability to price climate risks ▪ High technology risk perceptions ▪ Insufficient and/or uncertain risk-adjusted returns

Source: CIFs' thematic programming proposals (See Annex B); NCE (2018); IPCC (2018); Floater et al. (2018).

[28] NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times. Note: estimates on the economic benefits include those associated to land-use-related measures.*

3.1 Proposal overview: Large-Scale Integration of Renewable Energy Program

18. **To meet the climate goals, the share of renewables in the power mix needs to rise from one-quarter of the total generation in 2018 to two-thirds in 2040 and to over two-thirds by 2050.[29] It is critical to ensure the momentum of the energy sector transformation, speed its progress,[30] and implement demand- and supply-side grid flexibility resources to reliably integrate variable renewable energy in energy systems.**

19. The Large-Scale Integration of Renewable Energy Program recognizes two main challenges:

    d. Most power systems are not yet designed to deal with the variability and uncertainty of renewable energy generation at scale. Several flexibility sources[31] need to be harnessed in all sectors and planned ahead of time to shift cost-effectively from a fossil fuel-based energy system toward one dominated by renewable energy.

    e. Energy access remains a key development constraint. Nearly a billion people do not have access to electricity and 2.7 billion lack access to clean cooking facilities, relying instead on biomass, coal, or kerosene as their primary cooking fuel.[32] Decentralized systems, led by solar photovoltaic (PV) in off-grid and mini-grid systems, are considered the least-cost solution for three-quarters of the additional connections needed to provide universal electricity for all.[33]

20. The proposed *Large-Scale Integration of Renewable Energy Program* aims to enable the smooth integration of higher shares of intermittent renewable energy generation into the grid and increase off-grid access to renewable energy. As illustrated in Table 2, the program will do so by strategically deploying CIF's concessional capital through MDBs to support countries in accelerating the deployment of an integrated mix of flexibility measures in the following areas:

    - Enabling institutional and policy environment
    - Enabling technologies
    - Enabling infrastructure
    - Electrification and demand management

[29] IEA (2018), *Global Energy & CO_2 Status Report 2018*; *NCE (2018)*, *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times*.
[30] IEA (2017), *Energy Technology Perspectives 2017*.
[31] Flexibility refer to technical and operational aspects. Technical flexibility sources refer to a set of supply-side, demand-side and grid related measures including energy storage, demand-side management programs and transmission networks-related interventions. Operational flexibility refers to how the assets in the power system are operated. Beyond the constraints associated to each technology's capabilities, it is dependent on the regulatory and market environment that surrounds the physical system and drives system operations. (Source IRENA (2018), *Power System Flexibility for the Energy Transition*).
[32] IEA 2017 data available at *Sustainable Development Goal 7*.
[33] IEA (2018), *World Energy Outlook 2018*.

Table 2: Examples of interventions and instruments per target area of the proposed Large-Scale Integration of Renewable Energy Program

	Enabling Environment	Enabling Technologies	Enabling infrastructures	Electrification & Demand Management
TYPES OF INTERVENTIONS	**Sector policy level activities** ▪ Set policy targets and roadmap for deep decarbonization (low carbon pathway for energy and related sector) ▪ Create/improve auctions/procurement mechanisms for renewable energy ▪ Foster and pilot carbon pricing mechanisms **Market and system design and operations** ▪ Advanced weather forecasting and training on RE integration for grid operators ▪ Increased time and space granularity in electricity markets ▪ Promoting net billing schemes ▪ Designing carbon pricing / markets, renewable certificate (iREC) ▪ Long term contracting of energy or enabling hedging strategies	▪ **Energy storage technologies**, such as batteries, pumped hydro, and hydrogen, which are able to back up the variability of renewables and provide various services to the grid. ▪ **New technologies for real time grid management** that enhance electricity system flexibility and facilitate distributed generation, such as advanced metering systems, wireless network control and demand side management.	▪ **Grid interconnection** to integrate regional markets increasing their flexibility ▪ **Grid modernization** (to improve control of voltage, frequency, fault current, etc.) and expansion (to improve RE power transfer capacity). ▪ **Improve the climate resilience of grid**s to more frequent increased temperatures and extreme weather events as a result of climate change, particularly for hydropower-dominated systems ▪ **Electric vehicle charging infrastructure**, opening doors to new markets for renewable generation as well as new ways to store the generation surplus.	▪ **Business models that empower consumers**, turning them into active participants. ▪ New and smart grids, both large and small scale, that complement each other and enable new ways to manage RE generation. ▪ Innovative schemes that enable renewable energy supply, in both off-grid and connected areas with focus on **energy access**
INSTRUMENTS	▪ Grants for technical assistance and policy dialogue	▪ Grants for project preparation ▪ Junior equity / Mezzanine ▪ Concessional Debt (senior/sub) ▪ Guarantees / Hedging ▪ Performance-based incentives	▪ Grants for project preparation ▪ Concessional debt (senior/sub) ▪ Guarantees / hedging ▪ Performance-Based Incentives ▪ Credit enhancement of green bonds	▪ Grants for advisory services ▪ Equity / Mezzanine ▪ Concessional debt (senior/sub) ▪ Guarantees ▪ Performance-Based incentives

21. The program envisages a holistic programmatic approach encompassing the following:
    a. Action planning through long-term decarbonization strategies, identification of priority challenges and/or opportunities for improvements in legal and regulatory frameworks, as well as power market design and system operation
    b. Financial and non-financial support to public and private investments, including through new or improved business models
    c. Technical support and capacity building to governments to help them develop ambitious and feasible decarbonization policy and regulatory frameworks and supportive market design and system operations
22. Table 2 provides an overview on the possible range of instruments required to meet the program's objectives, spanning from grants for technical assistance to governments and project reparation through to credit enhancement in support of green bond issuance.
23. **CIF's business model is particularly well suited to deliver on the *Large-Scale Integration of Renewable Energy Program's* objectives**, considering the following:
    a. Accelerating the energy sector transformation and ensuring continued system efficiency and reliability requires efficient institutional dialogue and long-term coordination and planning between national, regional, and local governments and with other stakeholders of the energy

system.[34] Such dialogue and coordination is relevant to provide long-term low-carbon market signals that can accelerate decommissioning of coal and diesel generation and replacement by large-scale renewables.

b. Encouraging sustained investments in multiple infrastructure areas to achieve long-term impacts requires consistent policies coordinated across various energy sectors and developed based on the policy objectives of the many facets of government and business decision-making (e.g., taxation, urban planning, trade, innovation).[35]
c. Ensuring affordable, secure, and sustainable energy systems in the face of a greater reliance on distributed generation and more diverse sources of energy requires an integrated system management approach.[36]
d. Mobilizing private capital at scale (for example, by piloting new blended finance solutions) calls for CIF's toolbox of flexible cost and risk-bearing instruments. Meeting context-specific investment needs and achieving risk-return profiles attractive to private investors requires, in fact, a wide array of tailored financial and non-financial instruments.

24. The *Large-Scale Integration of Renewable Energy Program* expects to achieve significant GHG emission reductions, improve energy security, enhance the resilience of energy systems, and have positive impacts on employment and inclusion.

3.2 Proposal overview: Climate-Smart Urbanization Program

25. **Strategic urban planning and coordinated urban infrastructure investments are essential to creating low-carbon and climate-resilient cities that secure economic prosperity and protect citizens and economies from climate-related risks**.[37]

26. The *Climate-Smart Urbanization Program* aims to support cities in developing and emerging countries to accelerate the implementation of ambitious and transformative policy actions and investments that significantly contribute to transitioning to low-carbon and climate-resilient urbanization pathways. On one hand, unplanned and unstructured growth poses the risk of locking-in sprawling and economic, climate, and social costs over the long-term. On the other, urban growth offers the chance to plan, design, build, and manage cities that are environmentally, socially, and economically sustainable from the outset. Unlocking the power of cities to deliver economic development in a sustainable way depends on compact, connected, and coordinated use of urban land and ambitious action.[38]

27. As shown in Figure 3, this strategy proposes to do so by leveraging CIF's business model to strategically deploy CIF's concessional capital through MDBs to achieve the following:

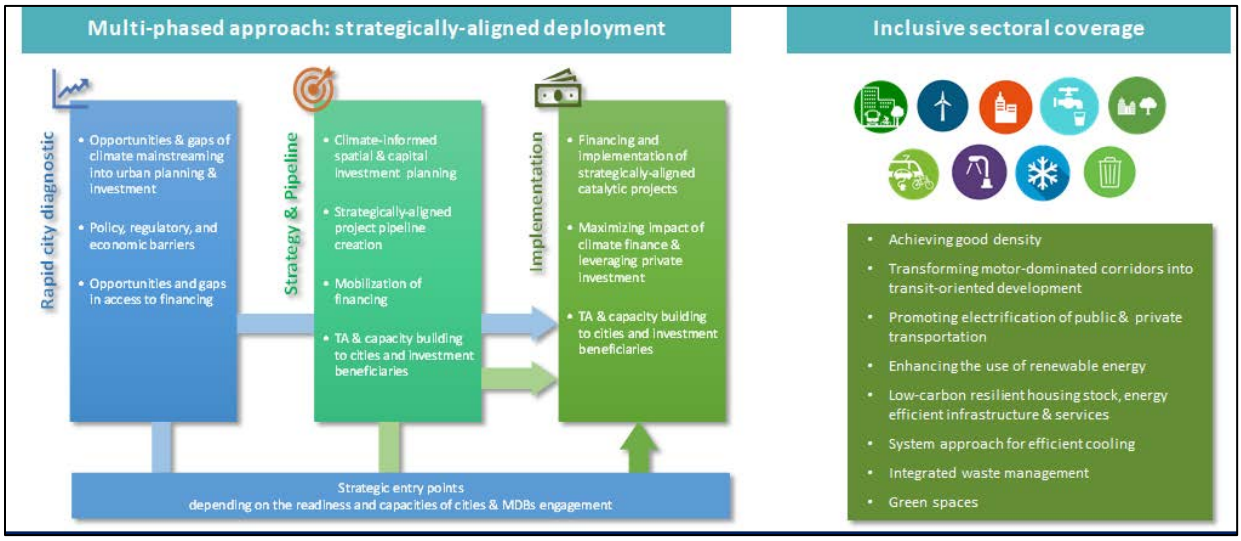
f. Diagnose cities' policy and regulatory frameworks, technical and financial capabilities and governance structures to identify gaps and opportunities to mainstreaming climate-related considerations into planning and investments
g. Prepare climate-informed, multi-sector strategic plans aligned with relevant local/national policies, and catalytic project pipelines
h. Implement priority policy reforms

[34] IEA (2017), *Energy Technology Perspectives 2017*.
[35] IEA (2017), *Energy Technology Perspectives 2017*.
[36] IEA (2017), *Energy Technology Perspectives 2017*.
[37] LSE (2019), *Scaling Up Investment for Sustainable Urban Infrastructure: A Guide to National and Subnational Reform*.
[38] NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times*. *Note: estimates on the economic benefits include those associated to land-use-related measures.*

i. Support projects that stimulate public or private investments in transport, energy, buildings' solid waste, and/or other interventions that improve a city's adaptation and resilience to climate shocks

28. CIF's concessional resources will be deployed to create conducive enabling environments, bridge data and information gaps, and build the capacity of cities and investment beneficiaries to make climate-informed policy and investment decisions across key sectors. They will also be targeted to crowd in additional public and private capital by de-risking investments through blended finance solutions, offering credit-enhanced capital market instruments, or creating efficient and attractive public-private partnerships.

Figure 3: A multi-phased approach to low-carbon and climate-resilient urbanization



29. **CIF's programmatic approach represents a suitable model for the successful delivery of the *Climate-Smart Urbanization Program*** for the following reasons:

j. Participatory planning and effective coordination and collaboration across levels of government (national, state, and municipal), the private sector, and civil society organizations are critical to designing, financing, and delivering transformative urban infrastructure investments[39]

k. Aligning multiple actors' behavior and incentives around a common vision will be critical to achieving compact and connected cities. Different levels of governments have different roles to play and need to work together to develop effective national-urban policy and fiscal frameworks across multiple sectors like housing, energy, transport, and tax policies[40]

l. Delivering economically, socially, and environmentally sustainable urban development requires a strategic and coherent approach to public spending and investment.[41] It calls for the use of a wide range of mechanisms to access finance, allocate costs and risks to the actor(s) more suited to bear them, and crowd in private capital at scale.

[39] LSE (2019), *Scaling Up Investment for Sustainable Urban Infrastructure: A Guide to National and Subnational Reform*.
[40] NCE (2018), *Unlocking the Inclusive Growth Story of the 21st Century – Accelerating Climate Action in Urgent Times*.
[41] LSE (2019), *Scaling Up Investment for Sustainable Urban Infrastructure: A Guide to National and Subnational Reform*.

30. In delivering this program MDBs would leverage their institutions' extensive experience in investing in municipal infrastructure, maximizing synergies, and attracting capital at scale, including through public-private partnerships or innovative financial mechanisms such as sustainable bonds and climate insurance. Further, the CIF-MDB partnership, which has demonstrated its efficacy in enabling testing and disseminating learning, can facilitate the dissemination and replication of global good practices while tailoring knowledge and climate-smart solutions to local circumstances.

31. The *Climate-Smart Urbanization Program* proposes to pilot a new urbanization growth paradigm initially in around 15 to 20 cities to focus efforts and deliver results. It expects to boost long-term urban productivity, avoid carbon and climate vulnerability lock-in, yield environmental and social benefits, and contribute toward unleashing cities' potential to attract more than USD 29.4 trillion in climate-related investments.[42]

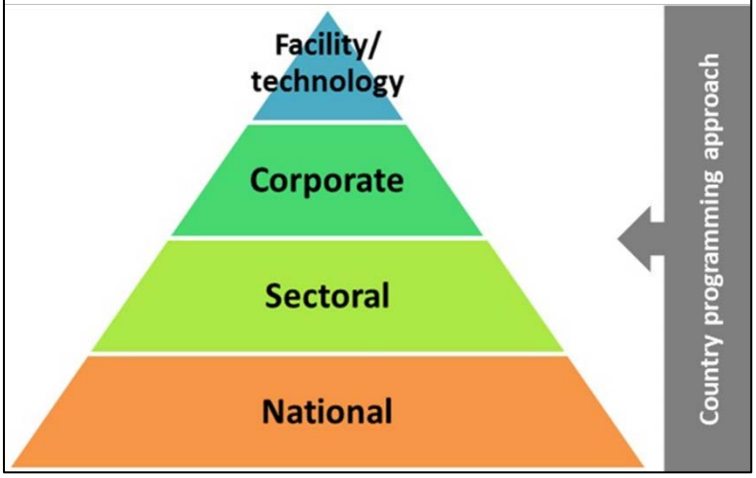
3.3 Proposal overview: Accelerating Low-Carbon Transition in Industry Program

32. **The industrial sector accounts for about 38 percent of global total final energy use and is responsible for about 24 percent of total GHG emissions.[43] Aligning with the Paris temperature goal calls for an accelerated industrial transformation.**

33. The *Accelerating Low-Carbon Transition in Industry Program* aims to catalyze deep behavioral changes and sustainable impact in priority high-emitting industries. Accelerating the low-carbon transition in industry is high on the agenda of global leaders. The United Nations General Secretariat selected this area as one of the lead themes at the Climate Action Summit 2019, with a dedicated "action track" that aims for an about 30 percent reduction of global emissions from key heavy industries, such as shipping (3 percent of global emissions), aviation (3 percent), transport (7 percent), petrochemicals including oil and gas (5 percent), iron and steel (7 percent), cement (7 percent), and aluminum (0.4 percent).

34. Harnessing such decarbonization opportunity implies significantly and rapidly scaling-up investments to understand and tackle the context-specific systemic challenges that 'tough-to-crack' high-emitting sectors face. It also implies avoiding carbon and vulnerability lock-in by installing new plants with highly efficient energy, material, and processes in developing countries undergoing industrialization. The *Accelerating Low-carbon Transition in Industry Program* seeks to do so by intervening at multiple levels—industrial facility/technology, corporate, sectoral and national—in an

Figure 4. An integrated approach to accelerate the low-carbon transition in industry



[42] IFC (2018), *Climate Investment Opportunities in Cities, An IFC Analysis*. Note: the report provides investment potential estimates across six key sectors (waste, renewable energy, public transportation, water, electric vehicles, and green buildings) by 2030 in cities in emerging markets.

[43] Note: data refer to 2016. Source IEA at https://www.iea.org/tcep/industry/.

integrated manner informed by an overarching country programming strategy (see Figure 4). The following activities are envisioned:

a. Industrial facility/technology level: Enhance the ability of corporates to understand their carbon footprint, identify technologies that deliver maximum emission reductions at lowest marginal costs, and invest in scalable low-carbon and climate-resilient solutions. Such a facility-wide planning approach would help highlight the benefits generated by investments in low-carbon and climate-resilient solutions (e.g., productivity improvements, differentiation from competitors, and business continuity in the face of physical climate risks).
b. Corporate level: Build the capacity of corporates operating in priority industries to price and manage climate risks, identify associated opportunities, and integrate climate considerations into corporate governance and investment decision-making. This include assisting them in the implementation of the Task Force on Climate-related Financial Disclosures' (TCFD) recommendations.[44]
c. Sectoral level: Design participatory sectoral "roadmaps" aligned with the Paris Agreement to deliver transformational change. Such an approach would offer a space for all stakeholders to define a shared vision for shifting to low-carbon, climate-resilient planning along with mitigation targets at the national level and carbon pricing.
d. International and national level: Engage national and sub-national authorities and other stakeholders in policy dialogues to tackle regulatory-related barriers to action and translate countries' NDC into regulatory reforms and operational strategies, and interventions at the corporate and industry levels.

35. This program proposes to strategically deploy CIF's concessional resources to build technical and financial capacity, achieve attractive risk-adjusted returns, strengthen regulatory frameworks, and accelerate the implementation of the TCFD's recommendations. Table 3 offers an overview on the entry points of intervention and the spectrum of possible measures.

36. **CIF's business model is uniquely placed to deliver on the goals of the *Accelerating Low-Carbon Transition in Industry Program*** due to the following:

m. CIF's track record and institutional capabilities will enable the prompt implementation of a coherent strategy for addressing GHG emissions in the industry sector, an area not yet targeted strategically by any constituents of the climate finance architecture.
n. CIF's tested programmatic approach will enable the private-public cooperation required to develop and implement Paris-aligned roadmaps and support the implementation of countries' NDCs.
o. Flexible, scaled-up, multi-MDB support via a programmatic approach is necessary to drive deep behavioral changes and catalyze transformational change in industry.
p. MDB collaboration in the delivery of a coherent package of interventions will help generate demonstration effects that go beyond the direct impacts of each MDB's individual investment facility.
q. The CIF-MDB partnership will help leverage and further build out the existing policy dialogue and capacity building on carbon pricing and carbon markets (e.g., Partnership for Market Readiness) and climate governance (e.g., Paris Alignment and Sustainable Development Goals) by strategically connecting these dialogues to investment programs that can drive transformational change on the ground.

[44] TCFD (2017), *Recommendations of the Task Force on Climate-related Financial Disclosures*.

Table 3: Possible interventions and instruments per target area of action under the proposed Accelerating Low-carbon Transition in Industry Program

	National	Sectoral	Corporate	Facility/Technology
EXAMPLES OF INTERVENTIONS	▪ Support countries to update their Nationally Determined Contributions (NDCS) and long-term low-carbon strategies under the Paris Agreement ▪ Support national actions required to drive investments into low-carbon corporate and industrial solutions e.g. carbon pricing and energy efficiency standards ▪ Support the development of markets for Internationally Traded Mitigation Outcomes (ITMO) approaches ▪ Enhance the regulatory environment for ITMO approaches such as GHG MRV and accounting under NDCs	▪ Develop sectoral low-carbon "roadmaps" addressing policy, regulatory, social and investment barriers to transformational change ▪ Enhance existing Nationally Appropriate Mitigation Actions to leveraging significant climate finance for catalytic whole-of-sector transformation approaches ▪ Promote sector and stakeholder group inclusivity and country ownership over sectoral low-carbon transformation pathways	▪ Piloting and accelerating the implementation of the TCFD's recommendations ▪ Managing GHGs emissions in the supply chain by promoting life-cycle emission analysis and scaling up green procurement approaches ▪ Build corporate's technical capacity to issue green bonds and catalyze demand from investors through tailored investment support e.g. credit enhancement ▪ Introduce corporate level MRV systems	Energy efficiency technologies ▪ High energy efficient production/process machineries ▪ Energy savings measures for process equipment e.g. heat recovery ▪ Energy management system upgrades ▪ Electrical and hybrid handling equipment and charging points/electrification solutions ▪ Low-carbon transport related technologies e.g. anti-ilding technologies, hybrid traction systems Renewable energy technologies: ▪ Facility level solar systems, biogas/biomass use, energy storage, advanced waste management
INSTRUMENTS	▪ Grants for capacity building and policy dialogues / reforms, including carbon-pricing ▪ Performance-based incentives	▪ Grants for capacity building and policy dialogues / reforms, including carbon-pricing	▪ Grants for capacity building ▪ Concessional debt (senior/sub) ▪ Green bonds ▪ Performance-based incentives	▪ Concessional debt (senior/sub) ▪ Guarantees ▪ Performance-based incentives

37. The *Accelerating Low-Carbon Transition in Industry Program* proposes to focus on middle-income countries whose industrial sector constitutes a major and growing share of overall GHG emissions. The integrated participatory approach proposed by this program has the potential to significantly contribute to driving the industrial transition needed to rapidly bend the GHG emissions curve. It also has the potential to generate a demonstration effect that will encourage others to replicate the program's approach in similar contexts elsewhere.

4 CIF's proven business model can push boundaries to drive innovation

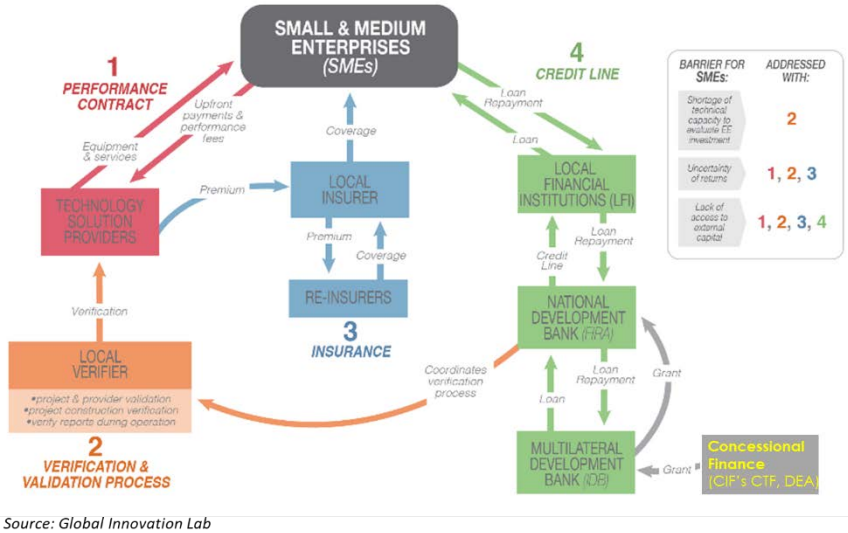
38. **CIF's business model holds a proven comparative advantage in enabling innovation. The new programming options offer an opportunity to accelerate MDBs' efforts in pursuing frontier approaches in difficult contexts and attracting private investors in new ways.**

39. CIF partnership with MDBs harnesses these institutions' capabilities, credit standing, and reach to innovate on how climate finance is deployed on the ground. Looking back, financial innovation found fertile ground in MDBs who introduced new tools, such as B-Loan, B-Bond structures, or private equity partnerships. In their climate operations, CIF has helped MDBs develop and test new products and learn lessons that were later replicated with their own resources and/or with resources from other partners, thus amplifying CIF's transformational impact.[45] CIF has helped MDBs "learn by doing" in relation to blended finance structures.[46]

[45] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.
[46] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.

r. The Inter-American Development Bank (IDB), for instance, piloted with CIF's support the Energy Savings Insurance Facility in Mexico and Colombia.[47] The Green Climate Fund (GCF) subsequently approved financing for its replication in El Salvador.[48] The Energy Savings Insurance Facility is an innovative risk-sharing mechanism structure that incentivizes and enables small- and medium-sized enterprises to invest in energy efficiency by paying out if the projected value of energy savings is not met. Its key features are illustrated in Figure 4. The Energy Savings Insurance Facility has been recognized by international think tanks, donors, and specialized publications for its innovative features and private finance mobilization potential.[49] It is now being replicated in other Latin American countries while continuing to raise interest in other regions.

Figure 4. Energy Savings Insurance



Source: Global Innovation Lab

40. Looking forward, CIF can enhance MDBs' ability to further innovate with a view of pulling private capital into geographies and markets otherwise deemed too risky or costly. Capitalizing on the lessons learned over a decade-long partnership, CIF can do so by fostering enhanced dialogues and learning with MDBs, and by supporting them in the design and implementation of innovative financing strategies seeking to:

    s. Tackle barriers to private climate investments that have not yet been addressed and/or that could be addressed more effectively and efficiently than approaches deployed to date by partner MDBs.
    t. Mobilize capital toward areas that have not yet been able to attract MDB or commercial capital at all or at scale.
    u. Accelerate recipient countries' ability to deliver on their climate and sustainable development targets.

41. To this end, the CIF Administrative Unit has engaged with the Global Innovation Lab for Climate Finance[50] (The Lab) to identify innovative blended finance instruments and business models of relevance to CIF's new programs in energy, urban, and industrial systems. To explore and harness their potential, CIF will

[47] Energy Savings Insurance Program at https://www.greenfinancelac.org/our-initiatives/esi/.
[48] GCF PROJECT FP009, *Energy Savings Insurance for Private Energy Efficiency Investments by Small and Medium-Sized Enterprises*.
[49] Energy Savings Insurance at https://www.greenfinancelac.org/our-initiatives/esi/.
[50] Global Innovation Lab for Climate Finance is a public-private initiative aimed at identifying, developing, and launching innovative finance instruments that can drive billions in private investment to action on climate change and sustainable development.

engage partner MDBs to evaluate these innovative structures in the context of the new programs. Tables 4, 5, and 6 provide examples of instruments that could be explored.

42. The analysis of 41 instruments of The Lab[51]—including innovative structures for tapping into capital markets via green bond issuance, pay-per-service models, and foreign exchange risk management tools—highlights the following:

    v. Many instruments have the potential to expand MDBs' toolbox and to overcome persistent barriers to the mobilization of private capital at scale for high-impact projects.

    w. Flexibility and risk taking are highly relevant to maximizing the impact of concessional finance resources, mobilizing private capital, and driving innovation. This is because concessional finance tranches must be tailored and blended in ways that address varying context- and investor-specific knowledge, cost, and risk barriers.

43. **The partnership with MDBs allows CIF to ensure diligent and targeted use of concessional capital for private sector projects thanks to their adherence to common standards**[52] for blending. These standards guide the structuring of blended finance transactions with a view of maximizing development impact and crowding in private investments while ensuring minimum concessionally and avoiding market distortions.

44. **The CIF-MDB partnership also allows CIF to maximize learning within and across MDBs and the broader climate finance community**, with a view of promoting scaling up and replicating successful models, as well as peer-to-peer knowledge exchange on what works and what does not in blended finance.

[51] CPI (2019 forthcoming), *Lab Instrument Mobilization Review – Lessons and Opportunities for the CIF.*

[52] These common standards are the *Enhanced Blended Concessional Finance Principles for DFI Private Sector Operations* (DFI Enhanced Principles) approved in October 20171 by the MDB Heads and European Development Finance Institutions Management. For details see *DFI Working Group on Blended Concessional Finance for Private Sector Projects Joint Report*, October 2018 Update

Table 4. Examples of innovative instruments to explore under the proposed Large-Scale Integration of Renewable Energy Program[53]

Features → Systems ↓	Lab Instrument	Category	Description	Innovative features	Key Benefits
ENERGY	**Green Receivables Fund (Green FIDC)** To provide lower-cost, long-term capital to clean energy projects	Securitization	Project finance instrument that allows green projects to secure financing based on future cash flows through an asset-backed vehicle	Combines green certification criteria, and a financial model tailored to the needs of renewable energy and energy efficiency projects to an existing instrument, the FIDC	▪ Mobilization potential: enables green projects to tap into capital markets ▪ Attractiveness to private investors: - The FIDC is well-known among domestic investors - Offers greater liquidity, and tax efficiency compared to alternatives - Allows for segregation of operational and financial risks
	Sustainable Energy Bonds To drive impact investors to sustainable energy projects	Green Bond	Class of debt instruments targeted to impact investors looking for debt exposure in the sustainable energy sector	▪ Aggregates small-scale sustainable energy projects ▪ Provides a platform for monitoring the impact created through standardized impact reporting ▪ Establishes a track record of debt servicing	▪ Attractiveness to local and international private investors: offers stable returns, standardized impact measurement and reporting; lower transaction costs, tax efficiency

[53] For further information, please refer to the Global Innovation Lab for Climate Finance web site.

Table 5. Examples of innovative instruments to explore under the proposed Climate-Smart Urbanization Program[54]

Features → / Systems ↓	Lab Instrument	Category	Description	Innovative features	Key Benefits
URBAN	**PAYS - Pay As You Save for Clean Transport** To accelerates clean transit in cities	Pay-per- service	Mechanism by which an utility invests in batteries and charging stations and recovers costs through a charge on the bus service provider's electric bill	Existing, proven financing approach structured to overcome major barriers to electric bus procurement in developing countries, and achieve scale	▪ Mobilization potential: each US$1 of PAYS grants leverages more than US$70 of private investment, vastly exceeding equivalent grant leverage from non-PAYS programs* ▪ Reduce concessionality: Reduced use of the concessional finance per bus compared with similar initiatives, even at pilot stage
	Battery Subscription Facility To enable the mass adoption of electric buses	Pay-per- service	Vehicle investing in batteries for electric buses, and providing them to bus operators on a subscription basis, charging for use on daily or per kilometer rates	▪ Enables third-party led, non-subsidized deployment of electric buses at scale	▪ Demonstration potential: prove a business model where there is currently no track record and appetite from commercial investors
	Distributed Energy for Social Housing (DESH) To accelerate the deployment of residential distributed solar power for low-income tenants	Pay-per- service	Third-party ownership and rental model for distributed solar systems in low-income tower houses. Tenants would pay a performance-based rental fee	▪ Only financing option enabling distributed energy at feasible rates and terms that match the lifetime of solar projects ▪ Only model targeting low-income households	▪ Mobilization potential: Mobilize capital towards an underserved market segment while delivering sizeable social and environmental benefits

(*) Note: estimated based on a 100-bus transaction in the city of Santiago, Chile.

[54] For further information, please refer to the Global Innovation Lab for Climate Finance web site.

Table 6. Examples of innovative instruments to explore under the proposed Accelerating Low-Carbon Transition in Industry Program[55]

Features → Systems ↓	Lab Instrument	Category	Description	Innovative features	Key Benefits
INDUSTRY	**Cooling as a Service (CaaS)** To decrease energy consumption and potent HFC emissions from cooling systems	Pay-per- service	Pay-per-service model, with integrated financial tools whereby customers pay per-unit of service used, while technology providers own, operate and maintain the equipment	▪ Pay-per-service model applied to cooling to incentivizing the design and use/re-use of efficient cooling technologies ▪ Includes a 'sale-and-leaseback' to engage financial institutions	▪ Accelerate uptake of energy efficient state-of-the-art technologies resulting in accelerated emission reductions
	Climate Resilience and Adaptation Finance & Technology Transfer Facility (CRAFT) To expand the global availability of climate solutions	Private equity	Blended growth equity fund structured with: ▪ A concessional equity layer and a commercial equity layer for investment ▪ A complementary technical assistance facility to support the uptake of technologies and solutions provided by portfolio companies in lower-income countries	▪ Structured to uniquely target and support companies located in both developed and developing countries which have proven technologies and solutions for climate resilience	▪ Accelerate availability and uptake of technologies and solutions for climate risk management

[55] For further information, please refer to the Global Innovation Lab for Climate Finance web site.

Annex A: Evidence from CIF's business model in action

1. The ten-year track record of CIF's business model shows that MDBs and flexible, programmatic concessional capital at scale play a critical role in driving and enabling transformational investments that would not otherwise happen.

2. **The CIF partnership with MDBs and the timing, scale, and degree of concessionality of CIF's resources help MDBs to experiment, mainstream climate in their operations, and build significant institutional capacity.**[56]

    a. MDBs have a proven track record in developing and implementing climate-relevant interventions targeted to address market and institutional failures and other barriers. Over the 2011 – 2017 period, the MDBs, jointly reporting on climate finance, collectively committed almost USD 194 billion, including the concessional resources under their management.[57] They have since set growing climate finance targets.

    b. CIF represents the largest source of concessional climate finance for the five MDBs operating as its implementing entities.[58] By lowering investment costs and risks to address prevailing barriers to the commercialization of new technologies, CIF has had a demonstrable effect on increasing MDBs' climate finance commitments, which from 2011 to 2017 increased by 30 percent.[59] Moreover, CIF's business model fosters a cooperative partnership among MDBs that has enabled them to work and learn together at the global level, with some positive spillover effects into other joint initiatives. [60]

3. **MDB coordination and delivery of finance contributes to large-scale, coherent intervention packages that help move markets**. CIF's business model provides MDBs with a collaborative platform that has resulted in enhanced on-the-ground and intra-bank coordination. Further, by enabling recipient countries to draw from MDBs' varied skillsets—including their ability to attract and coordinate financing from multiple sources, provide broader policy support, and deliver resources at scale to given markets and technologies—CIF's business model has demonstrated its relevance in helping to identify and address the underlying barriers to reform and investments.[61]

    - In Mexico, for instance, the joint MDB planning process helped design a coordinated mix of public and private interventions targeted at addressing multiple constraints to clean energy development. This approach along with CIF's concessional financing helped the market for wind energy to reach a "tipping point," and incentivized policymakers to strengthen policy and institutional frameworks, thereby driving down investment risk perceptions and costs.[62]

4. **Concessional climate finance is part of the broader MDBs' Paris Agreement alignment agenda**. The MDBs published in 2018 a Joint Declaration on their joint alignment approach to the objectives of the

[56] CPI (2016), *The Role of the Climate Investment Funds in Meeting Investment Needs*; ITAD (2019), *Evaluation of Transformational Change in the Climate Investment Funds*.
[57] Joint-MDBs (2018), *Joint Report on Multilateral Development Banks' Climate Finance*.
[58] CPI (2016), *The Role of the Climate Investment Funds in Meeting Investment Needs. Evidence* based on 2013-2014 concessional finance data, and comparison on the concessional finance approved across 8 multilateral climate funds.
[59] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds;* Joint-MDBs (2018), *Joint Report on Multilateral Development Banks' Climate Finance*.
[60] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.
[61] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.
[62] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds;* BNEF (2019), *The Clean Technology Fund and Concessional Finance - Lessons Learned and Strategies Moving Forward*.

Paris Agreement,[63] which goes beyond the MDBs' climate finance targets. The MDBs stated their commitment to actively support low-emissions and climate-resilient development pathways and "to go beyond current efforts to […] support clients' access to concessional finance, including for leveraging private capital […]".

5. **The scale, predictability, and flexibility of CIF's resources are critical drivers in overcoming institutional inertia and successfully changing risk perceptions among investors, leading to acceptable risk-adjusted returns.** In the energy sector, the development of unproven renewable energy technologies in politically unstable markets requires major financial commitments from the start and involves high risks. Access to scaled amounts of CIF's concessional climate funds have enabled MDBs and recipient countries to take on early-stage risk and cost barriers in ways that demonstrate economic viability and crowd in investment. Figure 1 shows the crowd-in effect achieved in Chile, Kazakhstan, Mexico, Morocco, and Thailand.[64]

    - In Morocco, significant Clean Technology Fund (CTF) concessional capital deployed as part of the country's renewable energy program has been instrumental in kickstarting solar thermal and unlocking investments in a new technology: utility-scale concentrated solar power. The flexibility and the degree of concessionality of CTF's resources has improved the project's financial viability by allowing partner MDBs to match repayments with the revenue profile of the investment, and the developer to hedge foreign exchange risk. CTF concessional financing has also helped deliver a competitively-priced source of generation that is available when the system needs it the most.[65]

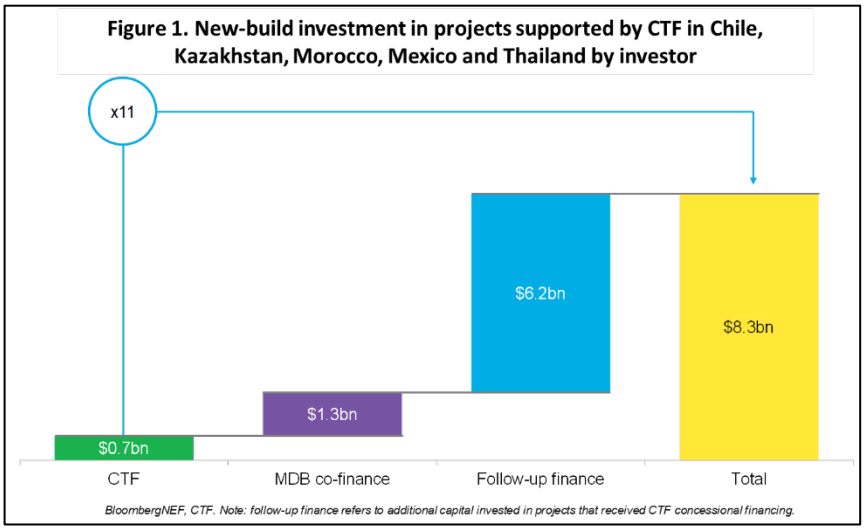


Figure 1. New-build investment in projects supported by CTF in Chile, Kazakhstan, Morocco, Mexico and Thailand by investor

    - In Niger, the large-scale investment made by CIF's Pilot Program for Climate Resilience (PPCR) relative to existing adaptation initiatives has provided a strong incentive for high-level institutional ownership and engagement on the broader climate mainstreaming agenda, particularly for non-environment sector ministries. It has also proven effective in driving policy and long-lasting institutional interventions.[66] This engagement and buy-in has facilitated the implementation of an integrated investment strategy developed with CIF support, and has been translated in the mainstreaming of climate change considerations in

[63] The MDBs' alignment approach to the objectives of the Paris Agreement: working together to catalyse low-emissions and climate-resilient development.
[64] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*; BNEF (2019), *The Clean Technology Fund and Concessional Finance - Lessons Learned and Strategies Moving Forward*.
[65] BNEF (2019), *The Clean Technology Fund and Concessional Finance - Lessons Learned and Strategies Moving Forward*.
[66] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.

225 communal plans (i.e., over 85 percent of all plans country-wide). This shows a noteworthy evolution toward deep, locally-relevant resilience awareness and planning.[67]

2. **The flexibility of CIF's financing provides the opportunity of demonstrating new financing models for catalyzing private sector investments that otherwise would not be tried.** Evidence shows that the flexibility of CIF's financing has been a key ingredient in attracting private participation in unserved sectors, laying the foundation for replication.

    - In Ghana, the flexibility of financing from CIF's Forest Investment Program (FIP), including access to concessional loans and grants for project preparation, secured unprecedented clearance from the African Development Bank's (AfDB) credit committee to undertake its first-ever private sector project in the forestry sector and demonstrate a new financing model. Building on the potential of this model, AfDB is exploring the possibility of replicating it.[68]

3. **The adaptability of CIF's funding model enables learning-by-doing and course correction during implementation to adjust programming and investments to changing contexts**. The ability to re-program resources to follow evolving needs, has allowed CIF's delivery partners and countries to keep pushing toward the frontier and leverage emerging opportunities.

    - In Thailand, the country's CTF investment plan was revised two years after it was approved to reflect newly available public finance at low rates that reduced the need for concessional finance.[69] This flexibility allowed resources to be reallocated from public to private sector projects and helped leverage favorable policy conditions to develop markets for solar photovoltaics (PV) and wind. [70]

4. **The ability of CIF's model to evolve and make revisions along the way has contributed to mobilize greater private sector capital**. The CTF's Dedicated Private Sector Program, and the private sector set-asides established under the Strategic Climate Fund (SCF) arose in recognition of the need to pursuing new ways to enhance private sector engagement in CIF's projects. These ad-hoc initiatives have to date helped attracting USD 2.2 billion in private sector co-financing.[71]

5. **CIF's business model supports social inclusion advancing the voice, skills, and livelihoods of women, indigenous peoples and local communities**. CIF's Dedicated Grant Mechanism for Indigenous Peoples and Local Communities (DGM), in particular, has been commendable in its efforts to engage with and empower indigenous people and local communities to lead on decisions that impact them directly.[72] This innovative feature has been underscored as one of the key comparative advantages of FIP among other forestry funds.[73]

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[67] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.

[68] ITAD (2019), *Evaluation of Transformational Change in the Climate Investment Funds;* Joint-DFIs (2018), *DFI Working Group on Blended Concessional Finance for Private Sector Projects,* Joint Report, October 2018 Update.

[69] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.

[70] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*.

[71] Refers to projects at Committee approved and MDBs Board approval stages.

[72] ITAD et al., (2019), *Final Evaluation Report - Evaluation of Transformational Change in the Climate Investment Funds*; ITAD (2019b), *A Learning Review of the Dedicated Grant Mechanism (DGM) for Indigenous Peoples and Local Communities in the FIP of the CIF.*

[73] ICF (2014), *Independent Evaluation of the Climate Investment Funds*. Volume 1. Evaluation Report.

Annex B: Three new proposals for CIF's future programming

1. This Annex presents the three new strategic programs that the CIF Administrative Unit and the partner MDBs propose to the Joint Meeting of the CTF and SCF Trust Fund Committees at its June 2019 meeting.

2. These new programs seek to accelerate far-reaching transitions in energy, urban, and industrial systems. Each proposal presents an overview on the sector, then outlines how MDBs can address the key challenges identified and scale up ambitions with the support of CIF concessional finance and its business model. Each proposal provides insights on the type of activities that can be supported and the intended transformational impact.

3. CIF has experience and a functional structure in place that can help drive system transitions in these priority areas. To implement these promising program proposals, and thereby harness the unique strengths of CIF's business model to deliver on key priorities, the Joint Meeting of the CTF and SCF Trust Fund Committees can consider one and/or a combination of the following options:

    - Establish these programs as dedicated programs within the CTF's structure, much like the current Dedicated Private Sector Programs
    - Establish these programs as separate programs within the SCF's structure
    - Establish these programs under a new fund that would follow the current CIF's business model, including its policies, take advantage of the existing structures within the CIF Administrative Unit and MDBs, but have its dedicated Trust Fund Committee.

Annex B.1: Large-Scale Integration of Renewable Energy Program

1. Overview of the sector

1. Energy consumption worldwide grew by 2.3 percent in 2018, nearly twice the average rate of growth since 2010, driven by a robust global economy as well as higher heating and cooling needs in some parts of the world.[74] Weather conditions last year were also responsible for almost a fifth of the increase in global energy demand as average winter and summer temperatures in some regions approached or exceeded historical records. Cold snaps drove demand for heating and, more significantly, hotter summer temperatures pushed up demand for cooling. [75]
2. The biggest gains came from natural gas, which emerged as the fuel of choice last year, accounting for nearly 45 percent of the increase in total energy demand. Demand for all fuels rose, with fossil fuels meeting nearly 70 percent of the growth for the second year running. Renewables grew at double-digit pace, but still not fast enough to meet the increase in demand for electricity around the world. [76]
3. Global energy intensity improved by only 1.7 percent in 2017; the average rate of energy intensity improvement needs to accelerate to 3.4 percent annually. As an aggregate indicator, energy intensity is affected by changes in both energy efficiency and structural changes in economies.[77]
4. Higher energy demand was propelled by a global economy that expanded by 3.7 percent in 2018, a higher pace than the average annual growth of 3.5 percent seen since 2010. China, the United States, and India together accounted for nearly 70 percent of the rise in energy demand. Renewables, which grew by over 4 percent, met around one-quarter of the growth in total primary energy demand. This was largely due to expansion in electricity generation, where renewables accounted for 45 percent of the growth in 2018
5. The electrification of energy end-use is increasing, and maintaining this trend is an important component for decarbonizing the energy sector. The share of electricity in final energy consumption reached almost 19 percent in 2017, incrementally increasing each year since 2000. It would have to reach 28 percent in 2040 to meet the targets of the International Energy Agency's (IEA) Sustainable Development Scenarios (SDS), so long as it is combined with sharp falls in the carbon intensity of power generation
6. In 2017 the number of people without electricity access fell below 1 billion, a fall of 97 million compared to 2016. However, progress continues to be uneven and Africa accounts for the major share of people without electricity access.

2. Climate challenges facing the energy sector in developing countries

7. **Driven by higher energy demand in 2018, global energy-related carbon dioxide (CO_2) emissions rose 1.7 percent to a historic high of 33.1 gigatons of CO_2 ($GtCO_2$). While emissions from all fossil fuels increased, the power sector accounted for nearly two-thirds of emissions growth**. Coal use in power alone surpassed 10 Gt CO_2, mostly in Asia. China, India, and the United States accounted for 85 percent of the net increase in emissions, while emissions declined for Germany, Japan, Mexico,

[74]IEA (2018), *Global Energy & CO_2 Status Report 2018.*
[75]IEA (2018), *Global Energy & CO_2 Status Report 2018.*
[76]IEA (2018), *Global Energy & CO_2 Status Report 2018.*
[77] IEA *Global Transition Indicators.*

France, and the United Kingdom. Emissions stagnated between 2014 and 2016, even as the global economy continued to expand. This decoupling was primarily the result of strong energy efficiency improvements and low-carbon technology deployment, leading to a decline in coal demand. But the dynamics changed in 2017 and 2018. Higher economic growth was not met by higher energy productivity, lower carbon options did not scale fast enough to meet the rise in demand. The growth in energy-related carbon dioxide emissions in 2017 and 2018 is a strong warning for global efforts to combat climate change and demonstrates that current efforts are insufficient to meet the objectives of the Paris Agreement.

8. **Developing economies accounted for the major share of the global increase in carbon emissions**. Global climate finance flows from developed to developing countries fall short of what is needed to shift economies onto a low-carbon, climate-resilient development pathway. Although developing countries are, in general, reducing their energy and carbon intensity faster than developed countries, the higher growth rate of their economies creates the need for an enhanced capacity to deal with their carbon emissions to achieve the global objectives of the Paris Agreement.

9. The global average annual concentration of CO_2 in the atmosphere averaged 407.4 parts per million (ppm) in 2018, up 2.4 ppm since 2017. This is a major increase from pre-industrial levels, which ranged between 180 and 280 ppm.

10. Coal-fired power plants were the single largest contributor to the growth in emissions observed in 2018, with an increase of 2.9 percent, or 280 metric tons (Mt), compared with 2017 levels, exceeding 10 Gt for the first time. As a result, coal-fired electricity generation accounted for 30 percent of global CO_2 emissions. Most of that generation is found today in Asia, where average plants are only 12 years old, decades younger than their average economic lifetime of around 40 years.

11. Despite growth in coal use, fuel switching between coal and gas accelerated in 2018, reducing the carbon intensity of global energy use. Driven by economics and policies, coal-to-gas switching avoided almost 60 Mt of coal demand, with the transition to less carbon-intensive natural gas helping avert 95 Mt of CO_2 emissions. Without this coal-to-gas switch, the increase in emissions would have been more than 15 percent greater. This switch, most significant in China and the United States, reduced emissions by 45 Mt and 40 Mt, respectively.

12. Electricity generation from renewable sources increased by over 7 percent in 2018, injecting an additional 450-terawatt hours (TWh) into global electricity networks. Increasing output from nuclear contributed another 90 TWh of low-carbon generation. Yet this increase was not fast enough to keep pace with the rapid growth in electricity demand, which required additional generation of over 1,000 TWh. The resulting increase in generation from fossil fuel-fired power plants saw the power sector account for almost two-thirds of the increase in total emissions. **Without accompanying power sector decarbonization, electrification does not necessarily mean lower emissions**.

13. Despite continued growth in emissions, the power sector has seen significant transformation in recent years. Today the average carbon intensity of electricity generated is 475 grams CO_2 per kilowatt hour (g CO_2/kWh), a 10 percent improvement on the intensity from 2010. Without this, global CO_2 emissions would have been 1.5 Gt higher, or 11 percent of current power sector emissions. An additional improvement in intensity of 10 percent would have been needed to avoid any increase in emissions from electricity generation since 2010.

14. The IEA's Sustainable Development Scenario[78] charts a path towards meeting long-term climate goals. Under this scenario, global emissions need to peak soon and decline steeply to 2020; this decline will

[78] IEA (2017), *Commentary: A New Approach to Energy and Sustainable Development - the Sustainable Development Scenario*.

now need to be even greater given the increase in emissions in 2017. The share of low-carbon energy sources would need to increase by 1.1 percentage points every year to meet the objectives of this scenario, more than five-times the growth registered in 2017. In the power sector, specifically, generation from renewable sources would need to increase by an average 700 TWh annually in this scenario, 80 percent higher than the 380 TWh increase registered in 2017.

15. Overall, the use of renewables needs to expand much more quickly in all three sectors to be on track to meet long-term climate goals, cleaner air objectives, and aims to provide access to modern energy sources, as demonstrated in the Sustainable Development Scenario. **In this scenario, the share of renewables in the power mix needs to rise from one-quarter today to two-thirds in 2040. In the provision of heat, renewables need to rise from 10 percent today to 25 percent. In transport, renewables need to rise from 3.5 percent today to 19 percent, including both direct and indirect use, e.g. renewable electricity for heating and electric vehicles**[79].

16. From an adaptation perspective, dependence on fossil fuels or conventional renewables such as hydro power expose countries to external shock associated to the volatility of fuel prices and/or climate change impacts. Extreme weather events such as droughts create uncertainty in the future supply of electricity that is heavily dependent on water availability.

17. The integration of renewable energy into the grid poses certain unique challenges, caused mainly by the geographic dispersion of these power generating facilities, the variability of production determined by changing weather conditions, the uncertainty in its prediction, and the technology used by many of the generators. Such characteristics include the following:

    - Output variability, leading to increased reserves/ramping requirements, or curtailment of renewable energy
    - Location dependence, requiring upgrades to distribution/transmission power transfer capabilities to accommodate renewable energy
    - Changes to voltage, frequency, reactive power and/or fault current performance, leading to the grid operating close to or outside established operating parameters
    - A general increase in price volatility for countries with spot markets, otherwise lower marginal costs resulting in impacts on the revenue stream of existing generation assets.

18. While tools, technologies, and services exist to address these challenges, they fail to attract enough investment by both public and private actors, because they face the following barriers:

    - **Policy and governance barriers:** A lack of long-term planning, backed up by well-designed and implemented regulatory frameworks, mean that national electricity markets are often unprepared to face the emerging trends to integrate significant amounts of renewable energy generation
    - **Economic barriers:** Lack of pricing of negative externalities, short-term strategies, and shortage of human capital
    - **Commercial and financial barriers:** The business models for technologies that support renewable energy integration (e.g., energy storage, demand side management tools, reactive support) are still emerging. They may not be revenue generating in the first instance, and hence represent additional costs that need to be recovered by the party making the investment. In other cases, the technology is new and high average capital costs and financing charges discourage investment.

[79] IEA (2018), *Global Energy & CO_2 Status Report 2018.*

- **Social barriers:** Public opposition (lack of stakeholder engagement) and insufficient social awareness
- **Technology barriers:** There are specific technical challenges involved in integrating renewable energy into the grid or other energy systems (e.g., green gas, hydrogen, ammonia). These include reactive power control, advanced metering and control communications, and bespoke conversion and connection infrastructure, which present a cost and risk barrier to investment in renewable energy generation. Other technology barriers include transition shortages (i.e., lack of charging infrastructures) innovation gaps, and lock-in inertia.

19. The proposed program seeks to take advantage of the opportunities arising from the energy transition, taking into account the challenges described.

Box 1: Example battery storage market

In terms of market status, battery storage deployment in developing countries faces two major obstacles. First, the market for stationary batteries still represents just a small part of the global batteries market driven completely by the electric vehicles market (11 GWh of stationary batteries vs. ~400 GWh of electric vehicle batteries, cumulative, in 2017). Second, based on the World Bank Group estimates, there was roughly 4.5 GWh of cumulative installed capacity of batteries in developing world in 2017, mainly used in mini-grids and island applications. There is a need to create a separate market segment that caters to the needs of stationary battery storage (and not just electric vehicles) and addresses challenges that stationary battery applications will encounter in developing countries, such as extreme temperatures, irregular operational regime, need for long duration storage to serve off-grid areas, and a lack of local capacity to maintain and operate the facility, among other issues.

3. The need to accelerate the global energy transition

20. **To achieve global climate goals the world needs to shift to a pathway that leads to a transformation of the global energy sector from fossil-based to zero-carbon by the second half of this century**. At its heart is the need to reduce energy-related CO_2 emissions to limit climate change. Decarbonization of the energy sector and corresponding sectors requires urgent action on a global scale. While a global energy transition is underway, further action is needed to reduce carbon emissions and mitigate the effects of climate change.[80]

21. The energy transition will be driven by a series of emerging trends that will set the path towards the transformation of the energy system, namely:[81]

- **Policy and governance drivers:** Governments developing the pathways and setting the targets to meet the global commitments. Renewables will provide valuable input on energy security and diversification of risks.
- **Economic drivers:** The technology learning curve on solar and wind energy together with the progressive reduction of costs of energy storage and alternatives such as power to fuels. Furthermore, as environmental, green, and carbon markets differentiate the price between fossil and renewable energy sources, corporates can set targets to go green by e.g. purchasing energy from renewable sources and procuring green certificates under the RE100 pledge.
- **Social drivers:** From global to local, from consumers to prosumers. The distribution of electricity production in developing and developed countries widens because of solar, from thousands of

[80] https://www.irena.org/energytransition.
[81] DNV GL (2018), *Energy Transition Outlook*.

central to millions of distributed power plants. The increase of demand for transparency is another social driver of the energy transition.

- **Technology drivers:** Digital technologies support the decentralization through analysis of large amounts of sensor data and determination of optimal settings for the control software systems. In mature energy systems, end users become an active part of the energy sector with smart homes and appliances, electric vehicles, domestic storage, and in-house electricity generation enabling them to sell back any surplus to the grid. In developing regions, distributed renewable energy solutions (standalone and mini-grids), particularly significant for regions such as Sub-Saharan Africa and India, will be incrementally added to enhance energy access. This will also enable under-served energy communities to leapfrog over traditional centralized systems.

22. A clean energy transition is already underway with significant increase in deployment of solar power, wind power, and other forms of renewable energy. Solar and wind technologies, however, produce variable and uncertain electricity that most power grids are not designed to accommodate. This is emerging as a key barrier to the scaling up of renewable energy. The capability of a power system to cope with the variability and uncertainty of solar and wind energy generation avoiding curtailment of power from these variable renewable energy sources and reliably meet energy demand.[82] In the absence of such capability, in many developing countries highly-polluting diesel generators and heavy fuel oil are being used as sources of flexibility.

23. In addition, the penetration of wind and solar power leads to depressing electricity prices during times of high supply, hindering newcomers. The ancillary benefits of energy storage, such as providing balancing services, are not valued in many energy markets. Market rules need to be overhauled to consider the new technologies, and market design and new financial instruments need to be deployed to manage such price volatility risks.

24. A diverse range of emerging technologies are already available to enhance the flexibility of power grids, such as gas or hydropower generation, interconnections with neighboring countries, energy storage, and demand management. Operating a reliable electricity system requires the instantaneous matching of supply and demand. Renewable energy-enabling technologies can help maintain the supply-demand balance by acting as either supply or demand, making it a flexible resource that can help grid operators manage the integration of renewable resources and respond to changes in system conditions almost instantaneously. For instance, renewable energy can play a role in water desalination plants, if such plants can optimize the demand of cheap but variable renewable energy production.

25. For example, storage assets can participate in energy markets in a variety of ways: 1) as a generation asset, storage can provide energy, capacity, and ancillary services, 2) as a transmission and distribution network asset, storage can provide congestion relief, enhancing the capacity of the network to accommodate new power and avoiding the need for new transmission or distribution infrastructure, and 3) as a load asset, storage can participate in demand response programs, reducing the power demanded during certain periods of the day. Storage can be directly connected to the grid and optimized by grid operators. It can also be part of an isolated mini grid system, or it can be located behind-the-meter directly at a customer site.

26. The management of demand offers significant opportunities to increase grid flexibility. Several energy applications, such as pumping, heating, and cooling, can be managed to better match the profile of availability from variable renewable electricity generation. This has the dual benefit of reducing

[82] IRENA (2019), *Innovation Landscape for a Renewable-powered Future: Solutions to Integrate Variable Renewables*.

system costs as well as enhancing the ability of national grids and grid operators to integrate renewable energy in an effective way.

27. It is also recognized that fossil-fuel investments are long-life assets, with lifetimes of over 30 to 40 years. Countries are still investing in fossil fuel power generation assets that may become stranded in a carbon constrained world. Recent studies have shown that a significant amount of coal-fired plants currently planned or under construction would need to be cancelled or retired early to achieve global climate goals. **There is an urgent need to demonstrate, at scale, the integration of high volumes of renewable energy in national grids in a way that maintains safety, reliability, and security of supply, to establish alternative investment pathways that are consistent with a 2°C warming scenario**.

4. Concept proposal

28. In the current energy sector context and the climate change goals established by the international community, accelerating the energy transition requires a full package of measures to enhance flexibility in energy systems and, to this end, concessional capital to push boundaries and increase the penetration of renewable energies in the energy mix.

29. A low-carbon economy will result when a high share of renewable energy is achieved in the energy system and whereby such uptake at scale would be facilitated through storage and conversion technologies, demand side management, and grid flexibility. Growing the market demand for electrification and green fuels in sectors like transportation or heating will further accelerate renewable energy uptake at scale. Such a pathway will also generate important co-benefits relating to energy security, energy efficiency, air quality, and health impacts.

30. Energy access—enabling under-served energy communities to leapfrog over traditional centralized systems—is also an issue that impacts other key trends and business models in the innovation landscape. These include digitalization, converting data into value in the power sector; decentralization, converting individuals and communities from consumers to “prosumers” (energy market participants both in supply and demand side); and electrification of end-use sectors.

31. CIF proposes a program to support the large-scale integration of renewable energy. It would to provide concessional climate finance through its partner MDBs to support developing and emerging countries in accelerating the deployment of flexibility measures in the following areas:

    - Enabling technologies
    - Enabling infrastructure
    - Electrification and demand management
    - Market design and system operations improvement

32. While most existing initiatives focus on accelerating the deployment of renewable energy generation itself, this proposal responds to the growing need to address underlying technical, operational, and financial barriers hindering integration of renewable energy generation into the central power grid. Experience in countries around the world with growing shares of renewable energy generation show that unless these barriers are tackled, they can inhibit and discourage investment in renewable energy generation at the speed needed to achieve global climate change goals.

33. To achieve long-term decarbonization goals, it is acknowledged that national governments must put in place ambitious, flexible, and feasible decarbonization policies and underlying regulatory frameworks. Absent such government direction, investors will not be able to deploy capital at the speed and volume necessary to deliver on those goals. It is therefore proposed that up to a 5 percent

of the program resources be deployed as a non-reimbursable Technical Assistance Facility to provide policy reform, market design, and system operation support to client countries. Technical assistance resources would also be needed to support pipeline and project preparation and structuring. Table 1 provides an indicative list of activities to be supported.

Table 1: Possible activities to be supported under a non-reimbursable Technical Assistance Facility

Facilitating sector policy level activities	▪ Technical and market studies for designing storage needs and preparing pilot bankable projects
	▪ Policy targets and roadmap for deep decarbonization (low carbon pathway for energy and related sector)
	▪ New or improved auctions/procurement mechanisms for renewable energy
Promoting market and system design and operations	▪ Advanced weather forecasting and training on renewable energy integration for grid operators
	▪ Increased time and space granularity in electricity markets
	▪ Country diagnostics, studies, and recommendations regarding market structures, policy frameworks, etc. to create regulatory/market frameworks for innovative services (e.g., balancing market/ancillary services, capacity market, energy storage, etc.)
	▪ Net billing schemes
	▪ New roles of distribution companies
	▪ Carbon pricing/markets, renewable certificate (iREC)
	▪ Long-term contracting of energy or hedging strategies

34. It is proposed that most of the funding available under the program will be deployed as concessional finance to support the following technologies and services, as listed in Table 2.

Table 2: Proposed activities to be supported under the majority of program funding

Scaling up renewable energy - enabling technologies	▪ Energy storage technologies, such as batteries, pumped hydro, and hydrogen, which can back up the variability of renewables and provide various services to the grid
	▪ New technologies for real-time grid management that enhance electricity system flexibility and facilitate distributed generation, such as advanced metering systems, wireless network control, and demand side management
	▪ Technologies that enable electrification of other sectors, such as electric vehicle charging infrastructure, to open doors to new markets for renewable generation and new ways to store the generation surplus
Enhancing infrastructure to be renewable energy -ready	▪ Grid interconnection to integrate regional markets and increase their flexibility

	▪ New and smart grids, both large and small scale, that complement each other and enable new ways to manage variable renewable energy generation.
	▪ Grid modernization to improve control of voltage, frequency, fault current, etc. and expansion to improve renewable energy power transfer capacity
	▪ Improved climate resilience of grids to cope with more frequent increased temperatures and extreme weather events as a result of climate change, particularly for hydropower-dominated systems
Supporting renewable energy innovation[83]	▪ Business models that empower consumers, turning them into active participants
	▪ Innovative schemes that enable renewable energy supply, in both off-grid and connected areas
Enhancing system and market design and operation	▪ New regulations in the wholesale markets that encourage flexibility from market participants, better signal firming power supply's value, and properly remunerate their grid support services
	▪ Design and regulatory change in the retail market that stimulate flexibility on the consumer/prosumer side
	▪ New operation procedures that improve predictability of renewable energy such as advanced weather forecast procedures.

35. **The program would prioritize risk-tolerant financial instruments with an overarching goal to mobilize private sector resources**. The volume and type of financial resources required to develop the aforementioned investments at scale require financing solutions and investment vehicles that allow a larger scope of capital market participants, including institutional investors, to participate.

36. Guarantees by MDBs can be an effective instrument for de-risking investments to crowd in private capital financing. Guarantees can provide lower borrowing costs and longer loan tenures to borrowers while minimizing the use of MDBs capital-backed resources. Such guarantees represent only 5 percent of MDB operations, although they account for 45 percent of total private resource mobilization.

37. Risk management instruments (RMIs) are required to credit enhance projects or portfolios whose real or perceived risks may not meet the requirements of certain capital market participants. In such cases, concessionality may be required in the form of reduced pricing or subordination.

38. Bond subscriptions are required when the innovative profile of a bond's underlying assets may require mitigating placement risk with an MDB willing to play an anchor investor role. In such cases, concessional finance could be required to co-fund such an anchor investor position. Typically, the MDB's backstop subscription would be provided ahead of formally launching the issuance and disclosed to market. The subscription would then be reduced as a function of investors' appetite down to an adequate floor, especially in a case where anchoring the transaction around an MDB would be viewed as a key risk mitigant for noteholders.

[83] This proposal acknowledges that in some regions, direct investment in solar PV and wind (onshore and offshore) may still require concessional support subject to the degree of maturity of the renewable energy market in that specific country or region.

39. In certain development markets (most commonly those with sub-investment grade ratings or not fully developed financial markets), availability of non/limited-recourse project financing (particularly in terms of tenors, but also in terms of currency, among other) is not adequate to allow more capital-intensive clean technologies such as battery storage to be competitive.

40. This normally has to do with restrictions posed by general investment conditions in the country, regulatory risk, or specific challenges associated with off-takers or tender/purchase price agreement provisions, among others.

41. RMIs, for example in the form of refinancing guarantees, could allow sponsors to utilize shorter-term financing solutions, such as mini-perms, and, conversely, allow commercial banks with shorter tenor or more limited risk-taking possibilities (because of lack of experience, banking regulatory requirements, etc.) to participate in the initial financing of these projects.

42. To address the absence of available capital in some transactions in innovative technologies and business models, equity/mezzanine capital from concessional sources could be required. This capital will supplement similar positions taken by MDBs (but are limited in size by risk management guidelines) or take subordinated positions that allow further debt leveraging of the company.

5. Rationale for Climate Investment Funds

5.1 Need for concessional finance

43. Grant resources can play major role in the development of new approaches in market design. They allow new market structures and changes in the regulatory framework that encourage flexibility and value services needed in a renewable-based power energy system. They also enable innovation in system operations that allow the integration of higher shares of renewable power generation. These help to address the legal and regulatory barriers to higher penetration of renewable energy in the grid.

44. As generation from intermittent sources such as wind and solar grows, so does the need for grid flexibility, especially energy storage. Even in established markets, revenue uncertainty associated with storage projects deters investors. Concessional loans or other financial instruments are intended to reduce the cost of capital enough to offset the first movers' additional costs and mitigate the risks from initiating investments that go beyond the grid's business-as-usual needs.

45. There is a well-established set of measures that would maximize the integration of renewable energy in the grid. These measures interact with each other and call for a systemic approach rather than a pure technological approach. According to the National Renewable Energy Laboratory of the United States Department of Energy,[84] the energy storage requirements for achieving 50 percent solar PV penetration in the state of California strongly depends on a set of different initiatives to increase the flexibility of the system. These include increasing the export capacity of the system through grid interconnections, increasing the demand response availability in peak hours, increasing the electric vehicle share in light-duty vehicles, and optimizing the charging strategies of the electric vehicle fleet. Different levels of advancement in the adoption of flexibility measures implies doubling investment in energy storage GW to achieve the 50 percent target in 2030. Therefore, there is an established need for concessional capital in a set of relevant areas besides energy storage itself, which is the most obvious and well known.

[84] NREL (2016), *Energy Storage Requirements for Achieving 50% Solar Photovoltaic Energy Penetration in California*.

46. In relation to energy storage, lower costs of capital for energy storage projects would result in significantly lower energy storage levelized costs of electricity. At the extremes, a project with a 2 percent weighted average cost of capital would have a levelized cost of energy (LCOE) $125/MWh lower than one financed at a 13 percent cost of capital. The availability of finance, especially concessional finance, could prove crucial in incentivizing new-build storage globally.

47. For example, concessional capital can have greater impact on the cost-competitiveness of lithium-ion battery projects than conventional solar PV and onshore wind projects. According to the recent report produced by Bloomberg New Energy Finance (BNEF), "*The Clean Technology Fund and Concessional Finance",*[85] for each percentage point rise in the overall cost of capital for a lithium-ion battery project, its LCOE rises by USD10/MWh. This is three times the level of impact on storage as on onshore wind and PV LCOEs.

48. Business models for technologies that support renewable energy integration are also still emerging. They may not be revenue generating in the first instance, such as communications infrastructure for the power grid, and may represent additional costs to be recovered by the party making the investment. High average capital costs discourage investment, but the availability of concessional finance allows such business models (whether public or private) to be piloted and scaled up.

49. Given the infancy of such technologies, private sector project developers can face additional costs related to satisfying grid operational standards that can materially impact the feasibility of the projects. High capital costs represent a significant barrier to the successful implementation of such technologies. Prudent application of concessional finance can mitigate these investment risks.

50. Additionally, there are specific technical challenges involved in integrating renewable energy generation into the grid, such as impacts on reactive power control, advanced metering standards and control communications, and bespoke connection infrastructure. These can present a cost and risk barrier to investment in renewable energy generation. The availability of concessional support can help private and public entities to overcome these cost barriers.

51. At the same time, mobilizing additional capital from co-financiers such as MDBs can address the lack of long-term financing from local and international banks for this kind of investment and bridge capital gaps in the financing structure of such projects.

5.2 Why CIF?

52. The BNEF report acknowledges the critical role that concessional finance from the Clean Technology Fund (CTF), together with MDBs and other types of public climate finance, have played in opening new markets for clean energy investment in developing countries.

53. In the countries analyzed in the BNEF report (Chile, Kazakhstan, Morocco, Mexico, and Thailand), concessional CTF resources have helped achieve total leveraged investment worth 11 times more. This investment has translated into over 2.3 GW of new build solar PV, solar thermal, wind, and geothermal plants across the five countries. In addition, these markets have made significant progress in establishing policy frameworks that foster clean energy deployment when compared with their policy status in 2012, putting in value the strategical use of grant resources to assist countries in their regulatory frameworks and market design.

54. The BNEF report also recognizes that increasing penetration of intermittent renewables has brought new challenges. Pressing issues related to the functioning of power markets, namely short-term grid

[85] BNEF (2019), *The Clean Technology Fund and Concessional Finance. Lessons Learned and Strategies Moving Forward*.

flexibility and long-term reliability of supply, underscore the need for adoption of new technologies, such as battery storage, demand response, and flexible generation.

55. The objective of the proposed program is fully aligned with the objectives of CIF (i.e., CTF and SREP) to demonstrate and deploy low-carbon technologies, reduce the carbon footprint of the electricity sector, and increase energy access and create economic opportunities by using renewable energy. The program would complement and may support initiatives by MDBs relating to renewable energy integration and would build upon the experience of CTF and SREP, MDBs, other financial institutions, industries, governments, and other stakeholders.

56. The CIF business model is well suited to address issues faced in scaling up the penetration of renewable energy, particularly these key features:
    - Risk-appropriate financing tools at scale
    - Ability to target new sectors and technologies for transformational impact
    - Programmatic approach
    - Flexibility

57. CIF's programmatic approach encompasses the development and implementation of a country-led investment plan — supported by MDB collaboration, informed by multi-stakeholder consultation, and associated with a predictable and flexible resource envelope —that sets out strategically linked investments, unified by a transformative vision.

58. CIF's programmatic approach aligns well with the program's focus on both policy and investment barriers. It is intended to offer a holistic approach to renewable energy integration in national power grids, beginning with long-term decarbonization planning, assessment of business models for encouraging renewable energy integration, translating these models into legal and regulatory frameworks, and providing investment support to deal with commercial and financial barriers to public and private sector investment.

59. This programmatic approach, together with a dedicated private sector facility where appropriate, make CIF the partner of choice to support countries' development goals and achieve the Paris Agreement's objectives.

6. Expected outcomes and transformational change

60. Transformational change means: "*Strategic changes in targeted markets and other systems, with largescale, sustainable impacts that shift and/or accelerate the trajectory toward low-carbon and climate-resilient development*."[86] Transformation occurs when all dimensions of transformation change are present, to some extent. They are the following:
    - **Relevance**, referring to the strategic focus of CIF investments—impacting low-carbon and climate-resilient development, with sustainable development co-benefits
    - **Systemic change**, referring to fundamental shifts in system structures and functions
    - **Scale**, referring to contextually large-scale transformational processes and impacts
    - **Sustainability**, referring to the robustness and resilience of changes.

61. The program would draw on lessons learned from previous experiences in CIF program and project design. These can be synthesized in the following five key points, which indicate that climate investments may be more transformational when their design:

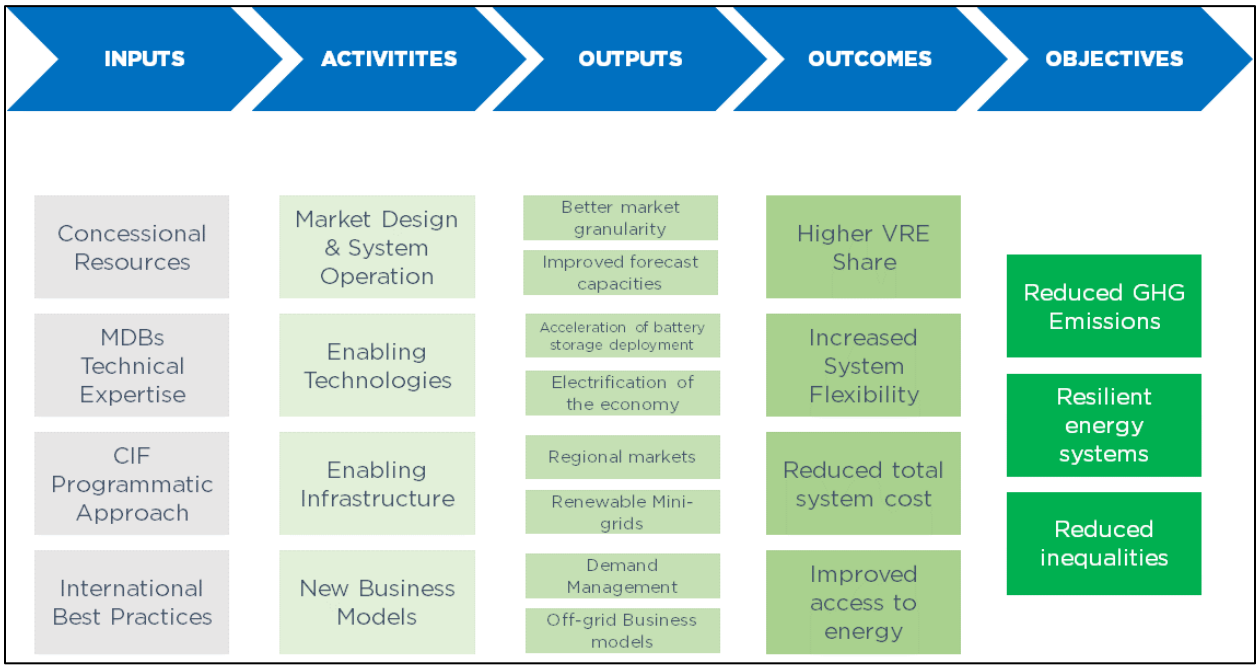
[86] ITAD et al., (2018), *Final Evaluation Report. Evaluation of Transformational Change in the Climate Investment Funds*.

- **Promotes country ownership**. Climate solutions must align with the political agenda and institutional context. Furthermore, project and program design should be able to address key policy and regulatory frameworks, involving regulators from the beginning with a view towards changing norms.
- **Supports innovative finance**. Solutions that advance "disruptive" business models for private sector involvement and financial intermediation are relevant enablers of change, especially when they support a move towards non-concessional finance.
- **Meaningfully considers social actors**. Investment preparation should involve a wide diversity of stakeholders beyond governmental counterparts.
- **Promotes cross-sectorial collaboration**. Designers should look to create synergies across sectors and make visible how climate interventions have co-benefits in the wider development agenda.
- **Crowds-in private investment and mobilizes resources**. Climate solutions should prove their commercial or financial sustainability from the design stage and operate knowing that concessional finance is temporary support. The program should aim to establish public and private partnerships around innovative, first-of-a-kind initiatives, preferably by maximizing the involvement of the private sector (including the supply chain) and bringing forward market-development intermediation.

62. The resources of the program would be deployed through national and regional investment plans that address both the policy and market barriers preventing further penetration of renewable energies into the grid and promote specific investments with demonstration effects in enabling technologies, infrastructures, or business models (i.e., a regulatory reform to compensate ancillary services and investment in first-of-its-kind energy storage investments in the country or region). In addition, a dedicated private sector window would be set up to invest in countries or regions where the regulatory framework and market design already allow for direct investment in flexibility and niche innovations, so there is less need for a programmatic approach.

63. The theory of change of the proposed program demonstrates how the key elements of the program would achieve significant impacts in terms of reduced GHG emissions and resilient energy systems (see Figure 1).

Figure 1: Theory of change of the Large-Scale Integration of the Renewable Energy Program



The expected outcomes of the proposed program are:

- Higher renewable energy penetration in the energy system
- More flexible and decentralized energy system
- Countries supported in maximizing their renewable energy potential through electrification of transportation and heating, as well as generation of alternative fuels
- Increased access to energy through innovative business models.

Annex B.2: Climate-Smart Urbanization Program

Driving the spatial transformation of cities toward low-carbon and climate-resilient development

1. Overview of the sector

1. Unprecedented urbanization is transforming the world and the way people live. For the first time in history, more people live in cities than in rural areas. Around 55 percent of the world's population live in urban areas and this share is expected to increase to 75 percent by 2050 (United Nations, 2018).
2. Growth in the urban population is driven by overall population increase and by the upward shift in the percentage of people moving to urban areas in search for social and economic opportunities offered by cities. Together, these two factors are projected to add 2.5 billion to the world's urban population by 2050 in the rapidly expanding cities and in new secondary cities, with almost 90 percent of this growth happening in Asia and Africa. By 2050, the share of urban population is projected to reach 56 percent in Africa and 65 percent in Asia (UN, 2014). Just three countries—India, China, and Nigeria—are expected to account for 35 percent of the growth in the world's urban population between 2018 and 2050. Close to half of the world's urban dwellers reside in settlements with fewer than 500,000 inhabitants, while around one in eight live in 33 megacities with more than 10 million inhabitants. By 2030, the world is projected to have 43 megacities, most of them in developing regions. Urban share of the global GDP is just below 80 percent and will contribute to the majority of GPD growth by 2050.
3. If managed well, urbanization can help reduce poverty and increase prosperity by improving access to land, basic services, and jobs, as cities can accelerate growth, attract investment, spur innovation,

> *"By 2050, two-thirds of the world's population will be living with the infrastructure and planning decisions we make today. […] Urbanization is occurring in places with much lower average levels of income than historical averages, particularly in sub-Saharan Africa, and new urban areas are emerging. Over 60% of the land projected to become urban in 2030 has yet to be developed, and smaller cities are growing faster than mega-cities."*
>
> The New Climate Economy, 2018, the Global Commission on the Economy and Climate, *Unlocking the inclusive growth story of the 21st century*

and enhance productivity. The transformative potential of cities to drive productivity growth stems from agglomeration: the clustering of businesses and individuals in an environment that promotes scale and specialization. Population densities bring workers closer to jobs, increasing their opportunities and fueling their productivity. Cities and towns bring people physically closer, facilitating the exchange of ideas and bringing about innovations. High "good" densities also enable network effects, making it cheaper to provide services efficiently and equitably (see Figure 1).

At the same time, new disruptive technologies (i.e., electric mobility, advances in communication technology, sharing economy), behavior change, and economic practices (i.e., telecommuting) may offer opportunities to reduce economic and environmental impacts of urban decentralization in the future, as they impact commuting patterns.

Figure 1: Urban planning: Achieving more compact urban growth, connected infrastructure, and coordinated governance

4. A large share of urban growth in developing countries is unplanned and unstructured with significant

economic, social, and environmental costs. Many cities in Sub-Saharan Africa, for example, have grown rapidly but without enough policy coordination, efficient planning, and adequate infrastructure and services. Cities are characterized as crowded with people and dwellings, disconnected due to a lack of transport and other critical infrastructure, and costly for both households and firms because of their inefficient spatial forms (World Bank, 2017). Nearly two-thirds of the region's urban population live in areas classified as slums by UN Habitat, resulting in increasingly high levels of congestion, pollution, illness, disease, crime, and insecurity, as well as in a lower resilience to extreme climate events.

5. For cities to grow economically as they have grown in population size, they must create productive environments to attract investment, increase economic efficiency, and create livable environments that prevent urban costs from rising with increased population densification. Productive jobs, affordable housing, effective infrastructure and cleaner mobility services will be urgently needed for residents and newcomers alike. As such, the value of early investments in neighborhood infrastructure and services, as well as the spatial planning, coordination, and prioritization among these investments, are equally critical.

2. Rapid urbanization in developing countries in the context of climate challenges

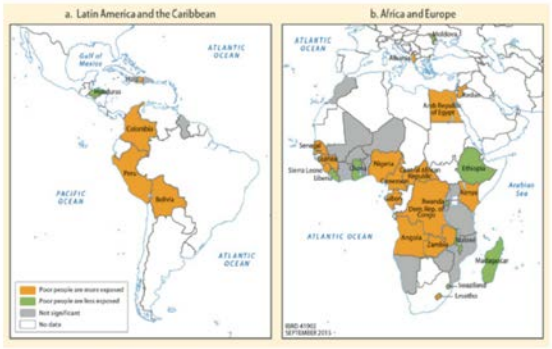
6. Many global risks of climate change are concentrated in urban areas, making cities and towns heavily vulnerable to climate change impacts. Rising sea levels, increased precipitation, inland and coastal flooding, more frequent and stronger cyclones and storms, landslides, heat stress, drought, and water scarcity will have significant adverse impacts on urban infrastructure systems and services, ecosystem services, urban economies, and urban population. These impacts are expected to be exacerbated in

the next decades given that the expansion of urban land use is likely to take place in areas of increasing vulnerability to extreme climate events (IPCC AR5, 2014).

7. Climate change may also negatively impact infrastructure and worsen access to basic urban services and quality of life in cities. Basic services include safe drinking water, proper sanitation and drainage, affordable transport, and access to health care and education. In fact, many major coastal cities are already under threat. In addition, most of the vital economic and social infrastructure, government facilities, and assets are located in cities (see Figure 2.[87]

Figure 2: Exposure to river floods and coastal floods in urban areas

The urban poor are more exposed to river floods in many countries



Source: World Bank (IBRD 41902, September 2015) based on Winsemius et al., forthcoming.
Note: Exposure was calculated for river floods.

Most cities with the highest coastal flood losses are in South and Southeast Asia*

Source: World Bank 2013

8. Climate change risks are amplified for urban populations lacking essential infrastructure and services or living in poor quality housing and exposed areas (i.e., slum dwellers in developing countries). Because of climate change, cities are also becoming climate migration hotspots. According to the World Bank Group Groundswell report (2018), by 2050, the number of climate migrants, could be highest in Sub-Saharan Africa, followed by South Asia and Latin America. This trend could progressively increase the weight of climate change migration among other migration drivers in urban areas. Addressing basic infrastructure gaps in a climate-smart way can help reduce vulnerability overall and risk exposure in urban areas.

2.1. Effective planning will be needed to address climate impacts on cities

9. Our efforts to successfully limit global warming hinge on cities. With dense population and diverse range of emitting industries, activities, and services, as well as being a locus of consumption of good and services by their residents, cities are the origin of considerable greenhouse gas (GHG) emissions. In 2013, 64 percent of global primary energy use originated in urban areas associated with GHG emissions of about 24 GtCO2 (IEA, 2016). While the magnitude of sources varies, the GHG emissions in urban areas are dominated by buildings, transport, and waste. The methane emissions from urban waste management alone accounts for 3 to 5 percent of the global GHG emissions. Because of cities' high population density and economies of scale, urban climate mitigation efforts can have a disproportionate positive impact, with significant cost reductions and co-benefits, such as reduced local pollution, improved health, and livability.

[87] For example, the average annual losses from coastal floods in the 20 riskiest cities in the world (i.e., high costs of ports upgrades) can reach up to 0.75 percent of the local GDP.

10. Rapidly urbanizing areas present a unique opportunity to plan, develop, build, and manage cities that are ecologically and economically sustainable and should be prioritized. Rapidly urbanizing areas—small to medium size cities in developing countries—where urban form and urban infrastructure are not locked in hold the largest mitigation opportunities with respect to human settlements and built infrastructure and systems (IPCC, AR5, 2014). It is urgent to act on these priority areas, given that 55 percent of total urban land in 2030 is to be built between 2000 and 2030 (about half in Asia with China and India leading half of Asia's urban development). Rapid urbanization in lower income countries is also expected to contribute to 90 percent of projected increase of urban transport emissions if the increase in air polluting car mobility goes unabated.

11. The urban planning and design phase is a strategic point of engagement to identify and facilitate high-impact solutions to curtail local environmental pollutants, avoid carbon lock-in, and improve cities resilience to climate-related impacts. The major change of urban forms, household behaviors, and land use are recognized as important ingredients of the large-scale transformation of economic activity required to achieve the global Paris Agreement temperature goal[88]. Cities can implement high-impact solutions by decarbonizing urbanization on one hand and deepening resilience on the other hand. For example, there are many efficiency and environmental gains to be had with ex-ante urban investments in reserving land for public right of way for infrastructure investments that follow with demand (Angel, 2016). Box 1 offers an example from Pakistan. If cities steer present resource-intensive urban systems towards resource-efficient urbanization pathways for land, water, waste, transport, and energy demand, the associated carbon footprints could rapidly decline.

2.2. Cities must act now to drive low-carbon and resilient urbanization

12. Cities can contribute significantly to bridging the global emissions gap and strengthening urban resilience to climate-related impacts. Given their capacity to innovate and their ability to take lead on local actions cities can significantly contribute to deliver on urban mitigation potential through the actionable implementation plans for the countries' Nationally Determined Contributions (NDC) under the Paris Agreement. Cities can directly implement national policies or enhance their effectiveness through independent action[89]. According to Bloomberg, action in cities could close the emissions gaps by at least 10 percent in 2030 and by approximately 15 percent in later years. Importantly, cities can also design and implement local policies and have influence over policy levers that national actors may not be able to access, such as strategic spatial planning.

13. Strategic spatial planning is one of the key city-level policy levers that shape urban development choices by informing the prioritization of capital investments. A strategic spatial plan is a conceptual plan that guides and articulates medium-term strategy (five to 10 years) formulation and implementation. Strategic spatial plans serve as a main guiding policy instrument at the city (and regional) level, providing detailed context and rationale for investments priorities into infrastructure and service delivery. The planning process also establishes relevant policies and standards to guide future development[90]. If no plan or policy guidance exists, evaluation of development or investment proposals may raise critical development issues. Some examples of policy reforms informed by plans include policies for land use zoning, control and management of public open spaces and facilities,

[88] WBG (2018). Cities are also testing grounds for implementation of the SDGs and the Habitat III New Urban Agenda. More specifically, SDG 11 aims to make "cities and human settlements inclusive, safe, resilient and sustainable".
[89] SEI, Bloomberg Philanthropies (2015).
[90] Spatial planning has an impact on key drivers of urban GHG emissions, such as spatial arrangements (mix) and patterns of land-use, density and urban design, and spatial configuration of infrastructure (i.e., services and built-up structures like transportation systems, water supply, sanitation and wastewater management, SWM, drainage and flood protection, telecommunication, and power generation and distribution).

development of subdivisions and affordable housing, industrial locations, settlement upgrading, non-motorized and public modes of transport, and other related development standards.

14. A capital investment plan builds on the strategic plan and provides a link between the municipality's strategic vision, its spatial plan, and the annual budget. It describes the city's policies and financial abilities to manage the investment needs associated with its spatial development and built environment and helps outline the needs to mobilize financing outside the city's budgets. It then identifies and prioritizes specific projects through a ranking system as well as a general schedule, reflecting the budget for that fiscal year and the estimated future capital needs and revenue estimates.

15. Supported by some MDBs and NGOs (such as C40 and ICLEI), many cities have developed robust Climate Action Plans (CAP) or are in the process of developing one, demonstrating a strong commitment to move toward low-carbon and resilient pathways. The proposed CIF program will build on the experience from these plans and the lessons learned to date from their implementation.

16. The individual characteristics of each city's economy, resource base, and political structure provide different opportunities for dealing with climate change. Climate action planning tools and instruments can help cities to inform climate-smart urbanization strategies. It is achieved through the identification and prioritization of opportunities relevant to the city to achieve low-carbon and climate-resilient development and avoid lock-in into urban sprawl and associated long-lived carbon intensive built infrastructure. Yet, despite the opportunities that may be harnessed by avoiding carbon lock-in and strengthening urban climate-resilience, many cities have not yet incorporated climate-related considerations into their planning and investment priorities. This important gap needs to be urgently addressed, even more so in rapidly growing small and medium-size cities that are facing the strongest barriers and misaligned incentives to act.

2.3. Financing climate-smart investments in cities

17. Connecting cities with financing is an essential component of building urban resilience strategies and achieving mitigation targets. A city's ability to make climate-smart investments, particularly in emerging economies, often relies on the reallocation of existing budgets and the ability to raise revenue. Cities in emerging markets alone have the potential to attract more than USD 29.4 trillion in climate-related investments in key sectors (green buildings, public transportation, electric vehicles, waste, water, and renewable energy) by 2030 91. When regulations permit, private capital can play and important part in filling the financing gap for climate smart infrastructure.

18. However, cities face many investment barriers such as creditworthiness, bankability, and the lack of a viable project pipeline, which limits what they can do on their own and pose an obstacle to attracting private finance. Despite these fundamental issues that constrain investment in climate-smart urban infrastructure, cities can narrow this financing gap by taking advantage of a wide range of established mechanisms to access funding, and by deploying new and innovative models of finance and investment tailored to their specific context. The success of these approaches is contingent on cities having a long-term vision and commitment to green investment, including through the climate-informed planning and budgeting process, with a clear pipeline of projects.

[91] IFC (2018), *Climate Investment Opportunities in Cities - An IFC Analysis*.

19. Different traditional and innovative financing mechanisms used to finance urban infrastructure are described in the Box 2. While these financing approaches will largely benefit creditworthy metropolises and megacities, the vast majority of intermediary cities will require sustained and disciplined attention to policies underpinning their creditworthiness, as well as support to establish solid and stable climate finance ecosystems and integrate climate considerations into development frameworks. Innovative financial and collaborative approaches will be key to preparing bankable projects, developing domestic financial markets, and mobilizing private financing for local investment. A range of initiatives is already attempting to fill these gaps.

Box 2: Financing mechanisms for urban infrastructure

Public-private partnerships are one important mechanism used to finance capital-intensive, sustainable infrastructure. Targeted taxes and incentives can also be used to encourage investment in such infrastructure by favoring density over urban sprawl or low-carbon energy over fossil-fuel sources. Land value capture mechanisms can encourage green infrastructure development while leveraging private finance. Debt financing instruments such as green bonds have great potential to drive climate-smart investment by allowing cities to acquire long-term debt at stable prices. With support from national and international partners, cities are developing dedicated vehicles to enable private green investment.

In addition to these traditional approaches, innovative financial mechanisms to bridge the gap between resilient infrastructure needs and financing, such as resilience bonds and climate insurance, are already being piloted, particularly in cities in developed countries

20. To effectively deliver on the promise of climate-smart cities, it is critical to move from planning to pilots, from pilots to projects, and from projects to partnerships. To do this, cities often require support to plan, implement and finance their transformative catalytic investments and policy actions. This is due to the limited governance, technical, financial, and institutional capacities to incorporate adaptation and mitigation considerations into planning practices and investment decisions:

    a. **Technical and information barriers** include the following:
        - Limited technical capacity and data availability to understand and evaluate climate-related impacts on the built and natural environment leads to a limited ability to reflect these impacts into existing urban planning regulation and in the choice of materials and other design features at the stage of infrastructure design.
        - A lack of capacity and resources can lead to slow response to climate disasters.
        - There also can be a lack of public awareness of climate change-related risks and impacts on urban development, opportunities, and costs to improve climate-resilience and reduce carbon footprint, as well as of the associated local co-benefits.

    b. **Institutional, regulatory, and policy barriers** include the following:
        - Weak institutional capacity and inter-agency coordination at the city and/or national level can lead to a lack of relevant durable (long-term) policies and action plans able to provide signals on targeted urban and market transformation, including to guide private sector investments.
        - Limited institutional capacities and processes at the city level to ensure stakeholder's participation and transparency in urban planning.

- Lack of capacity and know-how to design and structure resilient climate smart infrastructure.
- Traditional capital investment plans and strategic spatial plans do not emphasize climate-related issues.
- Lack of connection between the planning and the mobilized financial package and lack of prioritization in the overall urban planning (competition for financing with other urban agendas) can lead to low levels of enforcement.
- Regulatory and legal barriers can limit the ability of the private sector to create efficient alternative investment vehicles, such as public-private partnerships (PPPs), use of private sector capital to support utilities investments, and working with both the public and private financial intermediaries.

c. **Financial barriers** include the following:

- Decarbonization/emission avoidance or climate-resilient options and measures can be more expensive, posing additional budgetary challenges to cities, in part because these options are less likely to attract private finance.
- Limited resources and the frequent failure of local authorities to appropriate enough resources for needed investments, including due to the limited access to co-financing from MDBs mobilized at the national level, and to allocate spending to those activities that maximize benefits.
- Limited capacity to mobilize and reduce the cost of financing (e.g., through blended finance, including from private capital, MDBs, IFIs, PPPs, climate finance among others) considering often low levels of creditworthiness of municipalities and high levels of indebtment, in particular in low-income countries.
- Reliance on grants to support incorporation of climate-resilience and low-carbon considerations at both planning and implementation stage.
- Limited capacity to bring a pipeline of bankable projects to the market, limiting attractiveness to private capital and to financial institutions.

3. Potential for MDBs solutions and support to cities

21. Mainstreaming climate-related considerations into upstream planning can help achieve transformational impacts both on cities' carbon footprint and on resilience of urban infrastructure and service delivery. Systematic effort to integrate climate-related considerations into strategic spatial planning can significantly contribute to avoid the carbon lock-in problem in rapidly urbanizing areas. It will help cities in communicating big picture beyond individual projects and conveying the overall direction towards low-carbon and climate-resilient urban development. Supporting cities in providing sustainable medium to long- term policy signals and incentives will help align behavior of individual infrastructure systems operators, investors, and consumers. Thus, transformational changes can be achieved in key sectors, including transport, energy, buildings, water, and solid waste management, to move toward low-carbon and resilient options.

22. Both the urgency of urban climate action and the scale of the infrastructure gap in rapidly expanding cities and new secondary cities create a need and opportunity for the MDBs to scale up support to cities. This is needed to achieve sustainable development through climate-informed strategic planning and to support strategically-aligned public and private investments that translate plans to implementation. For champion cities that have already developed their climate-informed

development strategies and action plans, in line with the main principles of this program, CIF finance will contribute to the implementation of transformative catalytic investments and policy actions. Channeling climate finance to cities will significantly contribute to achieving cities' development objectives and create an enabling environment for further raising the ambition of their climate actions.

23. Cities in emerging markets have the potential to attract more than USD 29.4 trillion in climate-related investments in key sectors (e.g., green buildings, public transportation, electric vehicles, waste, water, and renewable energy) by 2030 92. The scale of impact can be significant given that 70 percent of the global low-carbon and climate-resilient infrastructure will be built in urban areas at an estimated cost of USD 4.5 trillion to 5.4 trillion per year. [93]

24. A shift toward more compact urban growth, connected infrastructure, and coordinated governance can not only boost long-term urban productivity and yield environmental and social benefits, but also reduce urban infrastructure capital requirements by more than USD 3 trillion over the next 15 years.[94]

3.1. High priority needs for MDB support through CIF

25. Climate finance can be key to overcoming barriers and maximizing climate action in cities. It can promote programmatic city-level engagement—from strategic and spatial planning to implementation and financing—as a useful complement to the national adaptation and mitigation policies (i.e., carbon pricing).

26. The programmatic approach that has been prioritized by CIF as its primary model of delivery addresses barriers at the planning, structuring, and financing phases to unlock and scale up the implementation of climate-smart infrastructure. The programmatic approach offers a suitable business model to help overcome barriers to mainstreaming climate considerations into strategic and spatial planning, structuring and financing low-carbon and climate-resilient projects and to demonstrate its transformational impacts in rapidly urbanizing areas. Large-scale urban infrastructure investments will be required in the next few decades to sustainably meet the needs of rapidly urbanizing areas. It is urgent not to delay actions on urban planning and long-lived urban infrastructure systems that otherwise would be too costly to decarbonize rapidly and climate proof. These key elements provide a strong rationale for this observation:

- **Coordinated engagement of MDBs is needed to successfully support early and smooth urban transformation** by providing support at scale until the tipping point is reached where commercial finance kicks in.
- **A city-led strategic spatial plan and climate action plan that translate into comprehensive, multi-year strategically-linked capital investment opportunities offer an appropriate platform to support priority investments**, including from the private sector, facilitate MDBs cooperation, and maximize synergies in the use of climate finance toward the aligned policy objectives.
- **The certainty of available scaled-up resources offered by CIF's programmatic approach can help to increase cities ownership and strengthen implementation** of climate-informed strategic plans. It can help overcome institutional, political, and economy barriers and capital constrains and

[92] IFC (2018), *Climate Investment Opportunities in Cities - An IFC Analysis*.
93 CCFLA (2015), *State of City Climate Finance 2015*, New York: Cities Climate Finance Leadership Alliance (CCFLA). According to NCE (2018), the sustainable infrastructure financing gap is estimated at roughly USD 2-3 trillion per year between 2015 and 2030, with the Infrastructure related to sustainable urban development accounting of between two-thirds and three-quarters this gap to 2030.
[94] The Global Commission on the Economy and Climate (2014).

reduce challenges for cities in mobilizing finance for low-carbon climate-resilient policies and investments that are more expensive or more challenging to implement due to existing barriers.

- The CIF's programmatic approach contributes to **de-risking of catalytic investments and helps overcome barriers to attract private sector capital at scale into transformative projects.**
- **Demand-driven capital investment portfolios, informed by spatial plans or other strategic planning, aligned with local and national pathways to low-carbon and resilient urbanization,** can allow MDBs to leverage and deepen their support to transformational urban interventions. The CIF programmatic approach can also leverage the MDBs' strategic dialogue at the national level to help mobilize necessary institutional and political support to urban climate action and enable effective mobilization of resources (beyond CIF) from MDBs and other financial institutions.
- **The CIF-MDB partnership can facilitate dissemination of global good practice, while tailoring this knowledge to local circumstances**. MDBs can also use their convening power to foster strategic partnerships between governments, donor agencies, civil society, and the private sector.

27. A CIF's *Climate-Smart Urbanization Program i*s therefore proposed to address the challenges outlined in this proposal and help to fast track the implementation of climate-smart urban infrastructure and policy actions that significantly contribute to transitioning to low-carbon and climate-resilient urbanization pathways.

4. Rationale for concessional finance

28. **MDBs can use climate finance to provide catalytic financing to cities to plan and implement systematically their carbon-smart urbanization programs**.

29. **Grants will be necessary to provide upfront support to help overcome barrier**s identified in the previous section, namely, to spearhead the preparation of city-level, climate-informed strategic planning and investment plans. Overall, the share of grants is estimated to about 2.5 percent of the global program budget. The rationale for the use of grants is the strongest for municipal authorities in the most rapidly urbanizing regions that also typically have the smallest per capita budgets and limited technical or institutional capacities (NCE, 2018). In the absence of such support, cities may continue to address pressing development needs, forgoing longer-term benefits from climate-informed, resilient, and compact and connected urban forms.

30. **The degree of concessionality required to overcome barriers at the investment stage will depend on the nature and severity of the barriers at the city level**. Concessional climate finance can contribute to covering higher up-front costs and risks for more expensive or more challenging priority interventions and can create a policy-enabling environment conducive to the participation of private sector capital through the appropriate investment vehicles, such as PPPs, the use of private sector capital to support utilities investments, and the engagement of both public and private financial intermediaries. It also can help reduce technical and institutional barriers, bridge financial and information gaps, and stimulate urban transformation by providing clear long-term policy signals.

31. By defining the engagement scope, from strategic and spatial planning to implementation, the program aims to create a policy-enabling environment where both public and private sectors at the city level will gain the knowledge, capacity, and financial incentives necessary to embark on strategically-linked and timely low-carbon and climate-resilient interventions. Therefore, the program

is expected to have larger, catalytic effects on mitigation and resilience building in urban areas, maximizing the leverage of climate finance.

32. Concessionality can also help overcome the barrier related to the myopic behavior of many cities that focus on low-cost, sectoral, short-term solutions and help demonstrate the benefits of a strategic, longer-term vision and the importance of crowding in private sector investment. Given a relatively long timeframe needed to transform long-life urban infrastructure (or demonstrate impacts on climate-smart choices for new infrastructure), longer-term concessional climate finance would allow MDBs to maintain durable engagement at the city level. Such engagement is needed to reach the tipping point where the targeted barriers to implementation can be overcome and commercial finance can take over.

33. Concessionality will help to de-risk catalytic, first-of-their-kind private sector investments to support low-carbon and climate-resilient cities that may not otherwise be feasible for private investors across numerous sectors. This can help crowd private sector capital into markets where such financing is not currently available.

34. Resources with a concessional component are also expected to unlock opportunities for greater co-benefits (i.e., reduced local pollution and increased livability, connectivity, and productivity of cities). This can contribute to sustain city action and could reduce the need for concessional climate finance in the medium to long term.

5. Concept proposal

35. **The objective of the proposed program is to support cities in developing countries around the world to accelerate implementation of ambitious and transformative investments and policy actions that significantly contribute to transitioning to low-carbon and climate-resilient urbanization pathways**.

36. These objectives will be achieved in the following ways:

- **Scaling-up support to cities to achieve sustainable development patterns through climate-informed urban spatial and investment planning** that help avoid locking in conventional urban forms; support good infrastructure solutions; and enable retrofitting of existing city centers to make existing and new cities greener, more compact, mixed-use, transit-oriented, and more resilient; and enhance urban-rural linkages while responding to development needs.

- **Supporting financing and implementation of strategic public and private investments that translate plans into action** by creating policy-enabling environment, reducing barriers, covering higher up-front costs and risks of low carbon and resilient infrastructure, bridging financial and information gaps, enabling effective mobilization of resources at the national level and from international financial institutions, and stimulating markets by long-term, city-level policy signals.

- **Supporting the use of data-driven, climate action planning tools that inform cities' decisions to help transition toward long-term, low-carbon and climate-resilient pathways, relevant to the national and local circumstances and capabilities.** The program will help cities by providing clear and actionable recommendations in key sectors, including energy, transport, buildings, water, and waste systems, and facilitating access to finance for climate mitigation and adaptation actions.

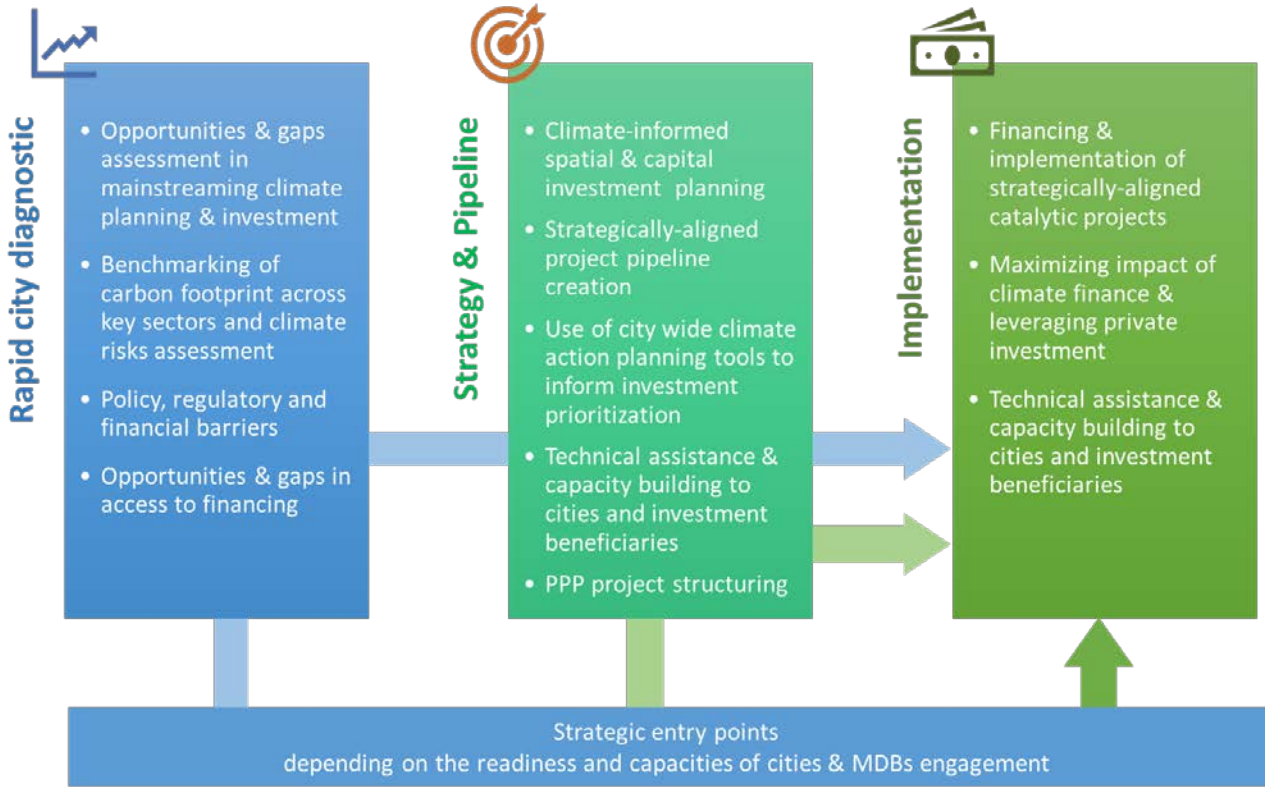
- **Enabling municipal and/or sub-national entities to attract private sector investments via capital markets** by supporting the development of financial instruments and investment vehicles that

improve urban projects' bankability, support cities' creditworthiness, and generate investors' confidence and appetite in municipal investments.

37. It is proposed to start with a limited number of cities, such as 15 to20, during an initial phase using a multi-prong approach. The program's structure includes three components, which may be undertaken simultaneously, concurrently, or on an as-needed basis depending on the stage of each city's development and its need for support. This will ensure that comprehensive but targeted support is provided to cities to cover the key elements of their transformative change, from strategic planning to implementation of investment and policy actions. In cities where sound low-carbon and resilient spatial and capital investment planning is already available and is in line with the global approach outlined in the proposal, the program entry point may be defined at the phase of implementation of catalytic investments and policy actions. Therefore, the strategic entry points will depend on the readiness and capacities of cities and MDBs engagement (see Figure 3).
38. While the program will cover a period of up to eight to 10 years, some cities are expected to show immediate results in two to three years. Others may require more support to prepare their investments before implementation.
39. Under the program's approach, MDBs would assess the state of readiness of existing spatial and investment plans and each city's need for support along the three program components as described in Figure 3.
40. To guide the preparation and assessment of urban interventions to be supported by the *Climate-Smart Urbanization Program*, two criteria would be applied to ensure their alignment with the overall goals of the program (to be further defined):

    - Criteria pertaining to targeted cities of different sizes, such as urban and socioeconomic growth, carbon footprint, vulnerability to the impacts of climate change, and willingness to change
    - Criteria relative to the targeted level of ambition and transformational impacts of the strategically-aligned investment pipeline. The way the guiding principles will be operationalized will take into account specific operational modalities of each MDB to ensure the most efficient deployment of the program.

Figure 3: Proposed Climate-Smart Urbanization Program structure



5.1. Component 1: Rapid city diagnostic

41. Component 1 aims to identify and engage with beneficiary cities through a rapid city diagnostic to assess the current situation and predicted trend of these cities, their exposure to climate risks, current level of preparedness, and gaps to mainstreaming climate-related considerations into mid-term urban planning and investment pipeline development. The diagnostic will identify existing barriers in the policy, regulatory, and economic incentive structures at the city level, as well as the limitations in access to financing that may prevent effective climate actions and limit private investment flows into catalytic projects.

42. In cities that do not have established high-quality climate-informed urban development vision and action plans, the implementation of a rapid diagnostic for a city is excepted to be completed within six to 12 months. Cities that have an active engagement in this area, the diagnostic will focus on identifying necessary support to translate the existing commitments into an investable portfolio of catalytic actions and on addressing critical policy gaps and financing barriers that would need to be overcome to accelerate implementation and leverage private investment.

43. The implementation of this Component 1 can be accelerated by the creation of a “one-window” pool of technical resources supported by CIF grants that can be quickly and flexibly deployed to complement. It can further reduce the time necessary to initiate the deployment of catalytic investments by building upon existing MDB engagement with targeted cities.

5.2. Component 2: Preparation of climate-informed strategic spatial planning and other climate action plans and project pipeline development

44. This component consists of preparing climate-informed spatial plans and other climate action planning at the city level, appropriate to the regional/city circumstances and reflecting the outcomes of the effective stakeholder's engagement. It also includes multi-year, strategically-linked capital investment plans, with a focus on developing a project pipeline for implementation in Component 3. The proposed plans will benefit from the review and endorsement by an international committee or body to leverage best practices and international experience between participating cities and beyond.

45. Component 2 aims to create an enabling framework and policy environment where a cities' institutions and public and private sectors at the city level will gain the knowledge, capacity, and financial resources necessary to embark on strategically-linked and timely low-carbon and climate-resilient interventions. The resulting coordinated strategic vision and investment framework will define the range of priority investments, some of which may be supported by the MDBs. Component 2 will also help to build a joint-MDB consultative platform to facilitate MDBs' cooperation, enable synergies in supporting policy objectives identified by the city, and achieve impact of climate finance at scale.

46. Component 2 also aims to develop or add to a strategically-aligned project pipeline ready for implementation, including through the engagement of both the public and private sector arms of the MDBs, and to support mobilization of financing necessary for the implementation of catalytic projects. The implementation of this phase is expected to take up to one to two years, depending on the level of existing gaps.

47. Component 2 will include, but is not limited to, the following main activities:

- Providing technical assistance to improve the preparedness of cities in climate adaptation and risk mitigation and to use strategic opportunities to transition toward efficient, low-carbon urban development patterns through climate-smart planning (e.g., through developing or updating the cities' strategic growth plans, spatial development plans, and capital investment plans).
- Providing technical assistance to cities to use Climate Action Planning (CAP) instruments and tools to help them make decisions about the future carbon footprint and climate-resilience of their buildings, energy, transport, water and waste systems. The CAP tools will support cities prioritize multiple carbon-smart actions and investments by evaluating their costs and impacts.
- Reviewing and enhancing municipal budgeting and financing performance (including to improve creditworthiness).
- Identifying necessary policy, regulatory and zoning reforms, as well as appropriate financial instruments, to implement priority interventions in view of creating a pipeline of catalytic projects ready for implementation both by the public and private sector.
- Exploring innovative financial and collaborative approaches to prepare bankable projects, develop domestic financial markets, and mobilize private financing for local investment, including through partnerships[95] (e.g., by supporting municipal PPPs or bond issuance).

48. Targeted technical assistance and capacity building can also be provided as needed to accompany the investment beneficiaries to strengthen the demand for catalytic investments and enhance their

[95] The examples of the initiatives already attempting to fill these gaps, please see IFC (2018), *Climate Investment Opportunities in Cities - An IFC Analysis*.

deployment rate and transformational impact. This support could be provided in several forms, including but not limited to corporate development programs; tariff restructuring; technical, financial, environmental, social, and gender due diligence; and project implementation and monitoring.

5.3. Component 3: Implementation of catalytic investment projects

49. This component focuses on financing and implementing key catalytic investment projects identified by cities and relevant project pipelines. Priority will be given to strategically-aligned projects or policy interventions that are both ambitious and transformational[96] and where concessional climate finance is needed to overcome barriers to meaningfully achieve program objectives.

    Potential eligible investments include, but are not limited to, the following:

    - Shifting towards low-carbon and resilient access in cities by transforming motor-dominated urban corridors into transit-oriented development corridors, integrating transport modes to enhance efficiency and flexibility, and promoting non-motorized mobility.
    - Promoting low-carbon mobility, including electrification of public and private transportation (electromobility), traffic demand management, and investment in public transit.
    - Enhancing the use of renewable energy sources and increasing energy efficiency for the delivery of energy services within the city.
    - Enhancing the alignment of spatial and infrastructure planning in a sustainable and climate-informed way to help achieve good density, mixed use, and resilient development when constructing new buildings stock and relevant infrastructure and service provision (i.e., help enhancing coverage and implementation of building codes and energy performance standards).
    - Supporting green and resource-efficient improvements in new and existing buildings (e.g., electrification, use of distributed renewable energy solutions, demand-side management, climate-smart procurement practices, green buildings energy performance standards, and market facilitation) and efficient cooling systems and service provision.
    - Reducing the energy footprint of water supply and treatment systems and improving the resilience of water supply for a city.
    - Promoting sustainable cooling approaches, including: (i) energy efficient and low global-warming-potential technology solutions (e.g., cool surfaces and mitigation of urban heat island effects; district cooling systems), (ii) reducing the needs for artificial cooling (e.g., energy efficient/ green buildings) and (iii) policies to support access to clean and affordable cooling and thermal comfort
    - Promoting integrated solid waste management and waste to energy solutions.
    - Green infrastructure design interventions that would improve access to basic services while reducing carbon footprint and enhancing resilience of the city (e.g., wetlands, buffer zones, green roofing, retention ponds, street side swales, rain gardens, and porous pavements).
    - Rehabilitating eco-sensitive areas into green public spaces with social, environmental, and economic benefits to urban population.

[96] Ambitious interventions bring significant contribution to putting the city on a decarbonization and climate-resilient pathway, for example by transitioning to climate-smart growth models for cities. Transformational interventions are those that reduce barriers to implementation faced by future climate-related programs and projects, for example by showcasing the feasibility of climate-smart investments for crowding in private sector financing and engagements (based on WBG, 2018, *Strategic use of climate finance to maximize climate actions*).

- Structuring financial vehicles (e.g., green bonds, PPP schemes, equity investment facilities) to channel private sector finance towards the pipeline of low-carbon and climate-resilient investments identified in the cities' planning activities.

50. Component 3 also envisions continuous targeted technical assistance and capacity building to cities and investment beneficiaries, such as described in Component 2. At the implementation stage, such technical assistance and capacity building may focus on timely feedback of achieved performance and potential implementation gaps, as well as facilitating improvements in the investment pipeline to meet the expected outcomes and transformational impacts.

51. Boxes 3, 4, 5 and 6 illustrate how World Bank Group-supported interventions in four cities (Dar es Salaam, Tanzania; Kampala, Uganda; Colombo, Si Lanka; and Izmir, Turkey) have implemented some of the proposed activities.

52. The three components of activities are based on the theory of change that recognizes the need for climate-smart spatial planning, implementation capacity, and access to affordable financing. Effective planning is foundational for enabling cities to implement capital investment projects that are low-carbon and climate-resilient. It is necessary to reduce the carbon footprint of cities, avoid carbon lock-in for new infrastructure (while reducing the needs and overall cost for infrastructure investments), and build a sustainable future for cities prepared with sufficient and effective climate adaptation and mitigation measures.

6. Expected outcomes and transformational change

53. The program expects to achieve six core outcomes:

    a. Feasibility and benefits of mainstreaming climate-related consideration into urban development—from strategic planning to implementation—will be demonstrated in the context of rapidly expanding and new rapidly growing secondary cities around the globe.

    b. Cities will be enabled to provide sustainable policy signals regarding their climate-smart urbanization priorities, which can guide market transformation and help align behavior of individual infrastructure systems operators, investors, and consumers to these priorities. This will be due to enhanced technical, institutional, and financing capacity at the city-level to prioritize needs, prepare project pipelines, and mobilize finance to implement investment projects in line with climate-informed strategic planning. Cities will also benefit from demonstrated feasibility of climate-smart investment projects and policy interventions

    c. Public and private sectors at the city level will gain the knowledge, capacity, and financial incentives necessary to embark on strategically-linked and timely low-carbon and climate-resilient interventions.

    d. Cities will curb unplanned, sprawling urban expansion and transition to more efficient compact urban forms for socioeconomic growth. Cities will benefit from the economic and social opportunities associated with transformational low-carbon and resilient choices by the following:

        - Using mass rapid transit solutions (MTR) and transport-oriented development, including through the deployment of electromobility, to manage expansion and achieve low-carbon connectivity
        - Using spatial planning and urban design to shape district-level neighborhoods and respond to development needs, 3) achieving higher energy performance and reduced

carbon footprint of the existing and new buildings stock and cooling systems and service provision
- Facilitating redevelopment and rejuvenation though appropriate urban planning and design guidelines
- Protecting green, natural areas
- Strengthening the alignment of spatial and infrastructure planning to help achieve “good” density, optimize efficiency, and improve resilience of new housing stock and relevant urban infrastructure and service provision (water supply and treatment, integrated solid waste management)
- Implementing access to resilient water resources
- Implementing resilient waste management systems.

e. The urban population in participating cities will benefit from improved access to climate-smart services and improved level of protection, including through the prevention of losses due to adverse climate-related shocks and through the synergetic benefits for public health (i.e., reduced local air pollution from motorized transport and reduced health impacts due to urban heat extremes) and related productivity gains.

54. The transformational changes driven by the program will include the following:

a. Climate-informed strategic planning is expected to lead to raising priority and synergy of urban climate action within the overall urban development agenda in rapidly expanding urban areas and in rapidly growing secondary cities and to facilitating mobilization of finance.

b. Climate action planning will help cities leapfrog traditional approaches and transition to a long-term, low-carbon and climate-resilient pathway, relevant to the national and local circumstances and capabilities. This will be achieved through informing priorities and identifying actionable recommendations. The CAP will also help cities to access additional finance for climate change mitigation and adaptation.

c. Early effort to integrate climate-related considerations into strategic spatial planning and infrastructure investment is expected to contribute to avoiding the carbon lock-in problem in rapidly urbanizing areas, substantially contributing to the success of longer-term climate actions at the national and global level.

d. The program will help shift myopic behavior at the city-level by demonstrating the benefits of a strategic, longer-term vision and the feasibility of crowding in private sector investment. This will help cities to convey the overall direction towards climate-smart urbanization patterns, support policy-enabling environment and guide transformational changes in key sectors that include transport, energy, buildings, water, and solid waste management.

e. The implementation of the proposed approach will allow testing and dissemination of best practices in terms of policy reforms, implementation of replicable climate-smart solutions, and financing models that can effectively reduce barriers to enhanced private sector participation in urban climate action.

Box 3: Msimbazi Basin in Dar es Salaam, Tanzania: Transforming urban space and mitigating climate risks through participatory planning

The lower Msimbazi Basin transects the city of Dar es Salaam, Tanzania, including its central business district, critical transport infrastructure, and vulnerable low-income communities. This is a flood risk hotspot in the heart of the city and presents flood management complexities resulting from environmental degradation and erosion, poor infrastructure citing, encroachments of informal communities, climate change impacts, pollution, and competition for scarce land. Technical assistance provided under the World Bank-supported Tanzania Urban Resilience Program facilitated a participatory planning process of urban design to identify flood risk reduction measures in the lower Msimbazi Basin of Dar es Salaam. A participatory charrette process engaged multiple stakeholders in understanding, prioritizing, and designing solutions for these issues. The charrette spanned six months (from January to June 2018), engaging approximate 70 people across government, civil society, and communities, and delivered a comprehensive and integrated strategic development and management framework for land use in the Msimbazi River catchment area and its vicinity. The output includes elements that will support the resilient development of Dar es Salaam as a megacity, including flood protection, environmental rehabilitation, and green city park development.

Following the charrette exercise, experts will be mobilized to conduct a comprehensive flood model analysis as an input for making recommendations for a detailed area plan in the lower basin, as well as a basin-wide strategic management framework for flood risk reduction. The flood model will be the first time the river is scientifically surveyed, modelled, and assessed for flood mitigation options.

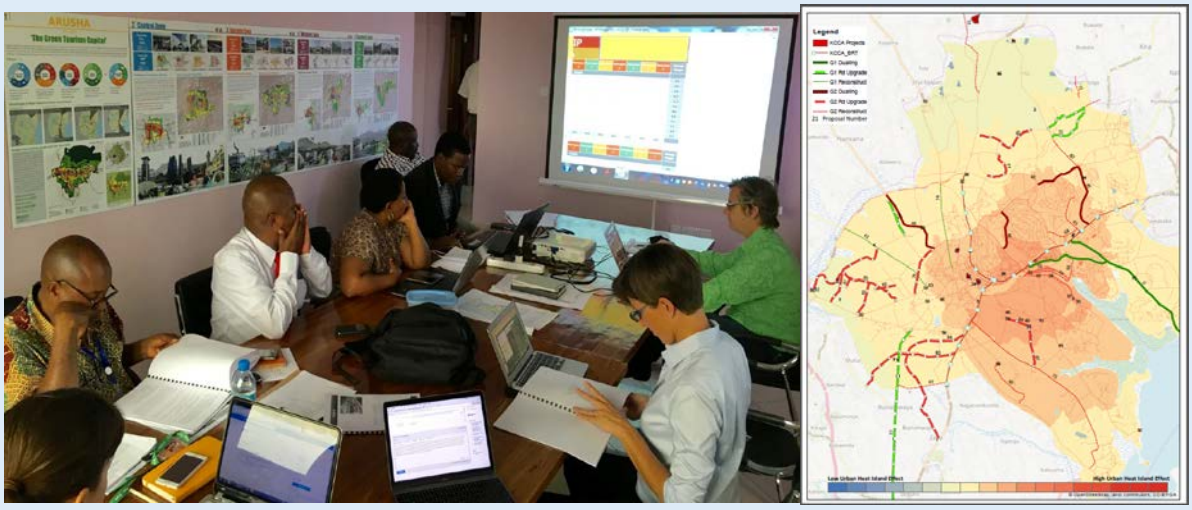
Sources: World Bank, 2018. The Msimbazi Opportunity: Transform the Msimbazi from A Flood Risk Area to An Icon of Urban Resilience in Tanzania. August 21, 2018, Dar es Salaam
World Bank, 2018. Msimbazi Basin Flood Mitigation and Participatory Planning Project Concept Note (P161530).

Box 4: Kampala, Uganda: Developing a climate-smart capital investment plan for a low-carbon future

Between 2002 and 2010, Uganda's urban population grew by 5.6 percent, almost twice as fast as the rural population. As a result, the capital city Kampala is projected to become a megacity of over 10 million by 2030, and other regional and strategic cities will also see a demographic explosion. With this increasing pool of urban residents, local government authorities have to be able to secure basic social services and facilities for the urban population in a sustainable way. The Kampala Capital City Authority (KCCA) adopted its Strategic Plan 2014-2019 to transform Kampala into an attractive, vibrant, and sustainable world-class city. To implement the plan, it has been necessary to break it down into investment projects.

Capital Investment Plan (CIP) is a policy tool used by local governments to forecast and budget capital projects and acquisitions over a given timeframe. This tool is integral to capital and operating budgets, asset management, long-term plans for development, and financial management of cities. With support from the World Bank, KCCA has developed its first Climate-Smart Capital Investment Plan. During the CIP process, the World Bank helped KCCA plot their desired CIP projects against maps of potential hazards to understand the climate risk implications of investments. The projects were then reviewed and prioritized based on a set of criteria, including climate benefits. As a result, for example, the education directorate removed all proposed schools in the floodplain in the CIP.

A remarkable degree of transparency was made possible through the publication of participant scores, investment proposals, evaluations, and results at each step of the process. Making this information available to the public helped enhance the opportunity for the public to hold decision-makers accountable.



The climate-smart CIP process (left) and the mapping of proposed projects against risk exposures (right) in Kampala

Sources: Whittington, Jan, and Catherine Lynch, 2015. Climate-Informed Decisions: The Capital Investment Plan as a Mechanism for Lowering Carbon Emissions. World Bank Policy Research Working Paper Series No. 7381. World Bank, 2018.

Box 5: Colombo, Sri Lanka: Transforming into a modern, world-class capital through climate-focused urban infrastructure and broader strategic planning

During a 15-hour period in November 2010, nearly 500 millimeters of rain fell on Colombo, the capital city of Sri Lanka, causing unprecedented flooding across the city. Many houses and buildings were destroyed, and the Parliament building was flooded by 1.2 meters of water. The floods caused high economic losses, as the Colombo metropolitan area accounts for about 50 percent of Sri Lanka's GDP. The floods were particularly destructive due to poor design and maintenance of drainage systems, illegal encroachments on flood retention areas, and industrial pollution. The metropolitan area is in a low-lying flood plain and extremely vulnerable to floods.

The occurrence and damage of floods in the area have steadily increased due to a combination of climate and non-climate factors, including rapidly changing climate patterns resulting in frequent and more intense thunderstorms. The metropolitan area has experienced 11 major floods in the last 32 years. Rainfall frequency has almost doubled in Colombo during the past 30 years, while the area's population has increased from 1.7 million in 1981 to 2.5 million in 2010. Storage capacity in the Colombo Water Basin has declined greatly since 2000 as a result of uncontrolled encroachment on landfills and the floodplain by illegal settlements. In the city of Colombo, 68,000 housing units are estimated to be in underserved pockets; most of this housing is in flood-prone areas and subject to the environmental and health risks of floods.

The World Bank Metro Colombo Urban Development Project (MCUDP) was initiated in 2012 to support the national government's aim to reduce flooding in the catchment of the Colombo Water Basin and strengthen the capacity of local authorities in the metropolitan area to rehabilitate, maintain, and improve local infrastructure and services through selected demonstration investments. The project is financing infrastructure, including pumping stations, tunnels, and canals, as well as the reclamation of urban wetlands and public spaces for increased natural drainage.

Climate-focused urban infrastructure within a larger strategic plan is critical. While the MCUDP sub-projects were under construction, Colombo again experienced flooding in 2016 and 2017. The 2016 floods alone affected 300,000 people and displaced 4,900. MCUDP has calculated that Colombo now suffers damage and other losses of nearly USD 45 million per year from floods and heavy rain. The prioritization and phasing of all future metropolitan infrastructure and residential development must be done in coordination to act as a comprehensive network and with flood prevention in mind.

Beddagana Wetlands Park, financed by MCUDP

Source: World Bank, 2012. Metro Colombo Urban Development Project Concept Note (P122735).

Box 6: Izmir, Turkey How to harness private sector solutions to address financing gaps and promote urban resilience

According to the Brookings Institution, in 2015, the city of Izmir was the world's second fastest-growing metropolitan area. With 4 million inhabitants, Izmir is the third largest metropolitan area in Turkey, after Istanbul and Ankara. Due to its buoyant economy, Izmir has attracted a large number of migrants, which has resulted in rapid growth of the city and a number of challenges, including sprawl, congestion, and the risk of polluting fragile ecosystems. These challenges have forced the municipal authorities of Izmir to consider how to expand the provision of urban services such as public transport, and water supply and sanitation.

The Izmir metropolitan municipality (IMM), and its municipal water utility (IZSU), were confronted with the need to raise funds to expand IZSU's services. IZSU needed to expand its concession to serve a considerably larger area, including districts where households disposed of human waste through a septic tank, and water supply facilities were inadequate.

Before its expansion, IZSU had 27 wastewater treatment plants (WWTPs) in the municipality, with the capacity to treat 802,757 cubic meters of wastewater per day. With this capacity, IZSU had achieved its key coverage and environmental objectives. In 2018, IZSU provided almost universal access to water supply, with 97.7 percent of households having a water connection. The utility also provided 87 percent of the population with a sewer connection. IZSU's operations now run on commercial principles, generating an operational surplus every year. Annually, IZSU treats 301 million cubic meters of wastewater, and collects and disposes of 2.02 million tons of solid waste. A study of pollution in Izmir Bay concluded that by 2018, water quality had significantly improved as untreated wastewater was no longer being discharged, and coliforms and other bacteria had been eliminated.

However, greater investments were required by IZSU for three main reasons: first, Urban expansion had led to increases in wastewater discharge and Izmir Bay needed greater protection from municipal water-borne pollution. It is an important tourist destination, with many pristine "blue-flagged" beaches (beaches certified as having high environmental standards), and it is the nesting ground of endangered animals and birds. IZSU was also committed to achieving the standards established by the European Union's Water Framework Directives (WFD). For these reasons, IZSU required financing of an estimated €200 million.

Solution: To help Izmir, the International Finance Corporation (IFC) formed a strategic partnership with IMM and IZSU to implement synergistic and high-impact infrastructure projects that would i) support the large capital outlay needed, and ii) leverage innovative approaches to address emerging challenges.

IFC's engagement opened up opportunities to raise non-sovereign backed financing for "public goods" investment in wastewater treatment and disposal. IFC provided about €48 million on commercial finance terms to support investments in IZSU, which included the construction of a fourth unit of the Cigli and Yeni Foca wastewater treatment plants. The expanded Cigli plant will be able to treat an additional 216,000 cubic meters of wastewater (adding 21 percent to the plant's treatment capacity). The Yeni Foca plant will only have the capacity to treat an additional 10,000 cubic meters of wastewater per day, but it will have significant positive impact on the fragile marine ecosystem surrounding Foca District, an eco-sensitive area which previously was a low-density settlement that relied on on-site sanitation. In addition to providing finance, IFC also provided technical recommendations based on its worldwide experience with private sector solutions for improving the operations of WWTPs, and also reducing the carbon footprint of wastewater treatment plants.

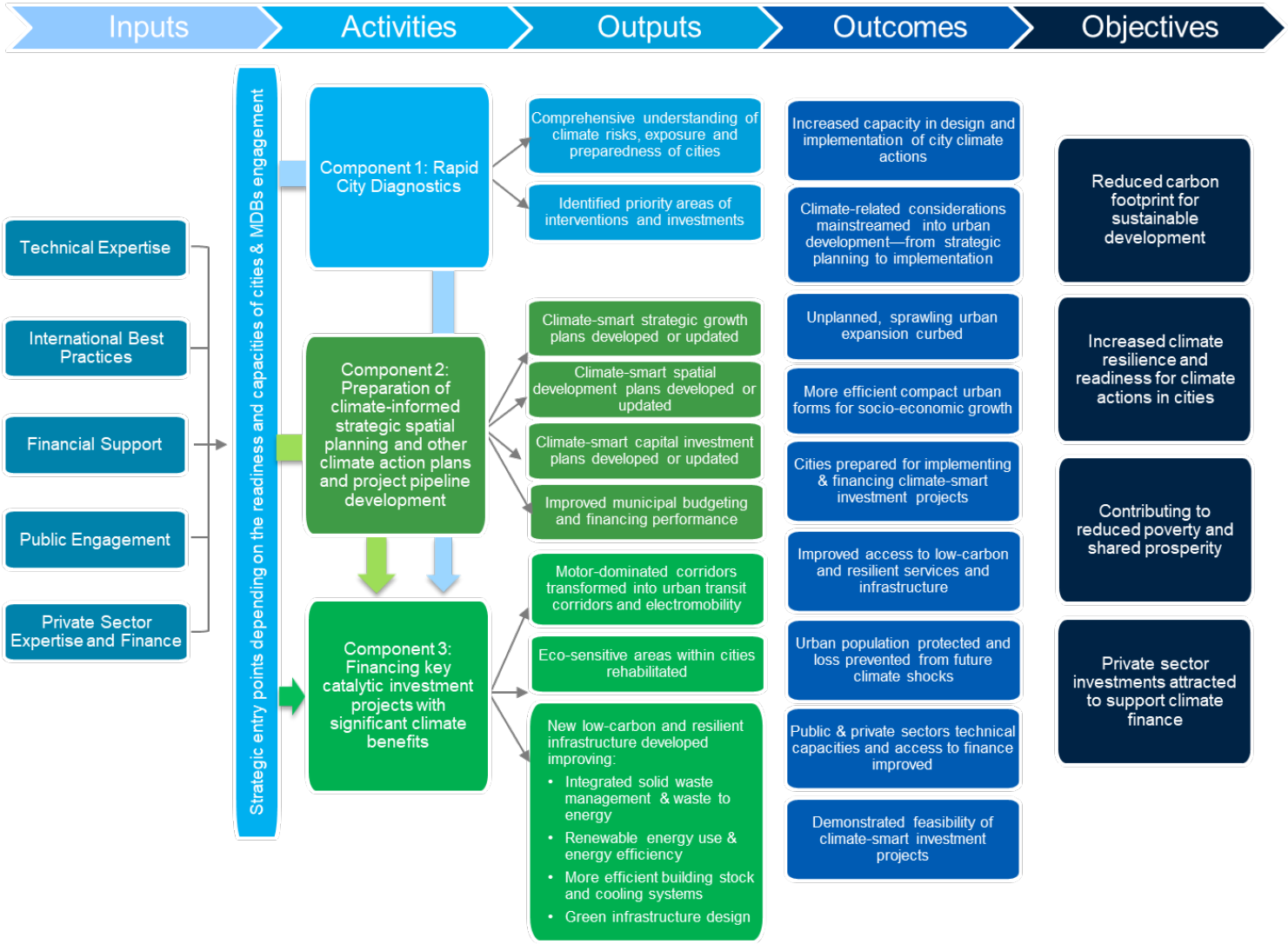
Results: IZSU tested private sector innovations that demonstrate the operationalization of circular economy concepts. At the Cigli Sludge-Drying Facility and the Menderes Treatment Facility, the innovations have enabled sustainable reuse, recovery, and recycling of the waste stream to transform it into a valuable input for Izmir's economic activities. The dried sludge dried, produced using anaerobic digestion processes and methane capture, has been tested as a fuel for cement factories. The cement produced through burning the sludge to generate power is being used to expand the city's tramway and integrated transport infrastructure, which will contribute to improve urban mobility and access to employment opportunities.

Cigli Wastewater Treatment Plant has significantly reduced its carbon footprint as the sludge produced at its facility is now dried and used as fertilizer for an afforestation program. The Menderes Havza Wastewater Treatment Plant uses solar energy instead of fossil fuel to dry its sludge. IZSU is also exploring the potential for combining organic waste with sludge to produce much larger volumes of renewable energy. Izmir's innovations in wastewater treatment have contributed to the city fulfilling its commitment to the European Union Mayors' Convention of reducing the city's CO_2 emissions by 20 percent and doing so well ahead of the target year of 2020.

At a time when Izmir was simply not able to access commercial finance, the city has been able to build a pipeline of bankable projects and access long-term finance from IFC and commercial lenders. In 2010, 70 percent of the city's debt was funded by sovereign-guaranteed financing, and the municipality depended on transfers from the national government. Now, 70 percent of Izmir's debt is funded by non-sovereign backed financing, at tenors of 12 to 13 years that are not otherwise available for Turkish municipalities in the credit market. Leveraging these new sources of financing has enabled the city to plan a large investment that focuses on key and synergic infrastructure projects to address transport and water management challenges. This has also opened up opportunities for non-sovereign backed financing of pure public goods investment in wastewater treatment and solid waste disposal.

Source: IFC. 2018. Case study on IFC impact and additionality in the City of Izmir. Washington DC: IFC and WRI – Ross Center for Sustainable Cities.

7. Theory of change for the proposed Climate-smart Urbanization Program



Annex B.3: Accelerating Low-Carbon Transition in Industry Program

A private sector-focused approach to accelerate industrial corporate climate leadership and impact

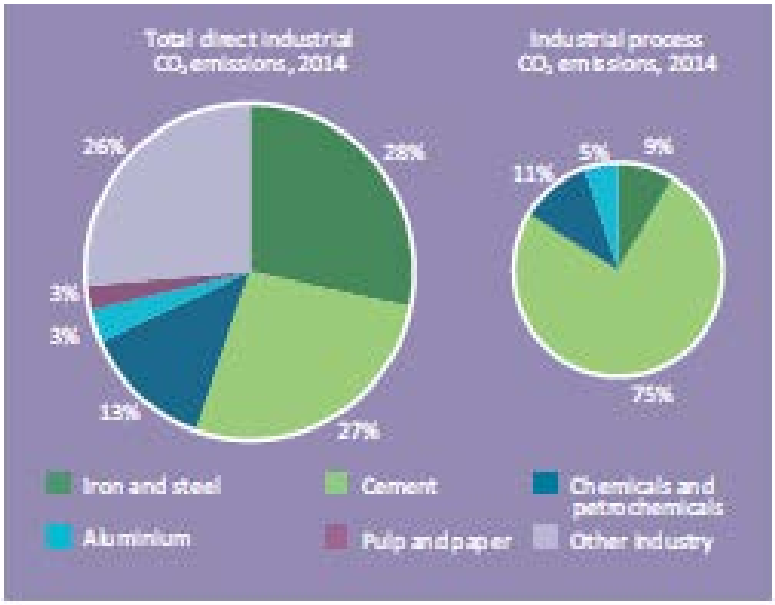
1. Overview of the sector

1.1 Industrial corporates and their increasing share in global GHG emissions

55. **Industry is one of the leading sources of increases in GHG emissions and may become the single biggest source of GHG emissions in less than a decade**. Industry is currently being overtaken by services and the growth of industrial GHG emissions is expected to come from non-OECD countries. Tackling industrial GHG emissions should be a high international priority with commensurate international support and is, therefore, proposed for CIF's future programming.

56. Iron and steel, cement, chemicals and petrochemicals, aluminum, pulp and paper and other are the high-emitting industries to target to significantly reduce direct industrial and CO_2 process emissions. Figure 1 shows the relative share of the CO_2 emissions for direct industrial and process emissions for key sectors.

Figure 1: Share of CO_2 emissions for direct industrial & process emissions for key sectors



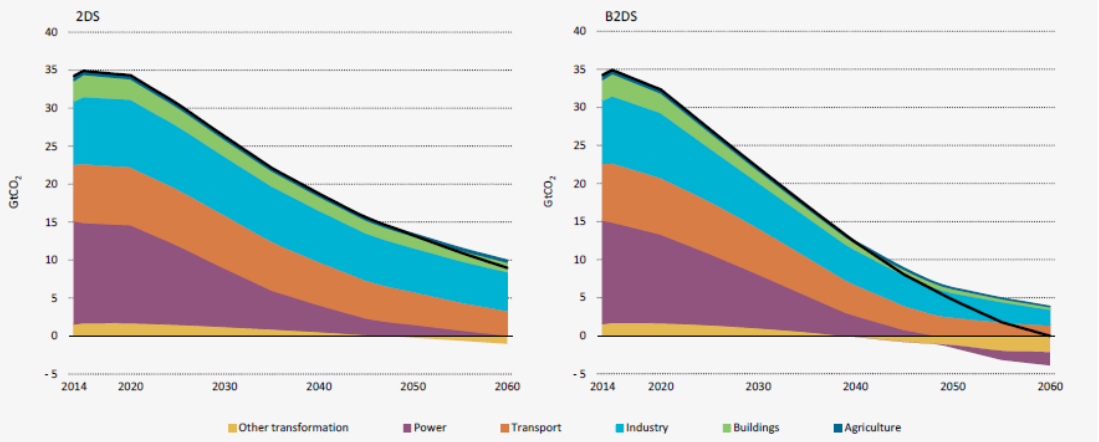
57. Industrial corporates are estimated to account for around 24 percent of global GHG emissions, and its relative share in is rising.[97,98] Currently, industrial GHG emissions are second after power sector emissions. By 2030, the IEA projects that industrial GHG emissions will represent the biggest share of GHG emissions (see Figure 2).

58. Regarding energy consumption, the industrial sector accounted for 154 exajoules (EJ), or 36 percent of global total final energy consumption (TFEC) in 2014. The long-term trend of production growth in energy-intensive industrial sectors has continued, along with growth in the industrial sector's TFEC, which grew by 1.3 percent in 2014.

[97] https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data.

[98] IEA Industrial CO2 emissions have reached 8.3 GtCO2 in 2014, 24% of global CO2 emissions.

Figure 2: Remaining CO_2 emissions in the 2°C Scenario and the Beyond 2°C Scenario[99]



Note: Solid lines represent net energy sector CO_2 emissions for each scenario.

Key point *The remaining CO_2 emissions from industry and transport in the 2DS must be targeted in the B2DS, with negative emissions necessary to achieve net-zero energy sector emissions by 2060.*

59. **The relative contribution of developing countries to industrial GHG emissions has been rapidly increasing**. Globally, industrial GHG emissions are dominated by the Asia region, which was also the region with the fastest emission growth between 2005 and 2010. As illustrated in Figure 3, in 2010 over half (52 percent) of global direct GHG emissions from industry and waste/wastewater were from the Asian region, followed by countries member of the OECD in 1990 (25 percent), Economies in Transition (9 percent), Middle East and Africa (8 percent), and Latin America (6 percent). Between 2005 and 2010, GHG emissions from industry grew at an average annual rate of 3.5 percent globally, comprised of 7 percent average annual growth in the Asian region, followed by Middle East and Africa (4.4 percent), Latin America (2 percent), and Economies in Transition countries (0.1 percent), but they declined in the OECD 1990 countries (–1.1 percent).

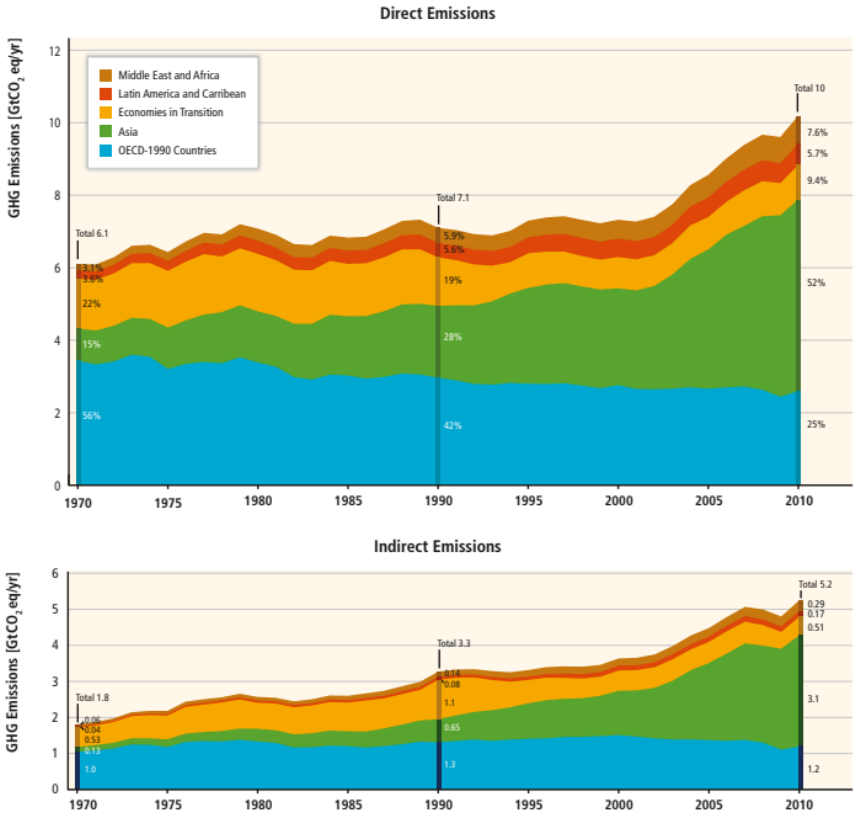
60. **The highest growth rate of industrial energy use occurred outside the OECD**; the energy use of non-OECD countries grew 1.9 percent in 2014 compared with 0.2 percent for OECD countries, and continued to gain share of global industrial energy use, reaching 69 percent in 2014, up from 49 percent in 2000. Growth in energy use was strong in China (3.1 percent) and India (4.3 percent) in 2014. The challenges of decoupling industrial output growth and GHG emissions require significant improvements in material and energy efficiency, deployment of best available technologies, shifts to lower-carbon fuels and feedstocks, and rapid deployment of innovative technologies, including carbon capture and storage (CCS).

61. Reaching the 2°C Scenario pathway, and going beyond, requires collaborative efforts across industrial sectors and regions to decrease energy and CO_2 emissions impacts. While OECD countries have a relevant role to play in deploying and transferring innovative technologies for industry, 86 percent of the global cumulative direct CO_2 emissions reductions by 2060 in the Beyond 2°C scenario would need to come from non-OECD countries where faster-growing material demand prospects, new capacity

[99] 2°C Scenario (2DS) lays out an energy system pathway and a CO_2 emissions trajectory consistent with at least a 50% chance of limiting the average global temperature increase to 2°C by 2100. The Beyond 2°C Scenario (B2DS) explores how far deployment of technologies that are already available or in the innovation pipeline could take us beyond the 2DS. See IEA web site at https://www.iea.org.

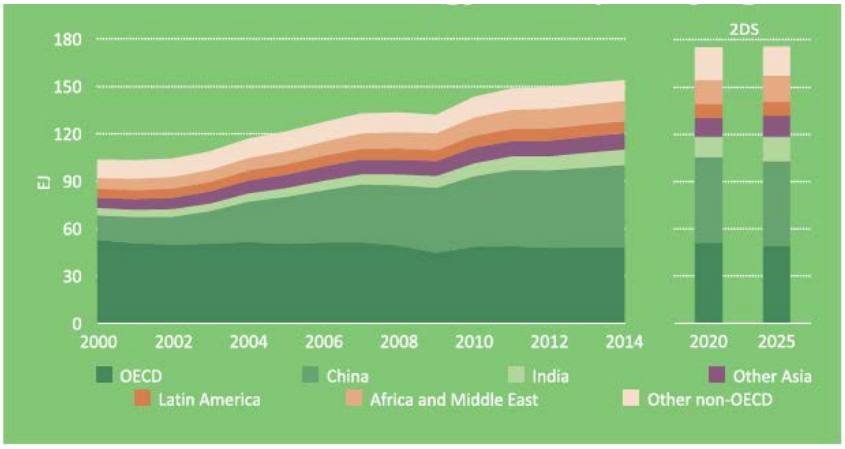
installations and growing importance in world markets increase the potential to widely deploy innovative industrial process technologies.

Figure 3: Substantial increase of industrial GHG emissions in developing countries, versus declining trend for the OECD countries (Source: IPCC)



62. As Figure 4 shows, even as industrial GHG emissions fall in OECD countries, globally they are expected to rise under the 2°C scenario. This situation may be even worse as the trajectory based on current NDCs is estimated to lead to more global warming than 2°C.

Figure 4: Total final industrial energy consumption by region
(Source: IEA, Energy Technology Perspectives, 2017)



2. Climate change context faced by industry in developing countries

2.1 Technical solutions exist, and energy efficiency is a key measure

63. While the industrial sector is broad and complex, especially when also considering supply chains, there are mitigation opportunities to seize. Opportunities exist to improve manufacturing efficiency, maximize the use of locally available resources, and optimize materials use. An illustrative overview of high-level technology (in a broad definition) mitigation approaches includes:

- Energy and materials efficiency measures through deployment of best available technologies can contribute around half of the cumulative emissions reductions in industry before 2030, underscoring the importance of early action.
- Increasing postconsumer scrap recycling rates and using this scrap to offset primary production of materials can significantly reduce the energy and emissions intensity of production, and thus should be promoted.
- All sectors should consider possibilities for sustainable use of industrial wastes and by-products as well as recovering excess energy flows. Implementation of these existing solutions, especially the low-cost, low-risk commercially available processes and technologies, will be a critical driver of the early phase of the transition.
- Large-scale deployment of innovative and proven technologies is needed at both pilot and commercial scale. There is a need to support innovation in economically strategic sectors such as iron and steel, cement, and chemicals.[100]

64. **The potential for industrial energy efficiency is critical for developing countries**. New industrial development opens the opportunity for the installation of new plants with highly efficient energy and material technologies and processes (UNIDO, 2011). It is also vital to work across entire industry value chains to identify opportunities to reduce waste, promote circular economy opportunities and ultimately reduce GHG emissions. The following are the most relevant industrial sectors:

[100] IEA (2017), *Energy Technology Perspectives 2017.*

- **Chemicals and petrochemicals**: This is the most energy intensive industry. There are multiple effective ways to reduce energy intensity in this sector, the most promising in the long-term is the shifting to a production based on bio-based feedstocks, which would also need a relevant supply chain change. Significant potential improvements can also be achieved by implementing process energy efficiency measures in existing production facilities such as waste heat recovery and combined heat and power or switching to lower carbon fuels and feedstocks.[101] From the regulatory side, improvements in plastic recycling should be pursued to potentially offset a significant share of virgin plastic production. In addition, production of synthetic fertilizers (petrochemicals) is an especially energy intensive industry. As population grows and global demand for food increases the use of fertilizers is expected to continue to grow. Thus, it would be valuable to work with integrated fertilizer companies to improve the efficiency of ammonia manufacturing as well as increase the downstream efficiency and effectiveness of fertilizer use to reduce carbon and N_2O emissions. Overall, the potential for investments in this sector is exceptionally relevant for CIF.
- **Iron and steel and aluminum manufacturing**: Investments to lower energy and carbon intensity should focus in the short term on energy efficiency improvements and on expanding collection and recycling routes. In the long term, effort should be placed on developing alternative and innovative production processes. Due to the sectors high reliance on electricity, particularly for aluminum, decarbonization of the electric supply will also play a major role.
- **Cement:** Research has shown that in the cement sector efforts to reduce GHG emissions should focus on an effective combination of different technical actions, such as lowering the clinker content in cement, improving thermal energy efficiency, using alternative fuels and raw materials, reducing by-pass dust and cement kiln dust, implementing waste heat recovery systems. These, in turn, should be combined with regulatory and market actions to introduce financial and market-based incentives, develop monitoring, reporting and verification (MRV) systems, balance clinker and cement production capacity with long-term domestic market demand, and build capacity and enhance dialogue between stakeholders.
- **Pulp and paper:** Sector reduction in energy consumptions and CO_2 emissions can be achieved by investing in combined heat-and-power generation, fuel switch and by improving energy efficiency and process optimization. The development of new bio-based products is also expected to play a relevant role. Moreover, from a policy side, strong efforts need to be put in place to increase recovered fiber usage by promoting paper recycling.
- **Glass manufacturing**: There are several possibilities to reduce energy consumption, either by improving energy efficiency (e.g. improved process control, increased use of cullet, increased furnace size, use of regenerative heating, oxy-fuel technology, batch and cullet pre-heating and reduction of reject rates) or from a market/policy side (increasing recycling reduces energy consumption, as both energy for the chemical reactions and related emissions can be saved).
- **Mining:** While the growing demand for minerals and metals provides economic opportunities for resource-rich developing countries and private sector entities alike, significant challenges will likely emerge if the climate-driven clean energy transition is not managed responsibly and sustainably. Minimizing the social, environmental and climate footprint through the value chain

[101] For example, particularly interesting pathways are represented by production of ammonia using hydrogen from low-carbon electricity and production of methanol, olefins and BTX from hydrogen and CO_2

of raw materials is at the forefront of a climate-smart mining approach. In addition, mining companies are across the biggest consumers of energy in several developing economies and their capacity to influence carbon markets and energy transition is yet to be developed.

65. In addition to these approaches, there is an emerging appreciation of the importance of climate resilience. In a world where supply chains are interconnected, climate change may affect, for example, the supply of agricultural feed-stock for the agri-food corporates. Climate resilience measures need to be taken alongside mitigation investments and operations.

2.2 Climate challenges facing industry in developing countries

66. While the potential of energy efficiency measures exists, the industrial sector has proven to be hard to abate. Compared with renewable energy where the reduction of risks and costs are increasingly driving scaled-up deployment, industry faces challenges that prevented it from shifting investments towards low-carbon, climate-resilient alternatives. These challenges include the following:

- **Governance**: corporate governance does not adequately address the risks of climate change or opportunities of proactive and informed decision-making and disclosure;
- **Policy**: In many cases, NDCs not yet being translated into actionable sector level plans; there is a lack of support for policies such as carbon pricing and a lack of facilitated inter-country or regional exchange of such strategies;
- **Commercial**: Low-carbon technologies are not always prioritized in corporate investment planning due to lack of profitability when compared with investment alternatives, and/or inability to monetize additional revenue streams such as carbon crediting. International competitiveness concerns, as industrial output is often traded internationally, may lead to corporates disagreeing with ambitious climate regulations. Compensating measures that governments then take to mitigate against such concerns (e.g. on leakage of industrial production), often weaken the effectiveness and impact of climate regulations in the more advanced countries;
- **Technology**: High perceived technological risk stem in part from a lack of relevant demonstration projects, and underdeveloped supply chains that do not facilitate technology transfer;
- **Innovation**: Deep cuts in industrial CO_2 emissions will require new and innovative low-carbon process routes and products. To ensure the future availability of such innovative technologies, the sector should focus on research and development in the near-term, which requires international collaboration;
- **Capacity and skills**: There is a need to develop skills in identifying, prioritizing, developing, implementing and monitoring low-carbon projects, particularly those that relate to energy efficiency, and understanding and adopting responses to climate change risks;
- **Finance**: Barriers to investments include inadequate access to finance, inflated risk perceptions, technology cost mark-ups, and a lack of local commercial bank experience appraising novel low-carbon projects.

67. To foster the change that is required to accelerate the low-carbon transition, there is therefore an urgent need to increase and leverage donor's concessional resources into the corporate industrial sector.

2.3 Investment needs by the industrial private sector under different temperature scenarios

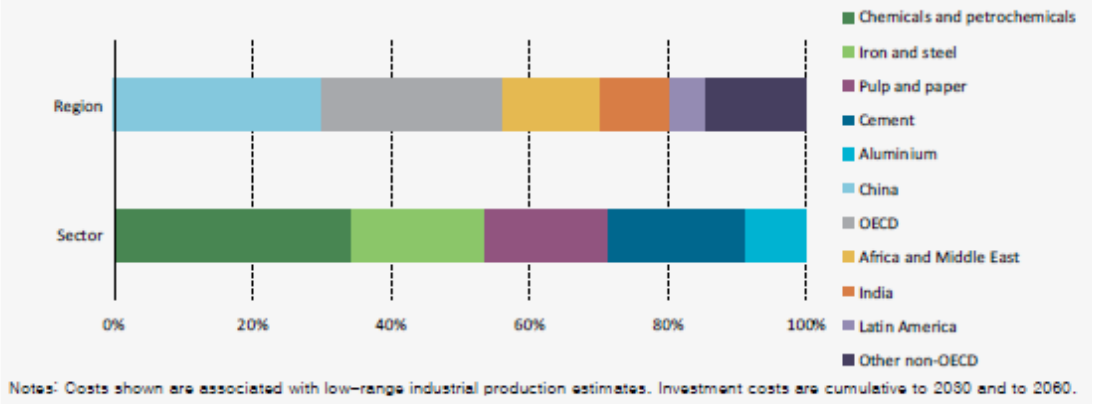
68. Globally, the IEA estimates that cumulative investment needs for energy-intensive industries are:

- USD 6.8 trillion to USD 8.0 trillion in the Reference Technology Scenario between 2017 and 2060
- USD 7.0 trillion to USD 8.7 trillion in the Beyond 2°C Scenario
- USD 6.3 trillion to USD 7.3 trillion in the 2°C Scenario

69. The 2°C Scenario is the least costly because requiring the implementation of resource efficiency strategies results in lower demand levels for primary materials. The Beyond 2°C Scenario is the costliest because it requires the deployment of more costly carbon abatement options and the rapid deployment of carbon capture and storage equipment. Nonetheless, the level of effort required in the 2°C Scenario in terms of structural shifts in industry and redefining product value chains is significantly more ambitious than in the Reference Technology Scenario, and even more ambitious in the Beyond 2°C Scenario.

70. Of the total investment required for energy-intensive industry in the 2017-60 period in the below 2°C Scenario, 34 percent needs to be made before 2030. Early action prevents locking-in of inefficient technologies in industrial capacity additions and avoids additional investments in low-carbon process technologies in the long-term. The Beyond 2°C Scenario investment costs are 11 percent higher than in the 2°C Scenario.

Figure 5: Cumulative investment needs in the Beyond 2°C Scenario by region and sector



Notes: Costs shown are associated with low-range industrial production estimates. Investment costs are cumulative to 2030 and to 2060.

Key point *China would contribute the most investment in energy-intensive industry in the B2DS, and chemicals and petrochemicals would be the most important subsector.*

71. The IEA models look primarily at mitigation costs. The costs associated to climate change and their impact on e.g. demand for materials do not seem to be modelled. The IPCC reported that there is a lack of knowledge on how climate change feedbacks may impact mitigation options and potentials as well as costs in industry. Insights into potential synergy effects (how adaptation options could reduce emissions in industry) or trade-offs (how adaptation options could lead to additional emissions in industry) are also lacking. However, it can be expected that many adaptation options will generate additional industrial product demand and will lead to additional emissions in the sector. Improving flood defense, for example, in response to sea level rise may lead to a growing demand.

72. These models give a direction of scale of investments needed, and the earlier the action the less costly measures would prevail.

2.4 Climate policy for industrial sectors

73. Considering industry's growing share of GHG emissions, policy frameworks that incentivize the transition to low-carbon and climate-resilient industry operations are required. Determining low-

carbon and climate-resilient pathways will be essential to inform which policies and regulations will be required at certain market development milestones. The pathways must include policies and measures, carbon pricing, and climate governance approaches.

74. In the design of the low-carbon and climate-resilient pathways the following aspects may be considered, subject to further stakeholder consultations:

- The relationship with the NDCs in the countries to which the pathways would be applicable.
- Enable MRV and tracking of progress by encouraging benchmarking initiatives at the industry subsector level to overcome confidentiality challenges, set stable long-term targets and indicators appropriate to track progress towards those goals.
- Encouraging internal carbon pricing strategies in preparation for transition risk management and prepare for market-based carbon pricing.
- Performance standards for energy-efficient equipment and process integration measures should be put in place regardless of the scale of decarbonization required.
- Regulatory and policy environment in host countries, such as the removal of fossil fuel subsidies and effective internationally coordinated carbon pricing schemes, should be implemented to encourage action in the industry sector. In turn, energy intensive corporates may influence the energy markets towards a decarbonization process encouraged by the target use of concessional resources.
- Supply chain and material efficiency strategies offer an important opportunity for emissions reduction. Development of life-cycle assessments for industrial materials and consumer products.
- Policy actions such as price signals or fiscal incentives can be effective to remove barriers for material efficiency, raise awareness, encourage shared responsibility among consumers and producers for collection, favor the valorization of recycled materials.
- Energy resource audits and integrated assessments that map resources and demand patterns are needed. Strategic planning for heating and cooling can help to identify cost-effective opportunities for the recovery of industrial excess heat and its productive use.
- Innovation and low-carbon technology access.

75. Advanced economies have seen an increase of policies and regulations that affect industrial investments and operations. These developments include carbon pricing / markets and approaches and standards for climate governance, particularly in the financial and capital markets. These developments provide both opportunities and threats for the industrial corporates.

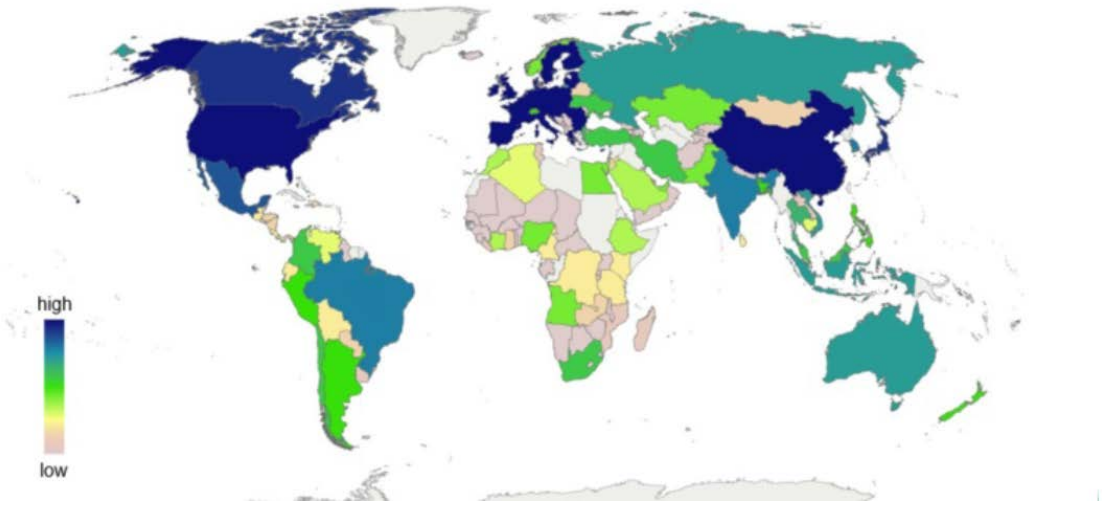
76. Carbon markets, such as the EU Emissions Trading Scheme and other explicit carbon pricing schemes (e.g. carbon taxes), are increasingly providing a price signal to corporates. The private sector was very active in markets such as the Clean Development Mechanism, and certain sectors made advances in implementing MRV systems. These experiences provide a basis to further encourage and develop upon. At the international level there is the global carbon market development under the Carbon Offsetting Scheme for International Aviation (CORSIA) as part of the International Civil Aviation Authority's work, and increased interest in Article 6 under the Paris Agreement. Carbon pricing is being promoted by initiatives such as the Joint MDB Working Group on Article 6, the Partnership for Market Readiness (PMR), Carbon Pricing Leadership Coalition (CPLC), International Carbon Action Partnership (ICAP), Transformative Carbon Asset Facility (TCAF) and the Carbon Market Platform e.g., under the joint MDB activities development work is carried out on the Mitigation Action Assessment

Tool (MAAP). These initiatives are expected to result in further expansions of carbon markets (see Figure 6).

77. Particularly for the industrial sector, carbon pricing is an important tool to ensure the cost of carbon is factored in investment decision-making and that operational GHG emissions are managed. As carbon pricing is a generic policy applied to entire sectors, it can help realize sector-wide transformational change and involve the private sector at scale. Carbon markets may also save significant amounts of costs, which may be deployed to arguing for greater ambition.[102]

78. CIF in co-operation with MDBs and recipient countries can play an important catalytic role in the uptake of carbon markets. Together they can do so by e.g. providing policy support, technical assistance and facilitate low-carbon investments by corporates willing to engage. In addition, concessional finance may play a catalytical role together with carbon pricing to promote switching towards low-carbon energy sources as a strategic priority amongst big energy consumers to accelerate decarbonization process in developing countries.

Figure 6: Market readiness and priority - carbon markets heat map



79. The parallel emergence of climate governance approaches and standards such as the Task Force on Climate-related Disclosures (TCFD) and others illustrated in Figure 7 have started to influence financial and capital markets. In addition, the MDBs are jointly working on the Paris Alignment approach that will further inform operations. Based on demonstration projects financed, CIF together with the MDBs may help fostering standardization, metrics and monitoring/tracking.

80. In the longer-term, deeper cuts in industrial CO_2 emissions will require innovative new low-carbon process routes and products. To ensure the future availability of those processes and technologies, the sector should focus research and development on low-carbon production and mitigation options. This deployment will require collaboration across companies, sectors and national borders. Existing efforts should be accelerated, and policy frameworks put in place to incentivize low-carbon innovation.

[102] Sha Yu, Ryna Cui, Stephanie Waldhoff, Sonny Kim, Jae Edmonds Joint Global Change Research Institute.

Figure 7: Landscape of climate governance initiatives

3. Concept proposal

81. The proposed CIF Accelerating Low-Carbon Transition in Industry Program seeks to catalyze deep behavioral change and sustainable impact by:

    A) Corporate sectors by i) introducing climate governance and strategies through policy dialogue, capacity building and technical assistance, ii) integrating climate change risks and opportunities into corporate decision-making and iii) supporting deployment of innovative and/or proven climate technologies across the supply chains of targeted industries;

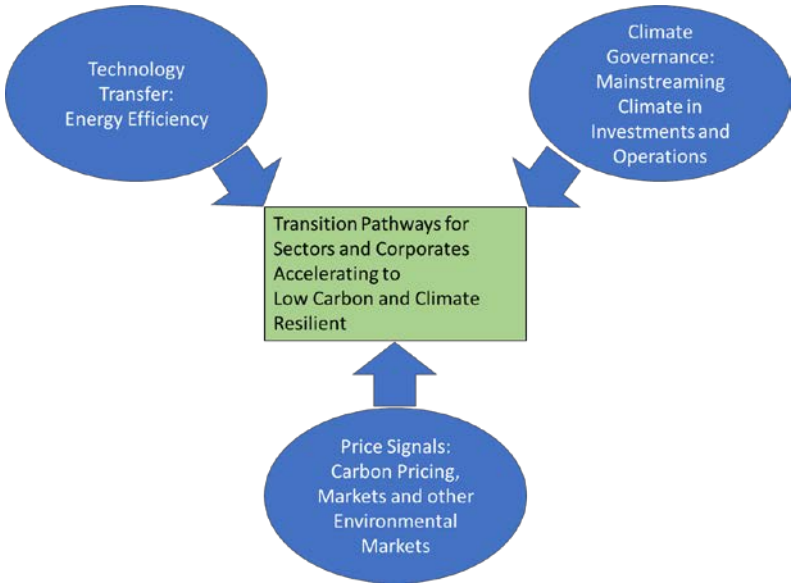
    B) National / regional level by facilitating sectoral and national dialogue on low-carbon and climate-resilient pathways for industry – including implementing policy considerations such as energy efficient regulations, carbon pricing and climate governance standards for financing;

    C) Monitoring, Reporting and Verification by improving current practices and organizing a sector participation in national and internal policies, including by accessing green financial markets (green bonds) and internal domestic and international carbon pricing and climate markets (e.g., CORSIA, Article 6).

3.1 Programming approach

82. The proposed approached is summarized in Figure 8. This conjunction of the different factors will facilitate the shift in the industrial sector to sustainable business practices, and unlock the investment needed to move it onto a low-carbon, climate-resilient investment pathway. The Transition Pathways are central at sector and corporate levels, as these will guide decisions that will affect the allocation of resources, capital and operations. Climate governance is important to ensure the mainstreaming of the climate agenda in sector and corporates. The recommendations made by the Task Force on Climate-related Financial Disclosures (TCFD) represent an example of a start point for climate governance. The work on price signals – resulting from emissions trading schemes, carbon taxation and/or other environmental markets (such as green certificates) – is equally important. Further, increasing technology transfer is needed to accelerate the realization of GHG emission reductions.

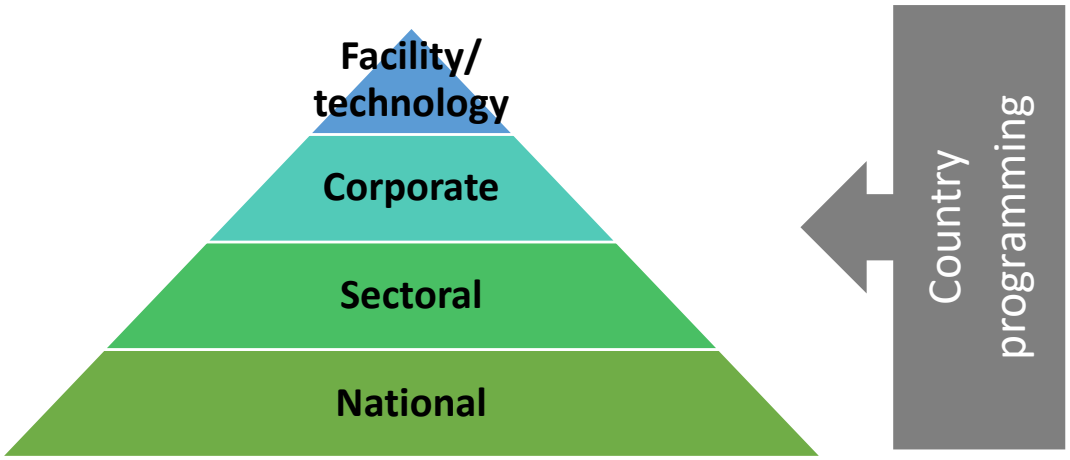
Figure 8: Transition pathways at industrial, sector and corporate levels



83. An investment strategy focused on industry under the CIF would enable the creation of a space for national level, multi-stakeholder approaches to drive deep behavioral change in the sector, while supporting countries in meeting their climate goals, including their NDCs. This recognizes that the barriers to investment in low climate impact technologies in the sector are both non-financial and financial, requiring a coordinated approach if they are to be tackled effectively. Such a space would draw on one of the CIF's comparative advantages in the climate finance landscape, which is to foster multi-stakeholder coordination at the national level to address climate change in a holistic way, supported by predictable funding for capacity building, technical assistance and investment support.

84. An investment strategy focused on industry under the CIF would support both private and state-owned industry enterprises through interventions at multiple levels: technology, corporate, sectoral and national. These would be integrated within an overarching country programming approach, like the one used in the existing CIF operating model (see Figure 9).

Figure 9: CIF Accelerating Low-Carbon Transition in Industry Program's approach



Facility/technology level

85. CIF's concessional finance for the provision of targeted technical assistance can help corporates look at the carbon footprint of their overall operations, such as through a sustainable energy investment plan, and assess and apprise technologies that deliver maximum emissions reductions at lowest marginal cost.

86. CIF's concessional finance can provide investment support for corporates to facilitate the adoption of scalable and proven GHG mitigation technologies with low market penetration, such as heat recovery, absorption chillers, variable speed drives, and fuel/feedstock switching. Such facility-wide planning approaches can also highlight the other benefits associated with investment in low-carbon, climate-resilient technologies, such as improving overall productivity, and improving resilience of business operations to climate change risks.

Corporate level

87. The industry investment strategy could focus on piloting and accelerating the implementation of the recommendation of the Financial Stability Board's TCFD in priority sectors. These recommended that organizations address and disclose their climate-related risks and opportunities through a set of measures covering governance, strategy, risk management and metrics and targets.[103] The flexibility of the CIF model would enable such an approach to be tailored to reflect country, sector and corporate maturity, and could range from full implementation of TCFD's recommendations, to the adoption of basic carbon and energy management functions. Such as focus is relevant because 'business as usual' governance, strategy and planning processes established by corporates do not systematically take climate change risks and opportunities into consideration.

88. The proposed program could also focus on managing GHG emissions in supply chains, by promoting lifecycle emissions analyses and scaling-up green procurement approaches. Targeting supply chains is relevant given that they can represent a significant amount of embodied emissions in end-user products. There are also opportunities in supply chains to reduce waste and adopt circular economy solutions to reduce overall GHG footprint.

[103] TCFD (2017), *Recommendations of the Task Force on Climate-related Financial Disclosures*.

89. The program has the potential to offer targeted support to corporates to build their capacity to issue green bonds. For larger corporates, the growing demand by institutional investors for green bonds offers a new approach for raising finance from debt capital markets. The industry investment strategy could also provide tailored investment support e.g. credit enhancement to catalyze demand from MDBs and institutional investors. Corporates could also benefit from investment support to pilot carbon pricing schemes under Article 6, as well as incentives to decarbonize their energy matrix through concessional financing.

Sectoral level

90. Experience shows that industry or national leadership is a decisive factor in driving low-carbon, climate-resilient behavioral change in emerging economies. The idea of a sectoral "roadmap" is therefore a powerful one, as it functions as a space for all stakeholders to define a shared vision for shifting to low-carbon, climate-resilient investment planning along a mitigation target. Sectoral roadmaps recognize that many stakeholders need to participate collaboratively to address private sector, community, environmental and regulatory needs.[104] This type of integrated approach has been a feature of the CIF's business model since its inception; applying it specifically to the industry sector in developing and emerging countries has significant potential to addressing policy, regulatory, social and investment barriers to transition in a holistic way.

91. This industry program's strategy builds on Nationally Appropriate Mitigation Actions (NAMAs), but it holds a significant CIF advantage in terms of its unique ability to leverage climate finance at scale, alongside the policy reforms. The roadmaps help ensuring sector and country inclusiveness, so that the process is indeed supported, and ownership is clear.

Inter/National level

92. Deep transformation in the industry sector's approach to climate change is not possible without a concerted effort to deal with national regulatory barriers to action. A combination of technical assistance grant funding and investment support for sector initiatives can encourage national actions to drive investment into low-carbon industry solutions, such as energy efficiency standards, industry transition packages and domestic carbon crediting mechanisms. This roadmap can facilitate the implementation of enabling legislation to support such policies.

93. A CIF's industry programming strategy can also play an important role in supporting emerging markets in updating their NDCs and long-term low-carbon strategies under the Paris Agreement. CIF's efforts to implement national low-carbon industry programs can feed into and/or complement existing national platforms for NDC design and implementation. The CIF's industry program can also support the development of a market of internationally traded mitigation outcomes (ITMOs) under Article 6.2, representing emissions reductions achieved against a credible baseline that can be traded towards an acquiring country's NDC. In certain instances, article 6.4, could be another avenue to foster international co-operation. This could be achieved by developing the underpinning regulatory environment for ITMO approaches, such as GHG MRV and accounting under NDC which may also help countries to meet broader sustainability commitments such as the Sustainable Development Goals. Industry sector carbon credits will have a crucial role to play in domestic markets when any carbon pricing instruments such as ETS or carbon tax are introduced, and if they are not covered under such

[104] An example of such a roadmap is the EBRD "Low Carbon Egyptian Cement Industry Roadmap", which was developed in collaboration with the Government of Egypt to highlight the way towards a low carbon, climate-resilient sector that is aligned with the goals of the Paris Agreement. The Roadmap is available at: https://www.ebrd.com/documents/climate-finance/egypt-roadmap-cement.pdf.

schemes. The MDBs are working together in an Article 6 Working Group and would bring in their developing joint initiatives and practices.

3.2 Use of CIF's proceeds

94. CIF proceeds would be used to address the barriers to investment identified herein, through technical assistance for technology/facility project preparation, corporate capacity building and procurement initiatives, sectoral pathways and national policy development, as well as concessional debt, guarantee products, risk sharing facilities or other financial instruments to address barriers to investment in low-carbon, climate-resilient industry business models.

95. CIF proceeds would be made to corporates in the sectors of interest, including private, semi-public and public. This may include upstream and downstream linkages of general corporates, industrial producers, agribusinesses and logistics companies.

3.3 Transformational change

96. The proposed program has the potential to transform the carbon emissions pathway of high priority industry sectors within several developing and emerging countries and demonstrate the kind of change that can be replicated in like sectors elsewhere. This is achievable because of the CIF's business model multifaceted approach that seeks to address the systemic barriers to low-carbon transformation in industry sectors, in an integrated way. CIF is uniquely positioned to drive such change, because of its deep institutional experience of country-led, cross-stakeholder programming approaches. In the same way that the CIF has been a notably and visible part of the renewable energy transition in many CTF countries, CIF can establish itself as a leader and magnet for potentially more donor support for the deep decarbonization of the industry sector over the next five or so years.

3.4. Policy alignment

97. The *Accelerating Low-Carbon Transition in Industry Program* under CIFs is aligned with the Paris Agreement commitments to enhance private sector participation in the implementation of NDCs (Article 6). This program proposal is also in line the Sustainable Development Goals, namely SDG 7 by ensuring access to affordable, reliable and modern energy and improvements in industrial energy efficiency, and SDG 9 on resilient infrastructure, inclusive and sustainable industrialization. The importance of accelerating the low-carbon transition in industry is also portrayed by the fact that this year the United Nations General Secretariat (UNSG) has selected this topic as one of the lead themes at the Climate Action Summit 2019 with a view of helping accelerate action towards the Paris Agreement implementation. The Climate Action Summit has one track fully dedicated to industry (Track #5). This track focuses on creating stronger commitments and actions from the hard-to-abate sectors with the aim to achieve emissions reductions by circa 30% of global emissions. The sectors targeted include: shipping (3% of global emissions), aviation (3% of global emissions), transport (7% of global emissions), petrochemicals including oil and gas (5% of global emissions), iron and steel (7% of global emissions), cement (7% of global emissions) and aluminum (0.4% of global emissions). The objective is the achievement of carbon neutrality by mid-century with the expected outcome of having a significant amount of governments and leading companies announcing policy measures and corporate emissions commitments that will deliver at least 20% of the 30% goal in emissions reductions by 2050.

4. Rational for MDBs solutions and CIF concessional finance

4.1 Need for MDB support

98. **Industry is a strategic sector for MDBs.** The proposal focuses on middle-income countries, using large-scale concessional finance to change perceptions of risk among investors around low-carbon technologies to foster environmental and social co-benefits of sustainable development. In these countries, the industrial sector is a major and growing share of overall GHG emissions. In addition, middle-income countries are more oriented toward private sector incentives, risk reduction and competitiveness and have a higher potential for transformational change to occur more quickly. Investments in the industrial sector can then unlock transformational change that is relevant, systemic, at a scale and sustainable.

99. **Frontier/higher risk technologies (tipping points) or business models with transformational potential**. Industrial and corporate energy efficiency and process change is required to achieve carbon neutral economies; however, there has been limited process at scale to decarbonize these sectors. Further, industrial assets are generally long lived, so the cost of inaction is compounded by the lock in effect of failing to invest in low-carbon and climate-resilient assets in the next 5-10 years. The concept is flexible enough to promote both incremental technology improvements with potential for wide uptake, as well as those that drive deep decarbonization in key industrial processes and energy consumption, which is a key element of shifting the industry sector onto a Paris-aligned mitigation pathway. Technological and financial barriers prevent most industry actors in CIF countries from investing in low-carbon, climate-resilient technologies.

100. **CIF's model of providing flexible, scaled-up, multi-MDB support via a programmatic approach is necessary to catalyze transformational change in industry**. A concerted effort by multiple-MDBs working through the CIF on industrial sectors would establish clear pathways and generate important demonstration effects that go beyond the direct impacts of each MDB's individual investment facilities (e.g. by piloting carbon mechanisms under Article 6 of the Paris Agreement, and implementing adequate MRV schemes). The CIF model can offer a range of concessional instruments tailored to country- and/or sector-specific circumstances, including concessional debt, guarantee products, risk sharing facilities or other financial instruments. The proposal's policy dialogue, including low-carbon and climate-resilient pathways would be developed to integrate the various aspects in a narrative that would receive the industrial stakeholders buy-in.

101. **Ability to set and contribute to robust standards, and global application.** Through this window, CIF in co-operation with the MDBs can sponsor the development of more harmonized international standards in carbon markets and climate governance for financing. The CIF-MDBs partnership has been instrumental in defining climate finance and establishing a community of practice that further informs stakeholders including the private sector. This development could repeat itself for the new international standards on carbon pricing and climate governance.

102. **Pipeline can be delivered in the next 2-3 years**. Based on existing industry facilities that MDBs are implementing, some of which are CIF funded, a pipeline of catalytic investments can be delivered in many countries, if donor funding made on suitable terms is available to address the financial and non-financial barriers to investment that exist. From a policy perspective, many countries have expressed in their NDCs a need for support to shift their industry sector onto a low-carbon, climate-resilient pathway.

103. **Current gap in climate finance architecture/limited redundancy**. No other major climate finance fund has a coherent strategy for addressing GHG emissions in the industry sector and considering the

technical, corporate, sectoral, and national challenges in an integrated manner. CIF has the capacity, experience and mandate to fill this gap. CIF can play an important catalytic role in the uptake of new instruments, through domestic carbon pricing, result-based financing, international carbon credits or impact result financing (green bonds), that would help to prepare industrial corporates for carbon pricing and climate governance policies and regulations.

4.2 Need for CIF concessional finance

104. **Grants for capacity building and technical assistance will be necessary to provide upfront support to establish sector roadmaps and aligned corporate roadmaps and business models to enable transformation**. The CIF programming model is ideally placed to contribute to the development of national sectoral low-carbon roadmaps, as there is a strong need for private-public cooperation.

105. **Concessional finance is required to address financial barriers that prevent most industrial corporate actors in CIF countries from investing in low-carbon, climate- resilient technologies**. Advanced technologies with high GHG impact are not usually available in developing / emerging countries due to underdeveloped supply chains which create high transaction costs that discourage their adoption. Local commercial banks generally do not have much experience with appraising low-carbon projects, and the actual and perceived risks of such projects lead to an artificially higher cost of capital that further impacts their bankability. Carbon pricing and climate governance standards are not yet mature enough to become the drivers for investments in climate projects.

106. **CIF concessional finance for a low-carbon corporate industrial window could mobilize a significant volume of funding from private sector corporates for low-carbon technologies and, over time, enable entry of local commercial banks**. In many countries, the private sector accounts for a significant share of industry sector activity. It is therefore expected that a low-carbon industry window could mobilize a significant volume of funding from private sector corporates for low-carbon technologies. Over time, local commercial banks are expected to play a greater role in financing low-carbon, climate-resilient industry projects as they become more familiar with the risk profiles of such investments. Even in the case of state-owned enterprises, supporting arm's length, commercially-operated public industry entities supports moving the investment burden for a less than 2°C pathway off national public budgets. CIF can also build capacity and offer an opportunity for learning-by-doing in preparation for post-2020 climate markets.

5. Theory of change

107. This proposal for a CIFs industry program is ambitious, as it tackles a sector that is deemed hard to abate. However, whilst complex, the CIF together with the MDBs can turn this into an advantage. We hereby also note that energy efficiency measures will remain key to start driving the change. This proposal is innovative in the sense that it connects the dots between already existing approaches and brings in a new focus on corporate's governance and seeks to combine the influence of climate finance and carbon markets. Using CIF as incentive for corporate's senior management to regard climate change as an ongoing concern and from a risk management perspective, is expected to contribute to much swifter action on energy efficiency and, ultimately, more substantive investments in the longer-term.

108. **CIF-MDBs partnership offers the possibility to leverage and further build-out the existing policy dialogue and capacity building on carbon pricing / carbon markets (like PMR, CPLC), and climate governance (Paris Alignment, SDGs) by connecting it to investment programs that underpin the transformational change**. To date these developments have been somewhat disjoined, and CIF could

become the leading platform for transformation, scale, and private sector inclusion for middle-income countries.

109. In the process, both CIF and MDBs would develop and set tools and standards for global use such as on Paris Alignment, operationalization of TCFD's recommendations, green financing and best practices as to transition from climate funding to carbon pricing, increasing scale and private sector involvement. CIF would help to incentivize and de-risk investments by industry corporates and create a platform of support for policy reforms by recipient countries. Informing and providing greater clarity on the pathways will be an essential element of the approach.

110. This proposal will not lay out an expected investment level for the whole investment strategy, as this is subject to a further conversation with donors on funds availability, recipient countries on content, and MDB on pipelines. To give a notion of scale, a CIF investment in one recipient country of USD 200 million (concessional finance 80 percent and grants 20 percent), could potentially leverage investments of up to USD 1 billion. It may sponsor 10 industrial plants, and their corporates. Such ambition can help to solidify the transformational policy change.

111. The potential size of CIF's concessional resources required is not known, nor are the distributional effects. However, practice indicates that GHG emission reductions due to industrial energy efficiency measures can be very substantial in terms of volume. The industry program's strategy is expected to generate commercial, economic and social benefits.

Figure 10: Theory of change of the Accelerating Low-Carbon Transition in Industry Program