



**CTCN**

CLIMATE TECHNOLOGY CENTRE & NETWORK  
UNFCCC Technology Mechanism



# Ensuring a Climate Resilient Recovery after COVID-19

A guide to utilising low-carbon pathways, supply chain circularity and resilient business models to meet climate change goals while improving economic competitiveness





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OTOS



The Covid-19 crisis has highlighted the importance of developing more resilient, inclusive, sustainable societies and economies.

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# 1. Introduction

The Covid-19 crisis has highlighted the importance of developing more resilient, inclusive, equitable and sustainable societies and economies capable of withstanding future crises, natural disasters, and other potential threats. Our energy, health and economic systems are at a moment of profound transformation resulting from the impact of the pandemic. The disruption from Covid-19 has sent a shock through global markets and resulted in a projected 20% decline in global (energy) investment in 2020.<sup>1</sup> Yet unlike the global financial crisis of 2008, the challenging environment today encapsulates both a financial and a health crisis with links to biodiversity destruction and climate change. It is within this context that the Climate Technology Centre and Network (CTCN) has crafted this guide. Covid-19 comes at a defining year for climate change action. The Paris Agreement (Article 4, paragraph 19) invited countries to strive to formulate and communicate long-term low greenhouse gas emission development strategies, taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. Five years after the global pact was adopted, countries are now updating their Nationally Determined Contributions (NDCs) so that full implementation of the Agreement can go forward. The current round of NDC updates will chart the course of climate action and set the direction of its travel over the next decade. Stronger NDCs can create the policy context to steer investments and attract climate finance while providing transparency and accountability through national and multilateral processes.

Climate change was at the top of the global public discourse at the close of the UN Climate Change Conference (COP 25) in December 2019. In addition, the world was in the throes of the final preparations for the UN Convention on Biological Diversity to discuss a “Paris Agreement” to deal with the global biodiversity crisis, including mass extinction of species and natural disturbance of up to 70% of the Earth’s natural ecosystem. Disturbance of natural ecosystems has been reported to increase the transfer of disease from wild species to humans and is suggested as the principal cause of increase in occurrence of neglected, forgotten, and human diseases. While habitat destruction is the main driver of decreasing biodiversity, climate change has played a role by forcing species to shift habitats, change geographical range, and survive in semi-natural habitats that may bring wild animals closer to humans and livestock.

In the economic fallout resulting from the Covid-19 pandemic, there is a growing global debate on whether we can afford to “build back better” without investing in sustainable solutions to the global biodiversity and climate change challenges. Energy investment was expected to fall by 20% (approx. \$400billion) in 2020 compared to previous years. This fall significantly impacts the oil and gas sectors and will also impact the power sector as well as end-use energy efficiency. The fall in investment is also expected to result in a 25% decline in energy demand. Interestingly, utility-scale renewable energy has been more resilient to the impact of Covid-19 but still shows a drop in 2020 investment (based on 2019 expenditure) across renewable power (-\$30B), networks (-\$25b), efficiency (-\$30B) and renewables for transport and heat (-\$4B).



Enabling policy action is urgently required to deploy climate technologies across developing countries.

The Technology Needs Assessment (TNA) and Technology Adaptation Planning (TAPs) processes identify a country's climate technology priorities. These are derived from ongoing policies, programmes and projects, as well as country strategies for climate change mitigation and adaptation. The CTCN's technical assistance process responds to such expressed climate technology needs as identified in a country's TNA, TAP or Nationally Determined Contribution.

Enabling policy action is urgently required to deploy climate technologies across developing countries. While the Covid-19 pandemic offers opportunities to reassess priorities and rebuild economies with a focus on more climate resilience, support is required to enable countries to best identify a wide range of domestic policy frameworks. Such frameworks can stimulate climate technology action and national systems of innovation to create the environment for technology deployment, including endogenous technologies. They can also lead to coherent implementation strategies that can ultimately garner multilateral financial support aimed at climate technology deployment. The delivery of such an enabling environment requires a wide structural shift that involves new policies and regulations (such as standards), incentives to stimulate technology adoption and R&D (such as technology demonstration supports and incentives instruments), institutional frameworks, new market designs, financial models to stimulate delivery, and capacity building training programmes (such as skills workshops or SME incubation support that promotes balanced gender representation).

This paper is fundamentally a guidebook for the CTCN's developing country partners / parties, their indigenous businesses, their civil society groups, and their government officials to inform their considerations when developing technical assistance requests to CTCN and also when investing in, and implementing, climate

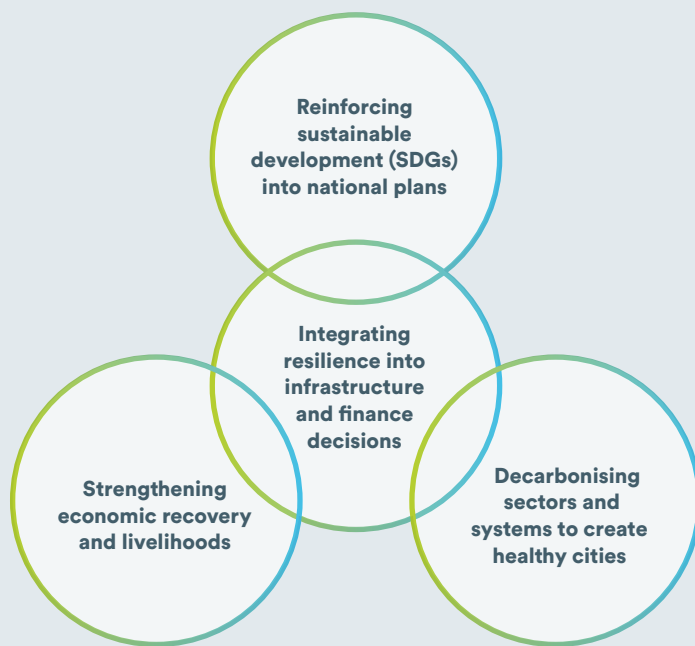
resilience actions. The intended outcomes are climate resilient systems in developing countries achieved through implementation of adaptation and mitigation actions in all sectors. The intent is to inform policies and roadmaps and highlight best practice cases for countries to more quickly get back on their feet, shift to sustainable patterns and 'build back better'. This involves choosing a new path: a low carbon climate resilient pathway, that values societies and strives to make them healthier, robust, equitable and better prepared for climatic risks. It involves channelling sustainable finance and investment into areas that seek to protect communities and natural ecosystems, mostly through appropriate climate technology related interventions and actions that are within the scope of CTCN intervention.

With respect to climate, biodiversity, and the state of land and forests, there are serious questions over whether current trends can protect society from threats over the coming decades. Some have concluded that 'policies and actions based on incremental change to 'business as usual' (BAU) are failing, and only a transformational change can safeguard communities and make them more resilient. The CTCN is responding to countries, network organisations and civil society in aiding them to transform how they consider, understand, plan, finance and respond to climatic risks, from the perspective of mitigation and adaptation technologies that are environmentally sound. In this context, the CTCN has identified four drivers to stimulate change and aid countries in 'building back better' as demonstrated in Figure 1 below. These drivers include enhancing resilience, protecting livelihoods, and promoting healthy city environments.

In framing the paper, the CTCN aims to provide practical guidance that enables countries to become more resilient, align their actions with their climate goals and ultimately become better prepared for future crises,

FIGURE 1

## Country drivers for change



available for green recovery. Such international policy guidance can inform actions aimed at providing technical assistance to developing country partners / parties. Since the CTCN was established, it has collaborated effectively with stakeholders and partners for successful and integrated results.

The challenges of delivering what is envisioned in the Paris Agreement requires partnerships and col-

natural disasters, and other potential threats. This is about incorporating climate resilience into national planning. The CTCN, as an operational arm of the UNFCCC Technology Mechanism, provides technical assistance related to the uptake of climate technology that supports societal and economic transformation, delivers innovative solutions, and unlocks investment and action from the private and public sectors.

Examples of such assistance include the CTCN working with countries to identify specific technology needs, address technology barriers and assist in piloting and deploying of environmentally sound technologies. Technical support can also take the guise of more rigorous planning through new low carbon strategies and enabling policies, action-oriented roadmaps and enabling regulations, training tools and methodologies.

In many cases, partnerships need to be forged that encourage collaboration to support capacity development and stimulate financial flows. The CTCN has shown its collaborative approach through its base of over 600 network member organisations and its engagement in more than 100 countries where it provides technical assistance responses. Capacity building is at the centre of the CTCN's technical assistance approach which considers skills development, training and reskilling as key to help respond to the needs of countries in their recovery from the Covid-19 pandemic.

International policy guidance on responding to Covid-19 (e.g., IRENA, WEF, IEA) has been abundant but is often global in nature. The CTCN approach involves collaboration and partnership with such global organisations that can further inform action based on resources that are

laboration. The CTCN has a mandate to lead climate technology-driven solutions, and, in its collaboration with the Technology Executive Committee, it aims to be proactive in influencing and shaping the policy landscape within which it operates. The CTCN's productive collaboration with national policymakers and other external stakeholders needs to be built upon and supported by further engagement with key organisations and the private sector, as well as through effective consultation. Building willing coalitions at a global scale can help countries develop technology roadmaps and move away from BAU trajectories and aim for net-zero strategies.

In aiding the delivery of action-oriented roadmaps, the CTCN could, for example, collaborate with international organisations and build strategic alliances with a small number of entities that can inform CTCN outcomes. For example, IRENA has established competence through its ReMap initiative and such collaboration could provide knowledge on technology, costs, investment needs and externalities. Further partnerships could be forged with entities such as the World Energy Council (WEC) to develop future project pipelines and build on their work in terms of the WEC Transition Toolkit and Insight Workshops. Partnerships and sharing of knowledge are critical in terms of ensuring a climate resilient recovery, and the CTCN could collaborate with the WEC on community-wide initiatives to facilitate the exchange of best practices and provide tools for leaders to manage through the Covid-19 crisis and shape the post-crisis agenda. The CTCN could also forge partnerships with the International Energy Agency (IEA) on its Clean Energy Transitions Programme. This would build on the IEA's and CTCN's collaborative analytical work, technical cooperation, training and capacity building and strategic dialogues.

## 2. Covid-19 context

Covid-19 is not only a health crisis; it is also a financial, social, and economic crisis that has exposed how countries are unprepared in terms of their response. Although its impact may be minor and short-lived compared to the negative effects of climate change, the pandemic has nevertheless affected all segments of the population, all sectors of the economy and all geographies, making the achievement of the climate goals even more challenging.

**Covid-19 has:**

- Exposed weak points in the dominant linear economic model; entrenched inequality, climate breakdown and inherent fragility.
- Highlighted the importance and value of nature-based solutions and the need for greater resilience in supply chains and our circularity of our economy.
- Provided a stark example of the interdependencies between the natural world, health, economy, and society that bind our natural, social, and economic systems.
- Prompted the need to reassess underlying frameworks.
- Highlighted how resource efficiency and resilience, the circular economy and the climate mitigation and adaptation agenda are inextricably linked and mutually reinforcing.

At the early onset of the pandemic, the belief and wider concern was that focus would shift from climate change, but the pandemic has awakened countries and citizens' social capital to the reality of climate change. There is now a much deeper understanding of what can happen when the world is unprepared for a major global event.

There are tensions between calls for a return to the previous normality and those calling for a leap to values better aligned with sustainable development. While the impact across industries has been devastating, businesses are now putting pressure on supply chains and forcing a broader narrative on sustainable development. Politicians and governments are beginning to understand how climate risk equals financial risk.

Covid-19 is not only a health crisis; it is also a financial, social, and economic crisis.



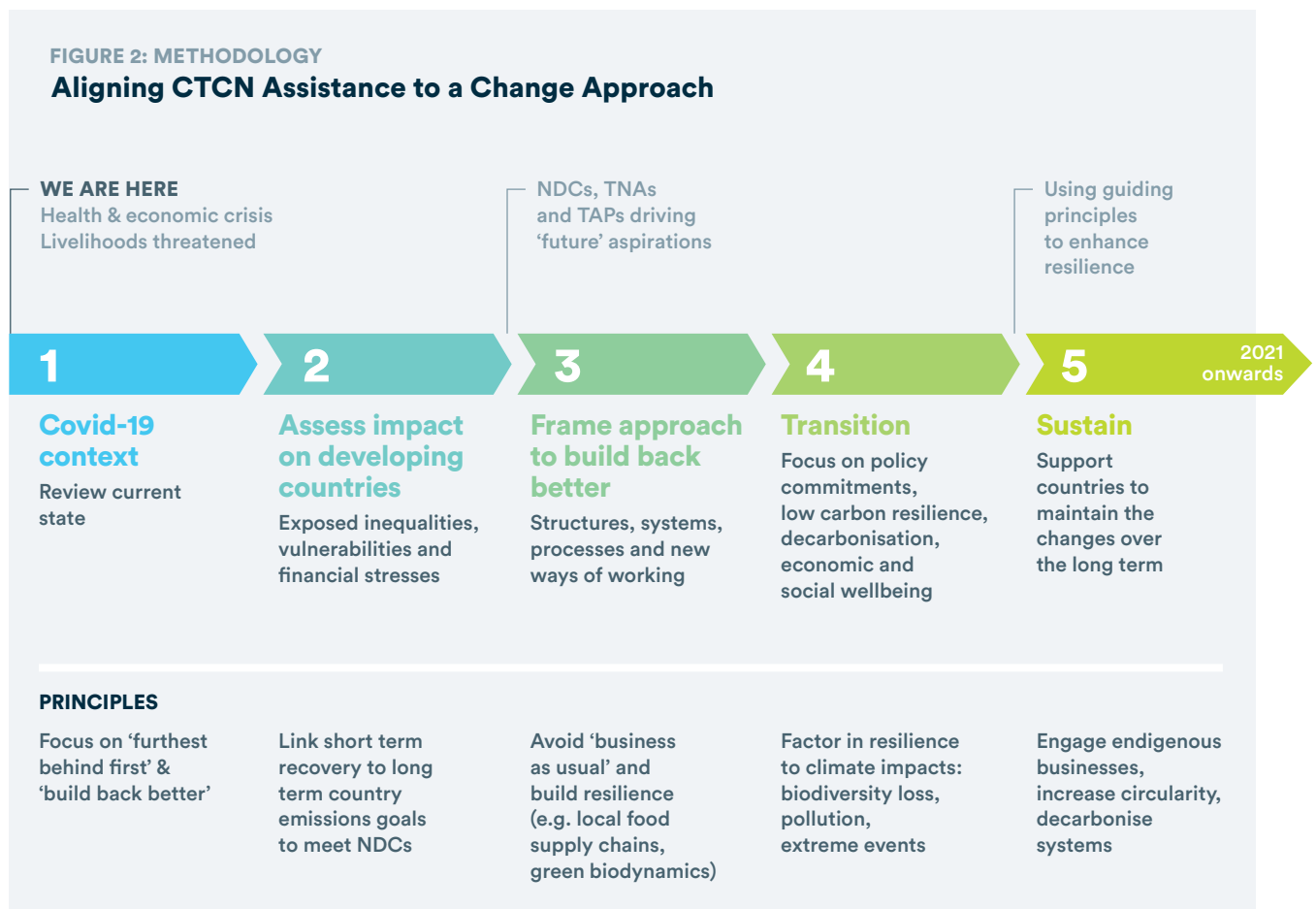
# 3. Approach

This guidebook is framed into 4 core areas in which the CTCN Secretariat receives the most requests from its engaged countries. Selection of areas was informed by looking across the areas where the CTCN receives the most demand; analysing the portfolio of countries where the CTCN operates; and seeking to identify unifying factors across all CTCN countries, often expressed in their NDCs.

It aims to guide countries and help frame their recovery from the Covid-19 pandemic in terms of deployment of climate technologies, services, and capacity building initiatives. In doing so it adopts a change management approach: a change from BAU to a new focus targeting more resilient societies, systems, and economies. It helps to assess vulnerability of communities in the targeted

areas of technical assistance and is a natural input into a country’s TNA or TAP. While it aims to assist countries, it will also align with COP guidance from parties as the CTCN continues its approach of responding to country driven requests from Parties, linked to its mandate.

This approach is outlined in Figure 2 below.





Deployment of climate technologies contributes to more resilient societies and aligns with Paris Agreement goals.

## 4. Assessing impact across developing economies

Many developing economies are at particular risk from the Covid-19 crisis, mainly resulting from the high inequality and low social mobility in many developing economies. Although the virus affects every person and community, we are seeing that it does not do so equally and brought inequalities into a sharper focus. The most vulnerable, including those employed in the informal economies, indigenous people, women, migrants, and refugees, and the aged, are at higher risk. The pandemic has exposed inequalities and further exacerbated existing disparities within and between countries. Evidence from previous pandemics and disasters present how recovery is slower for poorer households, often resulting in nutritional deprivation for children and women. This demonstrates why the Sustainable Development Goals agenda, the Paris Agreement, and Addis Abba Action Agenda continue to be extremely relevant, and their implementation is even more urgent than before.

The 2020 Sustainable Development Goals Report (2020) described how, pre- Covid-19 pandemic, progress on SDGs remained uneven and countries and the broader United Nations were not on track to meet their targets. The pandemic has resulted in a combination of both the physical risk of climate change in terms of disproportionate socio-economic impacts and new risk from the behaviours of businesses in how they invest in climate – resilient infrastructure and the transition to a lower-carbon future. The impact of Covid-19 has brought additional risk to developing countries. While developing economies have diverse needs, policy priorities and abilities, many have high levels of existing public sector debt, high levels of informal or insecure jobs, low levels of healthcare capacity and weak social safety nets. These are all compounded by weaknesses in their institutional arrangements.

The impact of Covid-19 can be seen in many developing countries in several different ways:

- a. **There is widespread risk of reduced income and direct aid/remittances from developed economies due to the global economic slowdown.** Reduced world trade, slower foreign direct investment, and falling remittances to low- and middle-income developing countries will provoke more destabilisation and impoverished nations.
- b. **Covid-19 has negatively impacted the global food balance, especially seen through food supply availability which affects the achievement of SDG 2 (zero hunger/food security).** For example, developing countries from Africa, Asia Pacific, the Caribbean, and Latin America are increasingly vulnerable to cereal supply shocks, with Covid-19 causing transitory vulnerability to food insecurity across developing countries.<sup>2</sup> This food insecurity may persist longer as a combined effect of the economic downturn and resulting poverty implications beyond 2020.<sup>3</sup> The overall global agri-food sector is impacted from the pandemic in the form of reduced movement of foodstuff, changes in the operation of production systems and insufficient numbers of workers. The Food Crisis Prevention Network (RCPA, 2020) estimates that over 50 million additional people could fall into a food crisis due to the combined effects of insecurity and the consequences of sanitary measures, in particular confinement, market closures, barriers to trade, etc.



A recovery focused on resiliency can address inequalities exacerbated by the pandemic.

- c. Covid-19 has also impacted the available opportunities for cross-border seasonal workers.** Given the temporary nature of seasonal work, these individuals are more vulnerable to precarious working and living conditions. Covid-19 has given more visibility to these conditions, and in some cases exacerbated them. Food supply chains have experienced significant disruption, especially in urban areas where supply chains rely heavily on human capital, including smallholder farmers, herders, seasonal workers, and transporters, who form the supply chain to enhance food security.
- d. Tourism-related incomes have been impacted across small island developing nations.** For example, up to 70% of GDP is generated from tourism across the Caribbean islands, and with limited social safety nets, the pandemic has resulted in devastating impacts. Economically this has also resulted in financial agencies lowering the credit outlooks in islands such as Aruba, Bahamas, Barbados, Belize, the Dominican Republic, and Jamaica. These Caribbean economies are most heavily exposed to a uniform slowdown in global tourist footfall.<sup>4</sup>
- e. Covid-19 has resulted in a global decline of economic activity and a steep reduction in carbon dioxide emissions and air pollution.** These emissions will (most likely) rebound as economies recover. As emissions bounce back to business as usual, it will make it increasingly difficult for nations to meet their sustainable development pathway goals and honour their NDC commitments and will reduce their ability to mitigate risks that relate to climate resilience. Certain countries will have reduced revenue and income from fossil fuel generation and associated exports and have seen a major drop in revenues.

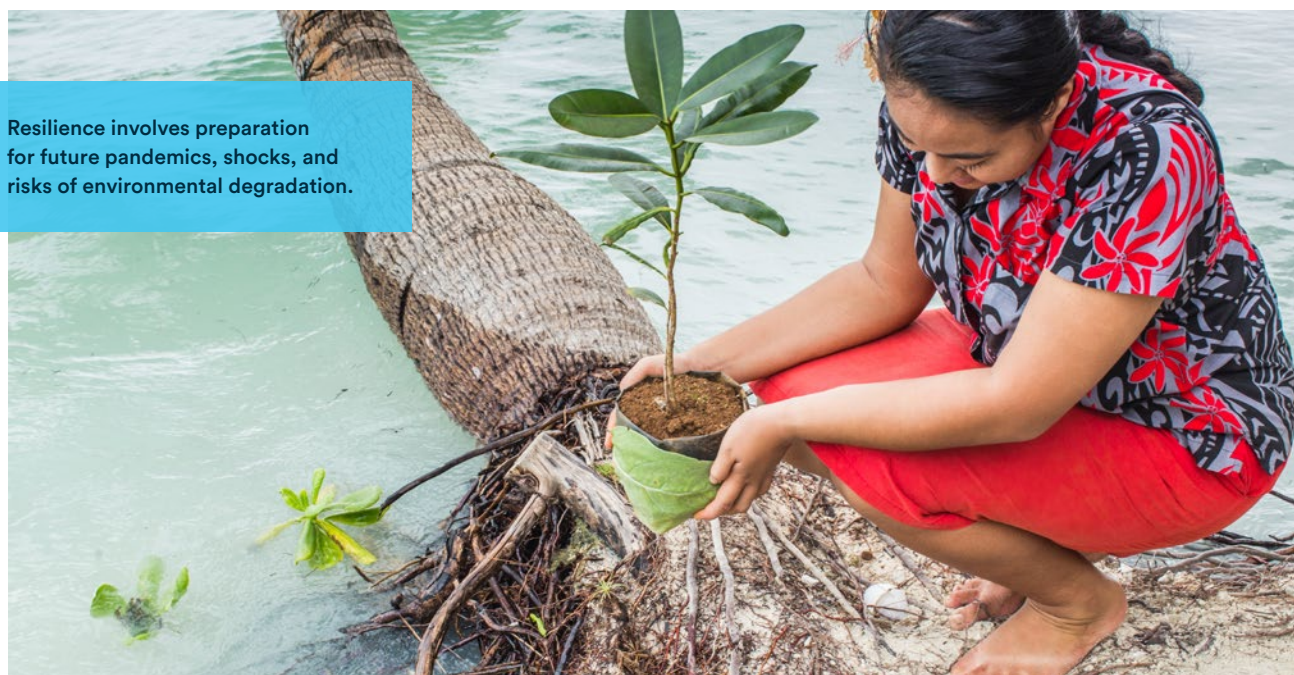
# 5. Framing the approach to ensuring a climate resilient recovery

Resilience involves preparation for future pandemics, shocks, and risks of environmental degradation. This places sustainable development practices at the core of countries' decision making. Sustainability action planning implies the responsible management of finite natural resources, addressing social, economic, and environmental challenges and building more inclusive and sustainable societies to improve the quality of life and social value.

Covid-19 has influenced long-term objectives within countries to build more resilience to deal with natural disasters and shocks when they occur. This is represented through the design of economic recovery packages aimed at 'building back better'. The ongoing work of the CTCN in terms of assisting in the development of TNAs, TAPs, as well as other technology assistance, can further prepare countries responses to such shocks and stresses and enable countries to be more resilient in terms of their physical assets, infrastructure, and organisations. Adopting a more integrated approach to 'building back better' can add value in terms of the circular economy, enhanced air quality, slowing biodiversity and achieving net gain, wider societal value, and community inclusiveness. Such approaches also need to ensure inclusive representation in terms of gender and youth. Ultimately,

it is about considering economic and societal well-being in a way that protects our natural environment and mitigates risks associated with negative climatic impacts. Such recovery initiatives must facilitate the shift to low carbon, climate-resilient economies, and support universal access to services.

As countries transition to cleaner economies and enact longer-term recovery plans, the first principle is one of replacement: a replacement of BAU practices with more sustainable recovery plans that are designed to enhance countries' national resilience and fundamentally support their pursuit of the goals of the Paris Agreement and the UN SDGs. Principles to guide this process are shown in Figure 3.



Resilience involves preparation for future pandemics, shocks, and risks of environmental degradation.

FIGURE 3

### Guiding Principles

#### FOR CLIMATE RESILIENCE TO BE SUCCESSFULLY EMBEDDED AND SUSTAINED IN THE LONG TERM

Avoid BAU, and focus on meeting policy commitments through decarbonisation, utilisation of digital technologies and commitments to build resilient economies and societies

Invest in (adaptation) planning and country preparedness, driven by country needs and priorities, establishing enabling environments and supporting infrastructural frameworks

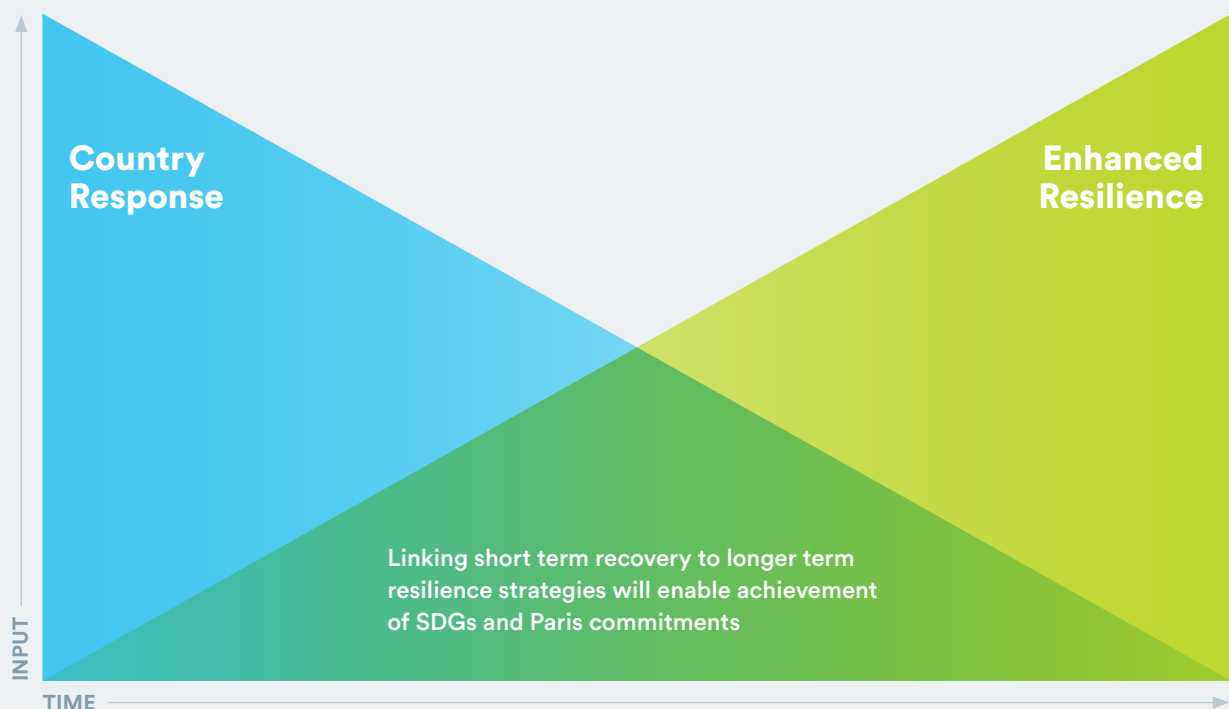
Focus on 'further behind first' and 'building back better' approaches, targeting investments to improve resilience (of economy, of health systems, of built environment) especially considering recent economic declines have been followed by intensive GHG growth

Factor in resilience to climate impacts including air and water pollution, biodiversity loss, extreme events and stimulate nature based solutions

Make best use of technological advances and engaging endogenous businesses

Increase circularity of supply chains

Identify financing instruments that are efficient and appropriate to 'just transition' principles. These will be vital to mobilise upfront investment to aid the transition



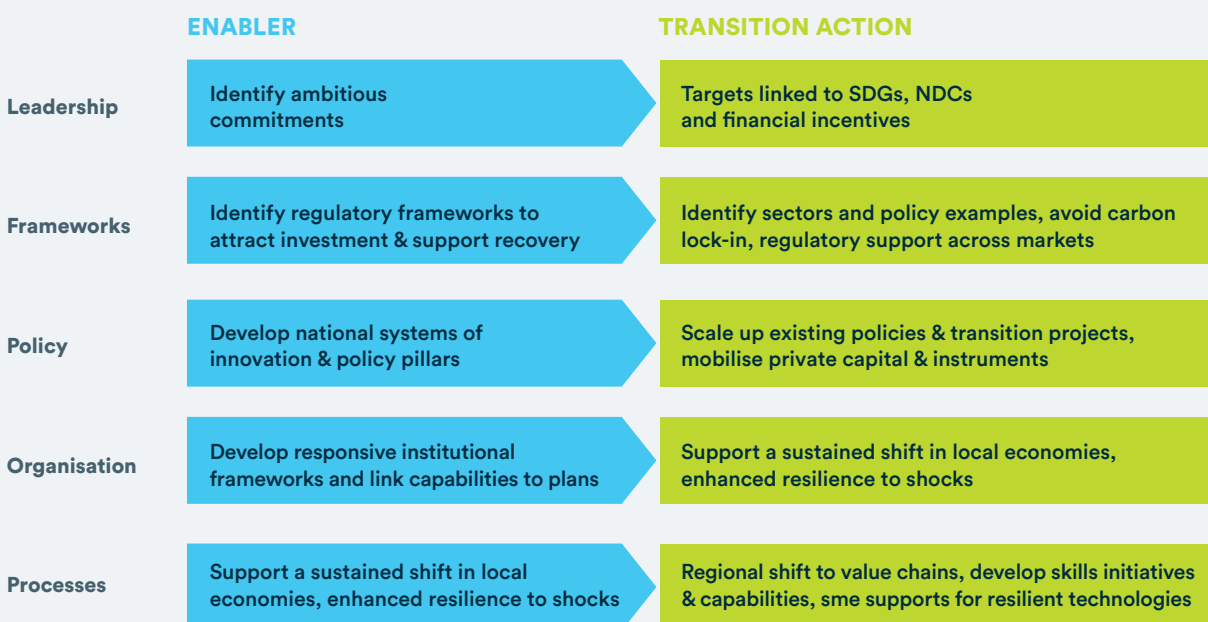
# 6. Transitioning from policy into action

From 2010-2013, industrial developments and resulting economic output have impacted emissions growth in developing countries by 43% (SDG Report, 2020). However, since 2013, climate technology programmes and initiatives have begun to reverse this emissions trend. For example, five least developed countries and four small island developing nations have submitted national adaptation plans (NAPs) to the UNFCCC. This reflects a significant step in preparatory elements and shows a prioritisation of climate change technologies and associated services into national planning and implementation strategies.

A combination of new policies and regulations, technology RD&D incentives, institutional frameworks, financial models, and capacity building can help place low carbon climate resilient development at the centre of national planning, embed sustainable development within a country’s climate strategy, and building resilient systems, economies, and societies. Countries often require help

in identifying the ‘enablers’ that need to be in place to support their specific development goals. Figure 4 identifies five country-led actions policy makers can employ to catalyse a transition to a more climate resilient future. The ‘transition actions’ translate the ‘enablers’ into more quantified impacts on NDC commitments.

**FIGURE 4**  
**Translating enablers into quantified action**





Countries can gain help to create and identify their pathway to a more climate resilient future.

Governments have clear opportunities to shape initiatives and regulatory frameworks that can support their economic recovery, considering national circumstances. Figure 5 presents a suite of potential measures that could support country resilience.

Many governments already have short to medium term Covid-19 recovery plans that deviate from the business-as-usual scenario to make up for the subsequent losses. Some of these entail a financial stimulus package that is considered adequate to bridge the gap that has been afflicted by Covid-19. As to whether such plans of action

are sufficient depends on the proposed specific interventions and approach by each individual country.

Figure 5 identifies the importance of policy leadership in shaping these plans of action, aimed at supporting resilience. According to the World Resource Institute, approximately 10 trillion USD was invested in crisis relief in 2020.<sup>5</sup> As to whether respective plans of action are adequate depends on the specific plan and interventions spelled by each individual country. Some governments require that local governments and sectors also develop their own recovery strategies.

FIGURE 5

## Potential measures to support resilience

### MEASURES TO AID RESILIENCE

<b>1. Strategy</b>	Identify strategic sectors and screen projects for their impact on delivering sustainability objectives/ long terms impacts on NDCs. Conduct risk assessments, identifying capacity gaps, and provide training.
<b>2. Commitments</b>	Cross check national policies with long term sustainability objectives and commitments (delivering low carbon growth, net zero, NDC, SDG outcomes).
<b>3. Integration</b>	Integrate approaches that encourage sustainable practices and so create long term investments across sustainable transport, sustainable production & consumption (circularity of economy), nature, renewable energy, and efficiency.
<b>4. Institutions</b>	Develop responsive institutional arrangements and capabilities to link plans and integrate financing frameworks. Responsiveness requires structural changes in our economies and environmental improvements.
<b>5. Investment</b>	Frame countries' response in terms of the right investment conditions that can mobilise private capital and access concessional loans and debt restructuring.
<b>6. Instruments</b>	Enhance policy/regulatory measures (efficiency of built environment and incentives to overcome policy gaps and co-ordination across markets) Incentivise technologies, products and services with strong environmentally sound criteria and promote sustainable finance measures (capital financing, public procurement) so providing opportunities to attract private investment.
<b>7. Scale</b>	Scale up successful existing policies and project pipelines, avoiding lock in carbon investments and infrastructures.

## 7. Sustainable actions within a roadmap

The guidebook is framed into 4 categories of actions in which the CTCN Secretariat receives the most requests from its engaged countries. The selection of areas was informed by analysing the areas where the CTCN receives the most requests and scanning the portfolio of countries where the CTCN operates in. Through this categorization, the CTCN seeks to identify unifying factors across all CTCN countries.

Below is a categorisation of potential actions where countries could target their interventions to achieve the level of transformative change envisaged under the Paris Agreement. Significant emission reductions will result from areas such as system and sectoral decarbonisation, circularity, nature-based solutions and eco-innovation. Such interventions also need to be driven by social value and capacity building initiatives. The following section will identify potential action areas across these four categories (See Figure 6) and provide evidence of

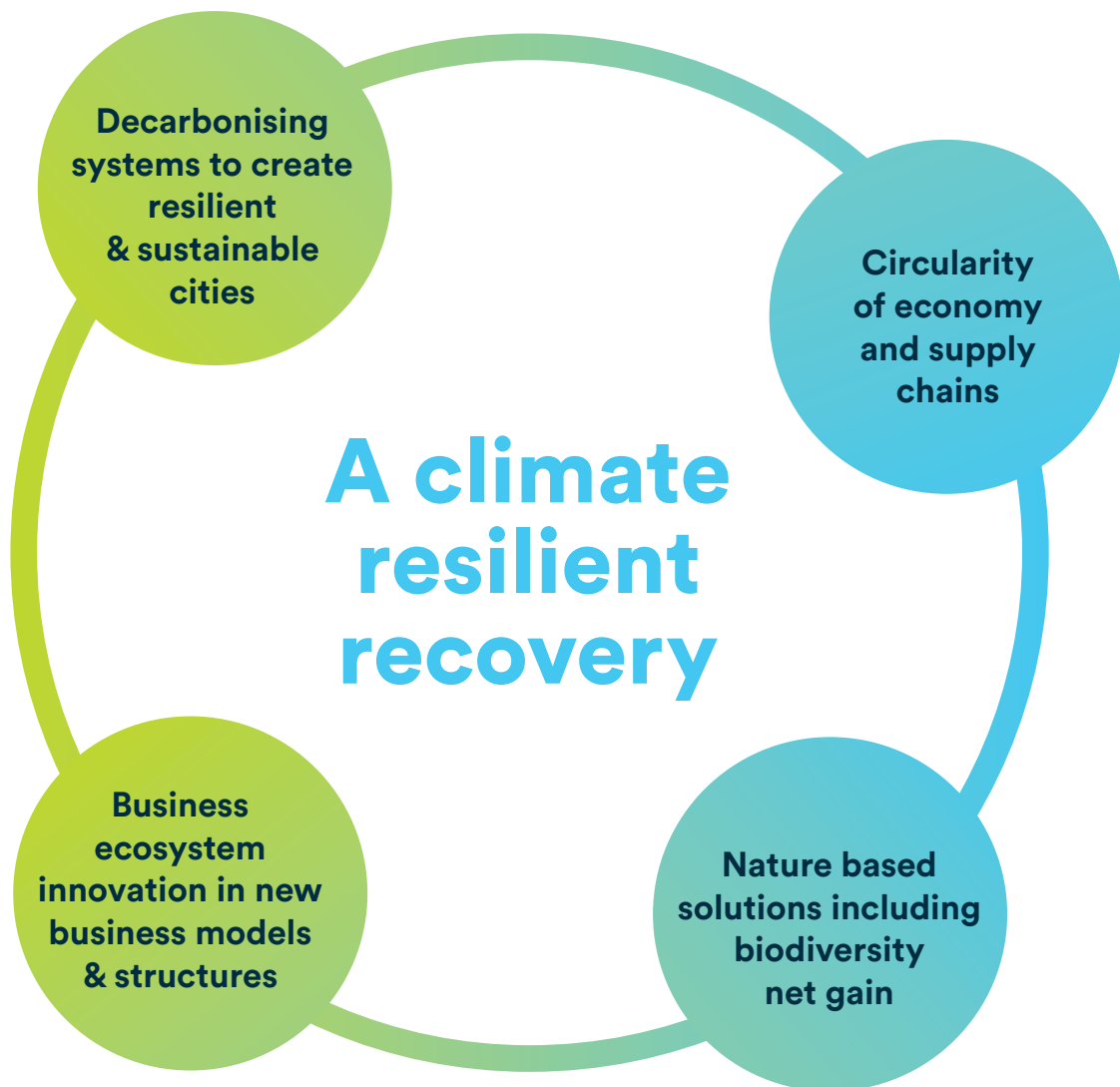
best practice and exemplar actions supported by the CTCN. This guide should be considered in the context of a country's NDC, existing commitments, capacities, natural resources action plans and policy frameworks. Efforts aimed at roadmap development should also seek to create synergies with ongoing work in this area as developed by organisations such as IRENA, IEA, World Energy Council and UN agencies. This will also stimulate a sharing of knowledge and increase the voice of countries through coalitions of the willing.



Governments have clear opportunities to shape initiatives and regulatory frameworks.

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**FIGURE 6**  
**Categories of potential actions**



## I. Decarbonising our systems and sectors

Developing countries can develop along a low carbon pathway, achieve system and sectoral decarbonisation, avoid BAU approaches and meet policy commitments (NDCs) through reduced GHG emissions, utilisation of digital technologies and commitments to build resilient economies and societies. It signals a shift away from a fossil resource base and yields major health and environmental co-benefits. Countries would preferably set science-based targets consistent with limiting temperatures as ascribed in the Paris Agreement. Understanding such approaches and having appropriate measurements

for actions will insulate countries against future unforeseen events/shocks and ensure that actions link with long-term country strategies. The rapid deployment of existing climate solutions will catalyse the development and demonstration of zero-carbon or net-zero technologies to accelerate countries' strategies to build resilience into their economy. Such resilience translates itself into attaining sustained growth, job creation and energy security. Decarbonisation benefits human health (SDG3), reduces emissions from power installations, enhances air quality and provides for cleaner supply chains.

### Secure clean energy pathways, achieve resilience and long-term climate and sustainable development objectives

#### 1. Decarbonisation potential areas

Decarbonisation can deliver resilient, sustainable cities and systems that provide supply security and quality of life. It requires stable policy frameworks and sustainability vision to guide investment decisions.

- Investments in transition related infrastructure, steering investment away from fossil fuels.
- Measures to unlock barriers to deploy proven technology
- Strengthen investment signals in low carbon technologies, products, services and energy management systems
- Targeting of heavy industries and infrastructures
- Retrofitting of commercial buildings, new regulations and standards, customised loans
- Grid investment (off grid and mini grid) and energy flexibility
- Energy conservation enhancing fuel affordability

#### 2. Lessons learned & best practice

- The CTCN assisted Tonga in developing an energy efficiency plan for its power, transport, infrastructure, tourism, education, fisheries and agriculture sectors. It measured sectoral energy use, costs, emissions, including gender-focused baseline studies, and delivered a longer-term capacity building plan.
- The CTCN assisted the Iron and Steel Institute of Thailand in establishing industrial baselines and benchmarks. It investigated the energy consumption and emissions baseline of other countries as a benchmark to support Thailand's NAMA implementation, identified best practices and recommended methods for energy and emission reductions.
- The CTCN worked with Kenya's Electricity Generation Company to conduct an assessment of possible opportunities for direct use application of geothermal resources across agriculture, manufacturing and tourism sectors. This also involved training a team of geothermists (geo-scientists, engineers and environmental specialists).

## II. Diversification of supply chains and circularity

There are clear synergistic gains from better-integrated supply chains, circularity, economic diversification, and the development of endogenous technologies (mapped to national circumstances). The uncertainty of long and complex supply chains, global production methods and value chains have demonstrated supply challenges, experienced acutely during the Covid-19 pandemic. In seeking resilience, companies are looking for shortened supply chains and enhanced resource efficiency, sustainable consumption and production. While companies need to consider the potential impact of local supply on local emissions (consumption versus production debates) they are becoming increasingly averse to the risks posed by the concentration of upstream actors and the impact of single suppliers within supply chains. Materials management becomes critical in terms of building greater resilience to supply risks, and policy can stimulate circular value chains through green procurement.

Policy and regulation help create an enabling environment that encourages directional change and aids in removing barriers, such as altering the definition of waste to facilitate re-use and minimise landfill. Governments can support new markets for secondary materials, for example, and unlock new revenue streams. Technological and regulatory developments alone will not suffice; a shift is required in business models and stakeholder behaviours and attitudes. Circularity approaches would benefit from strong industry targets for waste and re-use, as well as incentives to promote extending product life and remanufacturing. Unlocking circularity involves a rethink across the value chain that encompasses the whole lifecycle of an asset, from how it will perform throughout its service life, to how it can be taken apart and its component parts re-used.

**The systemic nature of circularity and supply chains requires both the ecosystem and its individual components to change. This requires systems thinking and highlights the importance of governance, regulation and business models to preserve our natural systems, and design out waste and pollution.**

### 1. Diversifying supply chains

- Diversifying and regionalizing supply chains and reducing entry barriers for local businesses seeking access to value chains
- Developing local industries & supporting national manufacturing via local content requirements
- Local workforce expansion in transition related industries, incremental innovation
- Promoting supplier development programmes, especially concentrating on regional chains and develop cross-sector partnerships to mobilise rapid responses
- Targeted education and training initiatives and development of productive capabilities to feed in and contribute to supply chains / coordinate educational offerings with industry needs/ vocational training

### 2. Circularity

- Develop multi-level policy framework and use policy levers such as public procurement to spur demand
- Implement circularity design frameworks and principles, including steps such as remanufacturing and refurbishing products and components; recycling materials; replacing physical products and services with virtual services/ virtual locations
- Convene and facilitate public private partnerships to develop scalable projects
- Analyse and develop new business models and services, such as alternative ownership models including leasing and performance models; and replacing product-centric delivery models with new service-centric ones
- Implement pilots to enhance knowledge and skills, build capacity and drive innovation in the reuse of materials and assets.

### 3. Lessons Learned & Best Practice

- The CTCN worked with the Governments of Brazil, Chile, Mexico, and Uruguay to develop their countries' circular economies. This involved identifying and connecting relevant stakeholders among government, industry, and civil society and building a plan for transforming current industrial models into more restorative ones which efficiently recover and reuse resources. Six other countries in Latin America and the Caribbean have now initiated their own circular economy requests for submission to the CTCN.
- The CTCN worked with the Women Initiative Gambia to improve the capacity of recycling of waste and organic materials. This involved training across 15 communities on appropriate technologies and strategies for recycling of non-biodegradable materials such as plastic bags, and gender specific training on how to produce charcoal briquettes out of dry leaves, saw dust and coconut shells.
- The CTCN worked with the Ministry of the Environment of Madagascar to create a technology development and education centre for climate change. This involved the design of climate change information, awareness and education tools; development of curricula and training programs; and research and deployment of technologies

### III. Business ecosystem innovation and new business models

Innovation can produce economic and social change, and new business models play a large role in shaping a country's innovation ecosystem. Since its establishment, the CTCN has developed a role as a climate technology and innovation matchmaker for developing countries.<sup>6</sup> A country's capacity to adapt to climate change depends on factors including investment in R&D, market dynamics, policy and institutional frameworks and market/non-market actor co-operative solutions. Countries have a new opportunity to develop and strengthen their innovation systems and understand the context-specific situations/

needs of their own country in terms of establishing the business conditions and enabling environments for transformational innovation efforts. Support to indigenous companies and endogenous technologies can support market readiness, preparation, business planning, and enable the deployment and scaling-up of climate technology solutions. Programmes of technology advancement, technology demonstration, feasibility studies and business accelerators and incubators can help businesses diversify, become more resilient and facilitate climate technologies adapted to local contexts.

**New business models can disrupt the high carbon pathway while providing market signals for a new economic opportunity. Innovation in business models, rather than product innovation only, can overcome bottlenecks associated with development and diffusion of technologies.**

#### 1. Business models

Companies need to develop new business models to diversify, enable transition and prepare the road for a resilient zero-carbon future. Such new frameworks accelerate innovation and overcome economic and institutional barriers.

- Investment support that fosters innovation, R&D, demonstrations projects & distributed generation
- Investment incentives for green R&D, intellectual property and patent discovery, venture capital
- SME models such as accelerators and incubators, to support tech transfer and diffusion
- Sectoral systems of innovation, integrating businesses in levels of production and innovation processes
- Process innovation aimed at enhancing productivity
- Financial assistance to SMEs: subsidies, guarantees, green procurement, grants, allowances, concessional loans
- Risk instruments to mobilise private capital

#### 2. Lessons learned & best practice

- The CTCN collaborated with Chile on Incubating Climate Technologies in Small and Medium Enterprises. It aimed to understand the barriers that prevent SMEs in the fruit, wine, vegetable, annual crop, beef, and dairy value-chains from implementing climate mitigation and adaptation technologies and proposed solutions to increase technology use. It identified the opportunities to reduce environmental impact and increase the resilience to climate change of selected agri-chains.
- The CTCN continues to work closely with NDEs/ NDAs to enhance technical support and guidance to countries to conduct needs assessments and technology roadmaps. This involves barrier analysis, private sector mobilization, identification of project ideas, policy and regulatory framework support and strengthening capacities to access finance.
- The CTCN collaborates with entities such as the West African Development Bank and the Central African Development Bank to deliver workshops aimed at building capacity, matchmaking services and small and medium sized enterprise engagement.

## IV. Nature-based solutions and biodiversity

Future cities will only prosper if they are understood as a complex adaptive system, where the relationship between humans and nature are deeply entwined. Widespread urbanisation in cities has concretised and restricted rivers and sewers, increasing impervious surfaces and ultimately stormwater flooding. Barriers exist to deploying green infrastructure solutions such as ownership cost, maintenance, vandalism, space, and knowledge of the benefits that prevent many governments from

implementing such solutions. Nature based solutions can build ‘city ecosystems’ that encompass parks and open spaces; urban trees, streets, squares; woodland and waterways that can help create healthier, safer and more prosperous cities. Green infrastructure and the protection of ecosystems are essential parts of landscape resilience and governments play an important role in terms of embracing the value of biodiversity and their overall impact on nature.

**Nature based solutions, known as green infrastructure, include our ecosystem, forests & biodiversity net gain, and provide the ingredients for solving urban and climatic challenges by building with nature.**

### 1. Nature based solutions

Learning to live in accord with nature involves actions to reduce vulnerability, safeguard freshwater supply and quality, protect ecosystem services, and installing robust, sustainable urban infrastructures. Initiatives include:

- Regenerating, safeguarding and restoring natural capital, green corridors, planting mangroves, drip irrigation tech
- Deploying Green Space Index and other tools to calculate eco-efficient use of space and assess the ecosystem services provided by public open spaces, green roofs, etc.
- Returning valuable biological nutrients safely to biosphere
- Deploying Green Roofs Strategy across city buildings
- Use stormwater management to combine nature-based and technical solutions, holding rainwater in individual plots
- Sustainable urban drainage systems and building new parks connected by green corridors, diverse biotopes

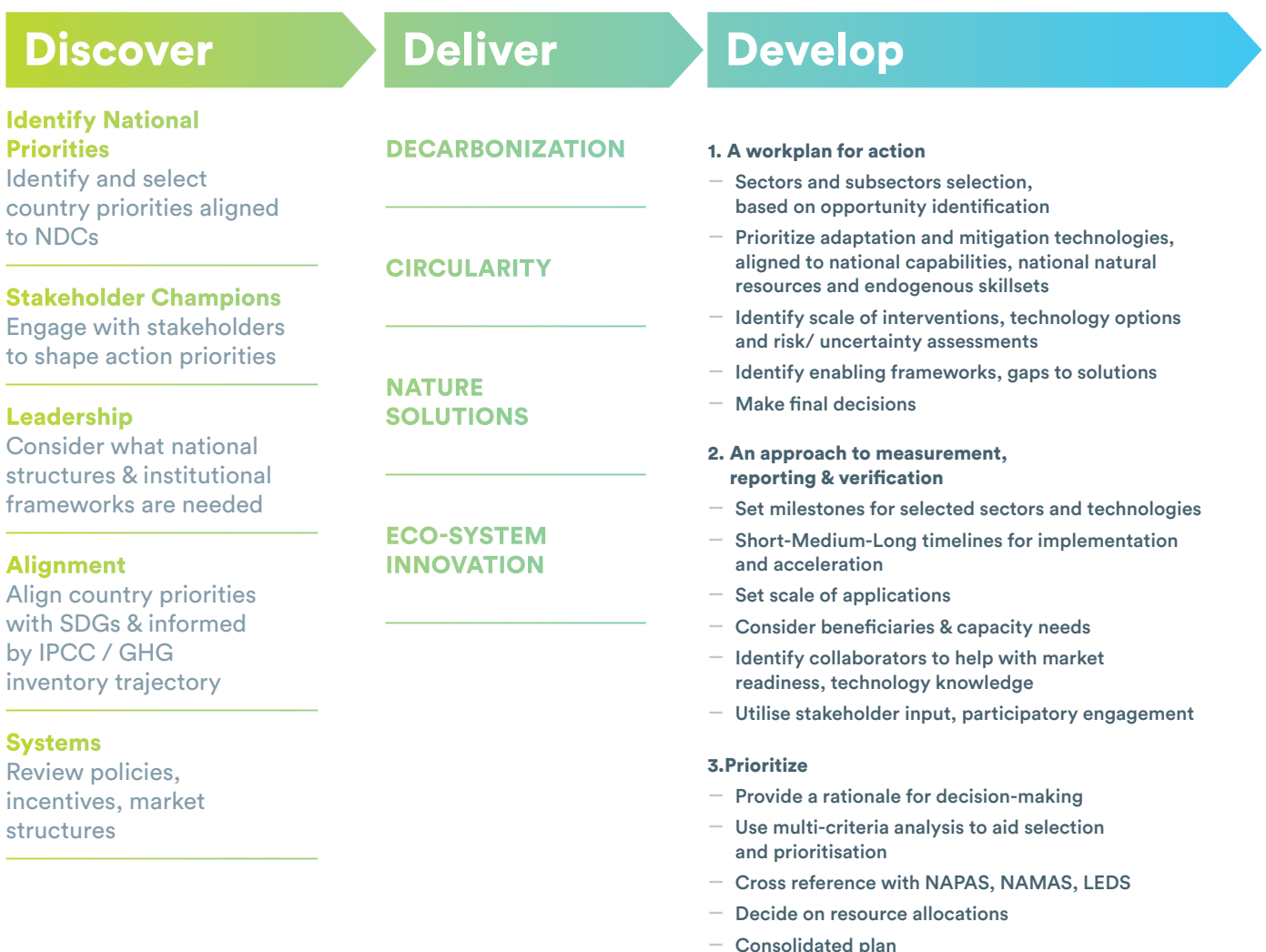
### 2. Lessons learned & best practice

- The CTCN and the Korean Green Technology Center collaborated with Bangladesh’s NDE and the Palli Karma-Sahayak Foundation to introduce desalination techniques and low-cost, climate-resilient housing options in coastal areas of Bangladesh in response to increasing saline water intrusion due to cyclones, floods, sea level rise.
- The CTCN collaborated with Government of the Dominican Republic to develop a biological mountain corridor in los Haitises and increase climate resilience among rural households. It outlined resilient landscapes and ecosystems in the Caribbean Corridor and presented an economic analysis of interventions.
- The CTCN and Kenyan Ministry of Agriculture developed a National Agroforestry Strategy 2020-2030, informed by a consultative and participatory framework. This involves a best practice benchmarking exercise, analysis and review of current policies and strategies that guide farm forestry in Kenya, and identification of gaps that need to be addressed to enhance role of agroforestry in addressing climate change impacts.

# 8. Roadmap development

The CTCN continues to work closely with the NDEs and NDAs of countries as it responds to identified needs by providing technical support and guidance to develop a pipeline for environmentally sound technologies and turn ideas into TNAs and NAPs. The following steps are presented as a guide for countries to consider how best to respond to the commitments outlined in their Nationally Determined Contributions and enable their economies to respond to the challenging environment resulting from Covid-19. Figure 7 outlines a path of action in terms of developing robust, country-led proposals to improve climate resilience.

FIGURE 7  
Roadmap of activities



# 9. Conclusions

**The impact of the Covid-19 pandemic has resulted in a reassessment of priorities and heightened the level of unpreparedness of countries to respond to global challenges. At the same time, it has led to an increasing awareness of the dire consequences of not taking major steps to re-chart our course for the future.**

This guidebook was prepared by the CTCN as it recognised how countries, network members and other institutions could benefit from guidance and assistance in transferring their commitments into action. This guidance can aid countries and direct their CTCN requests towards the broad scope of green recovery actions across sectors. Responding to such requests for technical assistance requires active engagement of network members and NDE collaboration.

The disruption of a high carbon pathway can be triggered by the actions and intervention of countries and CTCN network organisations. The CTCN further recognises the importance of maintaining a country-driven approach to needs and capacity identification, and that no one solution can be assigned to all countries. Its technical assistance will always be framed in the policy objectives of the partnering country. This country-driven approach can enable policy and regulatory frameworks to be developed for climate technology deployment and can support the prioritisation of climate technology solutions underpinned by national strategies and plans. CTCN also commends countries that have already developed policies and set up provisions for adequately addressing likely risks; such as setting up national and local climate funds, institutions, and long-term action plans.

Covid-19 has reminded us of actions that can make our communities, sectors, and systems more resilient to global impacts. Such actions include a renewed focus on nature-based solutions, the importance of re-use of materials and products, and the need to have local supply chains where we can engage with local business and enable our communities to thrive economically and environmentally.

As the implementation phase of the Paris Agreement continues, the CTCN will strive to serve an enabler for countries and to help shape climate plans, conduct feasibility studies and pave the way towards sustainably building back better. The CTCN is also a convener and collaborator that can build coalitions with financial institutions, such as the GCF, in supporting the 'readiness' of countries to transition their economies, systems and societies into ones that are ultimately more climate-resilient.

In the case of countries with policies and plans that can be rolled out to effectively support building back better, the challenge is to identify, incorporate and prioritize the best scope of intervention by the CTCN to support significant transformation.

The Climate Technology Centre & Network stands ready to assist countries to build more resilient businesses, infrastructure, and ultimately deliver on sustainable economic, social, and environmental development goals.

## NOTES

- 1 IEA, 'Energy investment is set to fall by one-fifth in 2020', <https://www.iea.org/topics/covid-19>. Accessed 25.2.2021
- 2 This involves the temporary inability for households to meet their minimum food needs, a decline in their ability to meet subsistence needs.
- 3 For more information see <https://www.sciencedirect.com/science/article/pii/S2590061720300570>
- 4 S&P Global Ratings 'Stress Scenario: The Soverigns most vulnerable to a covid-19 related slowdown in tourism'. 2020.
- 5 See WRI, 'Designing the COVID-19 Recovery for a Safer and More Resilient World', <https://www.wri.org/news/designing-covid-19-recovery-safer-and-more-resilient-world>. Accessed 25.2.21
- 6 See <https://www.ctc-n.org/news/new-ctcn-publication-role-ctcn-climate-technology-and-innovation-matchmaker-developing>. This model explains that the role of the inside-out innovation at the third technology diffusion stage. Accessed 25.2.21

The Climate Technology Centre & Network (CTCN) is the implementation arm of the United Nations Framework Convention on Climate Change (UNFCCC) Technology Mechanism. The CTC fosters technology transfer and deployment in developing countries through technical assistance, knowledge sharing and capacity building.

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# CTCN

CLIMATE TECHNOLOGY CENTRE & NETWORK  
UNFCCC Technology Mechanism

CTCN Secretariat  
UN City, Marmorvej 51, DK-2100 Copenhagen, Denmark  
[www.ctc-n.org](http://www.ctc-n.org)  
[ctcn@un.org](mailto:ctcn@un.org)



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