

1 **Effective climate action must integrate climate adaptation and mitigation**

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12 **Mitigation and adaptation strategies have historically been, and continue to be,**
13 **developed separately. The climate is already changing and integration of adaptation**
14 **and mitigation in policy and practice is now urgently needed.**

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16 Climate actions at the international, national, regional and local levels, have historically been
17 driven by efforts to mitigate greenhouse gas (GHG) emissions, with adaptation often lagging.
18 But global temperatures in 2023 already increased by 1.35°C above the 1850-1900 pre-
19 industrial average [1] with no signs of slowing down, as efforts to speedily and ambitiously
20 reduce GHG emissions have failed [2]. Even if global ambitions for net zero by 2050 are
21 achieved, the world will continue to warm, weather extremes will continue to worsen, and
22 adaptation will be required to protect people from the worst impacts of the changing climate.
23 Separating mitigation and adaptation actions could lead to imbalanced development and
24 slow progress on effective climate action.

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26 Moreover, adaptation and mitigation designed and implemented in isolation is not cost-
27 effective, does not reflect their multidimensionality and complexity, can lead to a range of
28 social barriers, and can even result in maladaptation and unintended consequences. This
29 could contribute to a range of inefficiencies occurring alongside policy incoherence. For
30 example, afforestation projects designed for carbon sequestration could increase water
31 demand, making it harder to adapt to changing precipitation patterns and undermining local
32 water scarcity adaptation efforts. Similarly, rapid investment in solar or onshore wind could
33 result in habitat disruption and reduce ecosystem resilience. Combined action on mitigation
34 and adaptation is necessary to deal more effectively with the impacts of the warming planet.

35 36 **Challenges in uniting adaptation and mitigation**

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38 It is logical to consider adaptation and mitigation side by side. However, historically and
39 institutionally, uniting them has faced many challenges. Firstly, mitigation has been
40 prioritised over adaptation in international governance. When the United Nations Framework
41 Convention on Climate Change (UNFCCC) was established, it had a strong focus on
42 mitigation [3], as the impacts of climate change hadn't manifested substantially, and the
43 need to adapt was not as prominent. Mitigation action has thus driven global efforts to tackle
44 climate change. However, these efforts are insufficient to achieve net zero targets [4], and
45 climate impacts are projected to become increasingly severe [5], necessitating urgent action
46 for greater and accelerated adaptation.

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48 Secondly, national climate action lacks coherence. In the United Kingdom (UK), for example,
49 adaptation and mitigation are the responsibility of separate government departments:
50 mitigation falls under the remit of the Department for Energy Security and Net Zero
51 (DESNZ), and adaptation is covered by the Department for Environment, Food and Rural
52 Affairs (Defra). This is also true in other countries and cascades down to the regional and
53 local scales [6] in the prioritisation and allocation of resources for adaptation and mitigation,
54 with teams within the same local authority often working in siloes. Further, institutional

55 memory is often short, with experts remaining in post for short periods of time and then
56 taking with them their knowledge and insights on potential integration with other policy areas.

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58 Thirdly, climate action is prioritised differently in different countries. Many lower-income
59 countries, such as Ethiopia, Burkina Faso, and Bangladesh, currently have very low
60 emissions yet are among the most vulnerable to the impacts of climate change. For these
61 countries the challenge is the urgent need for reducing poverty, improving prosperity, and
62 increasing adaptation and resilience to climate change, along pathways that are compatible
63 with global net zero aims. For example, Kenya, a lower-middle income country, has a
64 National Climate Action Plan that focuses on low carbon climate resilient development and
65 prioritises adaptation. In contrast, higher-income countries such as the UK submit Nationally
66 Determined Contributions which primarily focus on emissions reduction, but also address
67 adaptation measures. Similarly, the US's Inflation Reduction Act prioritizes tackling climate
68 change through emissions reduction and clean energy initiatives.

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70 Fourthly, mechanisms for monitoring, supporting and financing mitigation differ from those
71 for adaptation. There are clear global and national targets for mitigation, that prioritise the
72 reduction of GHG emissions across scales. In contrast, there are no clear targets for
73 adaptation, which tends to be location-specific and dependent on the type and severity of
74 climate impact, available data, vulnerability of the affected system, and other contextual
75 factors. Financing adaptation also tends to be challenging, because it involves investing in
76 counterfactual situations, which carry greater uncertainty. Although adaptation finance
77 presents numerous opportunities, a gap remains between conceptual ideas and
78 demonstrable solutions with positive impacts [7].

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80 **Integration is possible**

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82 The complex nature of adaptation and mitigation approaches, rather than being seen as
83 challenges, could provide opportunities for integrated approaches to climate action that
84 address both simultaneously. These approaches include addressing knowledge gaps,
85 limiting siloed work on climate action, enhancing co-benefits of climate action and minimising
86 unintended consequences, and enabling climate-resilient economic growth.

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88 Some options for tackling climate change already integrate adaptation and mitigation and
89 offer co-benefits. For instance, investment in urban green spaces (e.g. green roofs, urban
90 trees), offers the potential triple dividend of carbon sequestration, cooling, and improved
91 biodiversity. Similarly, protecting and enhancing mangroves (e.g. coastal protection through
92 tree planting and dune establishment), provides "blue carbon" mitigation benefits, protection
93 from storm surges, stabilises coastlines, and improves protection of marine species
94 biodiversity [8]. Also, adopting more balanced low-carbon diets combined with climate smart
95 agriculture (including regenerative agriculture [9], no-till farming, climate resilient crop
96 varieties, agroforestry, and reduced-methane livestock farming) could not only decrease
97 GHG emissions from food systems but also increasing the climate resilience of food
98 production and security.

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100 Moreover, integration of adaptation and mitigation actions helps mitigate potential conflicts
101 between the two. Heat risk and overheating is a growing issue globally with a range of
102 countries including India [10] and UK [11] reportedly unprepared for projected future
103 increases in temperature extremes. To adapt to the ambient temperature, many countries
104 have utilised energy-intensive cooling technologies (for example air conditioning), but these
105 technologies can lead to increased emissions and increase local ambient heat [12], further
106 increasing overheating [13]. Policies have traditionally focused on insulating buildings to
107 keep them warm in the winter whilst reducing electricity demand; if these measures are
108 installed properly, with adequate ventilation, they can indeed help to reduce the risk of
109 overheating while simultaneously reducing energy costs.

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Accelerating better integration

Integrating adaptation and mitigation can accelerate climate action in a fair way that has multiple co-benefits and mitigate potential trade-offs. Actions need to go beyond adaptation and mitigation framings and aim for broader policy integration beyond climate, including nature-based solutions and climate-resilient agriculture, sustainable land use planning, renewable energy solutions, infrastructure that is both resilient to climate impacts and low carbon by design, and community-based and –led approaches. We highlight principles that have the potential to accelerate the necessary changes (Figure 1).

Figure 1 – Principles for integrating climate adaptation and mitigation

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| Policies and regulations | Either newly formulated or revisited, including those linked to food, energy, waste and travel, explicitly address how adaptation and mitigation can be better integrated. This can be achieved through closer collaboration within and outside of siloed governance processes, underpinned by inclusive and co-production principles. |
| Financial incentives | Designed for actions that incentivise adaptation contingent on the implementation of mitigation actions, and vice versa. Funding mechanisms must move away from competition-based approaches to commissioning and funding climate action, to a collaborative, integrated process. |
| Framing and contextualising integration | Avoiding a one-size-fits-all approach, and addressing how climate change affects different parts of the world, groups within society, and components of economies in unique and complex ways. Integration must be flexible and iterative to the continuously evolving geographical, sectoral, political, cultural and social landscapes. |
| Enhancing capacity | Across adaptation and mitigation policy, practice and third sector communities, to assess the barriers and enablers to achieving integration, and to ensure similar framings and narratives for integration are used and applied. |
| Building a social mandate | Changes at the societal, community, household and individual levels are and will increasingly be required to support and lead efforts for climate action. Individuals are directly affected by the impacts of climate change, and also play a role in helping drive down greenhouse gas emissions. |

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An approach that integrates adaptation and mitigation thus has considerable potential to accelerate efforts to tackle climate change, by addressing the complex and multifaceted aspects of the climate crisis, and recognising explicitly interconnections between adaptation and mitigation efforts. In so doing, this approach will optimize resource and skills allocation and use, promote policy coherence, address social equity, and foster innovation, all of which are crucial to build a low carbon world that is resilient to the impacts of climate change we are increasingly going to face.

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Competing interests

The authors declare no competing interests.

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