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1 **Climate change mitigation and nature conservation both require higher protected area targets**

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8

9 **Abstract**

10 Nations of the world have, to date, pursued nature protection and climate change mitigation and
11 adaptation policies separately. Both efforts have failed to achieve the scale of action needed to halt
12 biodiversity loss or mitigate climate change. We argue that success can be achieved by aligning
13 targets for biodiversity protection with the habitat protection and restoration necessary to bring
14 down greenhouse gas concentrations and promote natural and societal adaptation to climate
15 change. Success, however, will need much higher targets for environmental protection than the
16 present 10% of sea and 17% of land. A new target of 30% of the sea given high levels of protection
17 from exploitation and harm by 2030 is under consideration and similar targets are being discussed
18 for terrestrial habitats. We make the case here that these higher targets, if achieved, would make
19 the transition to a warmer world slower and less damaging for nature and people.

20

21 **Keywords**

22 Biodiversity conservation; Natural climate solutions; Nature-based solutions

23

24 The year 2009 was a watershed in the progress of climate change [1, 2]. At a meeting at the Royal
25 Society in London to examine the past and consider the future of tropical coral reefs, participants
26 realised that global emissions, which by then stood at 386ppm CO₂, had already exceeded the
27 estimated 350ppm CO₂ tolerance of this ecosystem [1]. It was too late to simply reduce emissions; to
28 secure a viable future for coral reefs some of the CO₂ already in the atmosphere would now have to
29 be recaptured [1]. This recognition moved debate from consideration of how to avoid future
30 problems, to the fixes required for those already existing, a conversation that still continues [3-5].

31 The Paris Agreement acknowledged this shift in perspective by incorporating carbon recapture in the
32 two more ambitious Representative Concentration Pathways, RCP 2.6 (a stringent mitigation/low
33 emissions scenario) and RCP 4.5 (a stabilisation/moderate emissions scenario) [6], more recently
34 extended to include social and economic dimensions through Shared Socio-economic Pathways [7].
35 The most effective way to quickly capture sufficient CO₂ from the atmosphere is via photosynthesis,
36 so both RCPs include scenarios of mass reforestation and habitat restoration [4, 8]. But while climate
37 change and emissions reduction are now high on the political agenda, addressing the global and
38 accelerating deterioration of nature [9] is at least as urgent. In practice, however, biodiversity loss

39 receives far less attention and global actions to reverse it have been largely ineffective [9]. It is now
40 widely recognised that synergies between climate change and biodiversity conservation mean that
41 the two agendas must be pursued concurrently to meet societal and environmental goals, such as
42 the UN's Sustainable Development Goals, Convention on Biological Diversity's Aichi Targets, and the
43 Paris Agreement [9]. This recognition is now also reflected in global social movements aimed at
44 driving political action [10].

45 While reducing emissions remains fundamental, mitigation is also essential [4]. Conserving and
46 restoring natural habitats is among the most cost-effective emissions mitigation strategies available
47 but while clear synergies exist between the objectives of biodiversity protection and carbon capture,
48 there is also a risk that if conservation and climate change mitigation agendas are mis-aligned, one
49 could easily undermine the other.

50 The last decade has seen a surge in research on the benefits and costs of nature-based solutions to
51 climate change mitigation and adaptation and, as much of it acknowledges, there are trade-offs
52 among outcomes [4]. For example, habitats that store the most carbon, or are best for flood control,
53 or for pollution mitigation, are not necessarily the most diverse, intact, or natural. Hence the single-
54 minded pursuit of a narrow goal, such as carbon storage or reduced consumption of fossil fuels,
55 might well lead to policies antithetical to wildlife protection. An example of the former would be
56 establishment of large-scale, low diversity plantations with the potential to sequester large amounts
57 of CO₂ in repeatedly harvested timber but which could potentially hasten the disappearance of
58 threatened species by co-opting space and blocking dispersal [11]. An example of the latter would be
59 increased land conversion to facilitate crops for biofuels to reduce reliance on fossil fuels at the
60 overall expense of carbon emissions and biodiversity [12]. It is critical to avoid such "bio-
61 perversities" in any climate mitigation policies [13].

62 The numerous co-benefits from wildlife and habitat protection for climate mitigation and adaptation
63 must be embedded in revised global ambitions. Climate solutions must promote conservation, while
64 conservation efforts must work to counter climate change. Natural or restored habitats perform
65 functions that are crucial in mitigating climate change and promoting societal adaptation. For
66 example, wetlands, peat bogs and rainforests are often intense carbon sinks [14-16] while intact,
67 vigorous wetlands and coral reefs form natural, self-repairing breakwaters that can protect coasts
68 against sea level rise better than man-made defences [17]. Unfished mesopelagic fish populations
69 promote carbon sequestration in the deep sea [18] and protecting marine animals and ecosystems
70 can benefit carbon storage and prevent release of carbon already locked away [5, 19]. Natural and
71 restored forested landscapes promote water retention and counter flooding while regulating climate
72 and rainfall at local, regional and continental scales [20], while protected habitats in agricultural
73 landscapes sustain populations of natural pollinators, predators that control pests, and facilitate
74 seed dispersal [21, 22].

75 Existing global conservation targets (the 'Aichi targets') agreed through the Convention on Biological
76 Diversity (CBD) [23], and later incorporated into the Sustainable Development Goals [24], run until
77 2020. The Aichi targets have spurred governments to act and there have been some successes, but
78 global biodiversity continues to decline [9]. Attention is now turning to the post-2020 agenda and,
79 with the urgency of climate change well-recognised [25], there is a need to align conservation and
80 climate change agendas so that both may see greater success and fulfil their essential roles in
81 achieving the Sustainable Development Goals. The post-2020 CBD targets need a rapid increase in

82 ambition and action. For nature to substantially contribute to climate change mitigation higher
83 coverages of intact ecosystems will be essential because of the reliance of ecosystem service
84 delivery, including carbon sequestration and storage, on biodiversity and the crucial need to leave
85 existing carbon stores intact. Moreover, given that many ecosystems are already degraded, ensuring
86 continued provision of ecosystem services requires not only the precautionary protection of
87 currently intact habitats, but also large-scale habitat restoration.

88 Providing greater space for recovery of intact, vibrant nature is not altruistic conservation, but is, we
89 argue, an indispensable act of self-preservation, producing a cascade of benefits that will help
90 maintain the habitability of the biosphere as the climate changes, thereby securing the wellbeing of
91 generations to come. In truth, the goals of protecting 10% of marine habitats and 17% of those on
92 land by 2020 (Aichi Target 11) were political and never considered sufficient to save nature, even
93 without climate change, or to enable nature to contribute substantially to climate change mitigation.
94 Based on the species-area relationship, regarded as one of ecology's few universal laws, protection
95 of so little habitat will condemn thousands of species to extinction if habitat outside them is
96 converted, degraded or lost. It is this logic that underpins calls for 'Nature Needs Half' [26], together
97 with an understanding that ecosystem processes and services of the scale needed to sustain the
98 wellbeing of life on Earth require large wildlife populations and huge expanses of intact and restored
99 habitat.

100 Since the current Convention on Biological Diversity targets were agreed, new research has shown
101 that future conservation success will depend on greatly increased coverage of fully and strongly
102 protected areas and restored habitats. For example, in the oceans, a synthesis of 144 studies asked
103 how much protected area coverage was needed to achieve, optimise or maximise benefits for six
104 core environmental and/or socioeconomic objectives [27]. The goals were representation of
105 biodiversity; ensuring ecological connectivity among protected sites; avoidance of population
106 collapse; avoidance of adverse, fisheries-induced evolution; enhancement of fisheries yield; and
107 meeting the needs of multiple stakeholder groups. The results consistently indicated that protecting
108 several tens-of-percent of the sea is required to meet goals with average and median values of 37%
109 and 35%, greatly exceeding the 5% or so of the ocean that is currently protected and the 10% target
110 (<http://www.mpatlas.org>).

111 Climate change adds a new dimension to the question of how much protected area coverage is
112 needed to assure conservation of wild nature. Climate change is already reducing wildlife population
113 sizes and forcing range shifts as conditions alter [28, 29]. Protected areas counter such stresses by
114 building up populations, and connectivity of populations and habitats is emerging as a key property
115 in securing species persistence and resilience to rapid change [5]. Hence networked protected areas,
116 especially where embedded within well-managed land- or seascapes, provide crucial stepping stones
117 to accommodate range shifts and, where no further movements are possible, refuges of last resort
118 [5]. Analyses suggest that adequate levels of population viability and connectivity can be achieved
119 only with MPA coverages of 30% or more [27]. We are not aware of comparable analyses for
120 terrestrial ecosystems, but figures are unlikely to be lower [30], given the more limited capacity for
121 dispersal on land than in the sea [31].

122 Policies that target single objectives can lead to unintended consequences and a lack of alignment
123 between goals as we argue above [11-13]. However, protected areas, with their multiple benefits to
124 wildlife and human societies, offer a low-tech and cost-effective nature-based tool to simultaneously

125 pursue climate change mitigation and adaptation and staunch biodiversity loss [5, 32]. Of course,
126 methods matter and the ability of protected areas to achieve multiple goals depends on factors such
127 as level of protection, public engagement, governance, location, size, staff and budget but we have a
128 large body of experience on how to effectively design and deliver protected areas [33, 34] and
129 restoration programmes [35]. To date, much effort in marine protected area establishment has
130 focussed on remote and more intact ecosystems [36] which, while important in delivering planetary
131 benefits, is insufficient to address other immediate human needs. Extending benefits to more people
132 will require greater protection efforts in populous regions in both sea and land.

133 Over the past decade, we have gained a much clearer scientific understanding of the role of natural
134 ecosystems in human wellbeing and planetary processes, and the scale of the challenge from rapid
135 climate change. Given the plight of natural ecosystems and humanity's reliance on them for our
136 survival, there is an urgent need to increase protection targets set by the Convention on Biological
137 Diversity to secure sufficient space for nature to thrive and adapt in our fast-changing world. This is
138 so important because protected habitats must be part of frontline defence in efforts to mitigate
139 climate change and to promote ecosystem and societal adaptation against its effects. Our goals need
140 to coalesce in a joined-up strategy for planetary survival. For marine habitats, there is growing
141 consensus that at least 30% of the sea should be protected by 2030 [36] and a similar level of
142 ambition is justified on land [37-39], with protection targeted to achieve ecological representation
143 and connectivity to support and restore nature and its wealth of services. For the next phase of
144 reshaping global conservation ambitions, our focus must shift from saving nature, to harnessing the
145 benefits of nature to save ourselves.

146

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