

Aichi Biodiversity Target 11 in the like-minded megadiverse countries

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ABSTRACT

The group of like-minded megadiverse countries (LMMCs), which harbours a wealth of biological and cultural diversity, adopted a Carta in 2016 to accelerate progress towards achieving Aichi Biodiversity Target 11. This paper presents the progress made over the last two years and an analysis of the LMMCs' national priority actions; approved Global Environment Facility, GEF-5 and GEF-6 protected area-related biodiversity projects; and relevant targets, goals, and actions from National Biodiversity Strategies and Action Plans (NBSAPs). Through their recent actions, these countries have contributed to progress in Target 11, especially with respect to marine protected area expansion, where they contributed one-sixth of the area added in national waters over the past two years. Results indicate that if implemented as planned, actions proposed by the LMMCs will increase terrestrial and marine protected area coverage by 1,106,148 km² and 192,214 km² respectively. Of these commitments, 227,230 km² in terrestrial and 144,475 km² in marine protected areas have the highest chance of being implemented. In total, 741 commitments were identified from the above sources, with implications on the qualitative elements of Target 11 (coverage of areas important for biodiversity, areas important for ecosystem services, ecological representation, connectivity, effective management, equitable management, and integration into the wider landscapes and seascapes). Of these 741 commitments, 25% showed a strong likelihood of being implemented. The country-level analysis of all commitments indicates that equitable management and integration will show the most progress, measured against identified gaps, if commitments are implemented as proposed. This progress on the qualitative elements of Target 11 in the LMMCs will also provide benefits and co-benefits for other Aichi Targets and for the requirements of other multi-lateral environmental agreements, as well as at the global level.

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1. Introduction

Considerable declines in biological diversity have been measured globally, prompting calls to significantly expand the coverage of protected areas (Büscher et al., 2017; Locke, 2013; Wilson, 2016). As cornerstones for conservation, protected areas may help address this ‘biodiversity crisis’ (Hoekstra, Boucher, Ricketts, & Roberts, 2005) and avoid a sixth mass extinction (Ceballos, Ehrlich, & Dirzo, 2017; Dirzo et al., 2014). Despite challenges such as intense human pressures, gaps in effective management and equity, as well as increased fragmentation (Jones et al., 2018; Tucker et al., 2018), protected areas remain effective tools for biodiversity conservation (Coetzee, Gaston, & Chown, 2014; Gray et al., 2016; Le Saout et al., 2013).

In 2010, the Strategic Plan for Biodiversity 2011–2020 was adopted by the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD), with the vision that “by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people” (CBD, 2010a). The Strategic Plan includes 20 headline targets (Aichi Biodiversity Targets), among which, Target 11 states that, “By 2020, at least 17 per cent of terrestrial and inland water areas, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes” (CBD, 2010a).

Recent analysis shows that if national commitments are implemented as proposed, global protected area coverage will be on track to meet or exceed the 17% and 10% coverage targets for terrestrial and marine protected areas, though gaps remain in ecological representation, effective management and the other qualitative elements of Target 11 (Gannon et al., 2017). However, for successful achievement of Target 11, all elements of the Target must be addressed in an integrated and holistic manner. Implementation of national biodiversity commitments is a key part of this effort, although the factors that facilitate implementation differ depending on local context. Some of the important factors include willingness, engagement, sustainable funding, appropriate institutional and governance frameworks, technical support, capacity building, coordination, and cooperation.

This article provides a case study of efforts of the twenty like-minded megadiverse countries (LMMCs)⁴ to accelerate implementation of national biodiversity commitments. The group of LMMCs, developed for consultation and cooperation, was formed in 2002 to promote the three objectives of the CBD, namely conservation and sustainable use of biological diversity, and the fair and equitable sharing of benefits arising from the use of genetic resources. In December 2016, ministers and government representatives of the LMMCs adopted the *Carta to Achieve Aichi Biodiversity Target 11*, which urged all partners and stakeholders to support the implementation of commitments (SCBD, 2016b).

The 20 LMMCs together cover almost 29% of the Earth’s terrestrial surface and contain a large portion of its biodiversity. They harbour more than half of all currently-listed threatened species (IUCN, 2016a) and the ten countries with the highest number of bird species are all LMMCs (Birdlife International, 2016). Twenty-six of the 36 biodiversity hotspots have at least part of their area in LMMCs, which contain just over 50% of the total aggregate area of hotspots (CEPF, 2016). LMMCs contain the majority of botanical regions with highest levels of plant species richness and include six of the eight countries with the highest

numbers of endemic flowering plant species (Pimm et al., 2014). With over half of the world’s human population (UNSD, 2018), the LMMCs also contain a wealth of cultural diversity, including 14 of the 30 territories with the highest number of languages in danger (Moseley, 2010), and a high level of overall linguistic diversity (Lewis et al., 2016).

This article presents the status of Target 11 in the LMMCs as of May 2018, including progress that has occurred over the previous two years; an analysis of national biodiversity commitments related to Target 11; and the potential of these actions and other opportunities to enhance progress. The commitments and opportunities from the LMMCs have implications to both enhance the progress of Target 11, and provide benefits and co-benefits for other Aichi Biodiversity Targets, the UN Sustainable Development Goals, and for the stated objectives of some multilateral environmental agreements.

2. Methods

2.1. Status of Target 11 in the LMMCs

The status of elements of Target 11 for which indicators are available is presented based on information from global datasets. For the Target’s quantitative elements, UNEP-WCMC’s analysis of terrestrial and marine protected area coverage in the May 2018 release of the World Database on Protected Areas (WDPA) was used (UNEP-WCMC, 2018b). Although all CBD Parties are requested to report regularly to the WDPA, there are frequently time lags and omissions in reporting, and the WDPA is therefore an incomplete ‘snapshot’ of an extremely dynamic data set (Lewis et al., 2017).

Data in the WDPA is used as a basis for indicators of other elements. Mean percent coverage of Key Biodiversity Areas (KBAs), an indicator for the coverage of areas important for biodiversity, was analysed by BirdLife International, UNEP-WCMC and IUCN (2018), with results available at the national, regional, and global level. Terrestrial connectivity is assessed using the ProtConn indicator (Saura, Bastin, Battistella, Mandrici, & Dubois, 2017; Saura et al., 2018) and ecological representation is assessed based on protected area coverage of terrestrial and marine ecoregions, which were defined by Olson et al. (2001) and Spalding et al. (2007). These indicators are reported in the Digital Observatory for Protected Areas (DOPA) of the European Commission – Joint Research Centre (EC-JRC) based on analyses of the June 2016 and April 2018 releases of the WDPA, for connectivity and ecological representation respectively (EC-JRC, 2018). New marine protected areas in Brazil were added to the WDPA in May 2018 (designated March 2018); geospatial data for these sites was accessed from the WDPA (UNEP-WCMC & IUCN, 2018a) and overlaid on marine ecoregions (Spalding et al., 2007) to assess changes to representation. We present the status of ecological representation based on mean target achievement (MTA), an indicator proposed by Jantke, Kuempel, McGowan, Chauvenet, and Possingham (2018). MTA represents the degree to which targets are being achieved, where a score of 100% would indicate that all ecoregions have met the 17% or 10% conservation targets (Jantke et al., 2018). For this analysis we only considered ecoregions with at least 10% of their area, or 1000 km² in a given country.

The only global indicator for management effectiveness currently available is the completion of protected area management effectiveness (PAME) evaluations. In 2010, Parties were invited to work towards assessing 60% of the total area of their protected areas by 2015 (CBD, 2010b). Completed PAME assessments are tracked in the Global Database of Protected Area Management Effectiveness (GD-PAME), with data from May 2018 used to present the current status (UNEP-WCMC, 2018a). Until November 2018, when voluntary guidelines were adopted (CBD, 2018a) there was no globally accepted guidance for assessing the ‘equitably managed’ element of Target 11. Information on governance diversity (the percentage of protected areas under different governance types) could be one proxy for assessing procedural equity at

⁴ Bolivia (Plurinational State of), Brazil, China, Colombia, Costa Rica, Democratic Republic of Congo, Ecuador, Ethiopia, Guatemala, India, Indonesia, Iran (Islamic Republic of), Kenya, Madagascar, Malaysia, Mexico, Peru, Philippines, South Africa, and Venezuela (Bolivarian Republic of).

a protected area system level, as it indicates the extent to which responsibility for protected areas, and participation in their management, are distributed among different actors. Moreover, although any governance type can be equitable, the governance types “shared governance” and “governance by indigenous and local communities” may have a higher likelihood of fostering equitable participation in decision-making which is an important element in equitable governance. Governance diversity was calculated using the public version of the May 2018 WDPa (UNEP-WCMC & IUCN, 2018a), with UNESCO-MAB Biosphere Reserves and sites with a status of ‘proposed’ or ‘not reported’ excluded. Other aspects of protected area management effectiveness (e.g. conservation outcomes) and equitable management (e.g. governance quality, including equity, at the site level) have not yet been comprehensively assessed at the global level. There are no proposed indicators for assessing the integration of protected areas into the wider landscape and seascape or for the coverage of areas important for ecosystem services (CDB, 2016), hence no global assessments are available.

Changes in the status of these elements between 2016 (the year the Carta was adopted) and 2018 is presented using the same set of indicators, both globally and within the LMMCs.

2.2. National biodiversity commitments

The LMMCs’ national biodiversity commitments were examined for their relevance to the quantitative and qualitative elements of Target 11. The sources of these commitments included: Parties’ national priority actions (including questionnaire responses and information on status, gaps and opportunities) collected through a series of regional capacity-building workshops; approved Global Environment Facility, GEF-5 and GEF-6 protected area-related biodiversity projects; and relevant targets, goals, and actions from revised National Biodiversity Strategies and Action Plans (NBSAPs). For marine protected area coverage, commitments made during the 2017 UN Oceans Conference were also included. The potential coverage of terrestrial and marine protected areas in 2020 was estimated based on the area to be added if these national commitments are implemented as proposed. It was assumed that commitments indicating the specific sites or area to be added would have the highest likelihood of implementation, compared to more general goals or targets.

Relevant text was extracted from the above sources and organised according to the excerpt’s relation to one of the seven qualitative elements of Target 11 (coverage of areas important for biodiversity,

coverage of areas important for ecosystem services, ecological representation, connectivity, effective management, equitable management, and integration in the wider landscape and seascape). These excerpts (‘commitments’) consisted of two parts: the type of action (e.g., restoration, protection, or sustainable use), and an action statement (e.g., develop a plan, conduct research, or strengthen governance). Commitments for qualitative elements of Target 11 were ranked using a three-point scale (Table 1), according to the level of emphasis given to the element, i.e. as an indicator for the likelihood of implementation. Higher scores are meant to indicate greater chances of successful implementation. Following the ranking of all commitments, a comparison of the scores between elements was made, to identify which elements may lag behind and require further efforts. A comparison of commitment scores between sources (GEF, NBSAP, national priority actions) was also performed. In both cases, this was done using a Kruskal–Wallis test, followed by a Dunn’s test for multiple comparisons with Bonferroni correction, using R, version 3.5.1 (R Core Team, 2018).

The commitments identified in different sources and ranked were then collated for each element within each country. Subsequently, the collated commitments were used to assign an overall country score for each qualitative element using a five-point scale (Table 2). The scale used to assign country-level scores (Table 2) was expanded from the individual commitment ranking (Table 1) to acknowledge cases where a country may not have any actions for a specific element of Target 11 (score of 0), and where a country may have multiple clearly defined actions that directly address some aspect of the gaps identified for the element (score of 4). This country-level scoring was used to give an indication of potential progress towards the qualitative elements of Target 11. Progress will be most noticeable where countries have multiple clearly developed actions for addressing a specific element. This progress was assessed against gaps that were identified by the CBD Secretariat in 2016 (SCBD, 2016a; Table 3), recognising that several elements lack adequate indicators or benchmarks for successful achievement. The suggested gaps represent potential steps towards achievement as an approximation, rather than achievement of the target itself.

3. Results

3.1. Status of the quantitative elements of Target 11: protected area coverage

Fig. 1 presents a summary of the current status of the quantitative

Table 1
Ranking applied to individual biodiversity commitments.

Score	Scoring for each commitment
1	Commitment recognizes the need for action on the element in question; however, there is little elaboration and/or no action plan developed
2	Commitment addresses the element with a developed list of actions; however, no plan for implementing these actions is proposed
3	Commitment is supported by a specific and detailed plan to implement the proposed action(s) for the Target 11 element in question

Table 2
Country-level scoring for the qualitative elements of Target 11.

Score	Country-level scoring for each element
0	No commitments were provided for the element in question
1	Country has mentioned the element in their documents; the need for actions is recognized however there is no designed action plan
2	Country has developed a list of actions that address the element, however no plan for how to implement these is proposed, or no actions directly address the gaps identified in Table 3
3	Country has developed a specific plan(s) for how they will implement the proposed action(s), at least one of which directly addresses some aspect of the gaps in Table 3
4	Country has multiple developed action plans that address the gaps outlined in Table 3, and has put the element as a priority in developing comprehensive implementation plans

Table 3

Suggested gaps to advance progress on the qualitative elements of Target 11, following SCBD (2016a).

Element of Target 11	Suggested gaps to advance progress by 2020
Ecologically representative	Increased coverage of terrestrial and marine ecoregions
Areas important for biodiversity	Increased coverage for areas important for biodiversity, such as KBAs
Areas important for ecosystem services	Identification and mapping of areas important for ecosystem services and coverage of these areas by PAs or OECMs
Well-connected	Develop corridors or connectivity conservation initiatives
Effective management	Increased completion of management effectiveness evaluations; improved quality of management in existing sites
Equitable management	Report governance type for all existing sites; increased number of co-managed and Indigenous Peoples and Local Communities (IPLC) governed sites; completion of governance and social assessments; recognition of rights of IPLCs; mechanisms for equitable distribution of benefits and mitigation of costs
Integrated into the wider land-and-seascapes	Integrate protected and conserved areas into local, regional, and national spatial planning; mainstream protected areas into important sectors

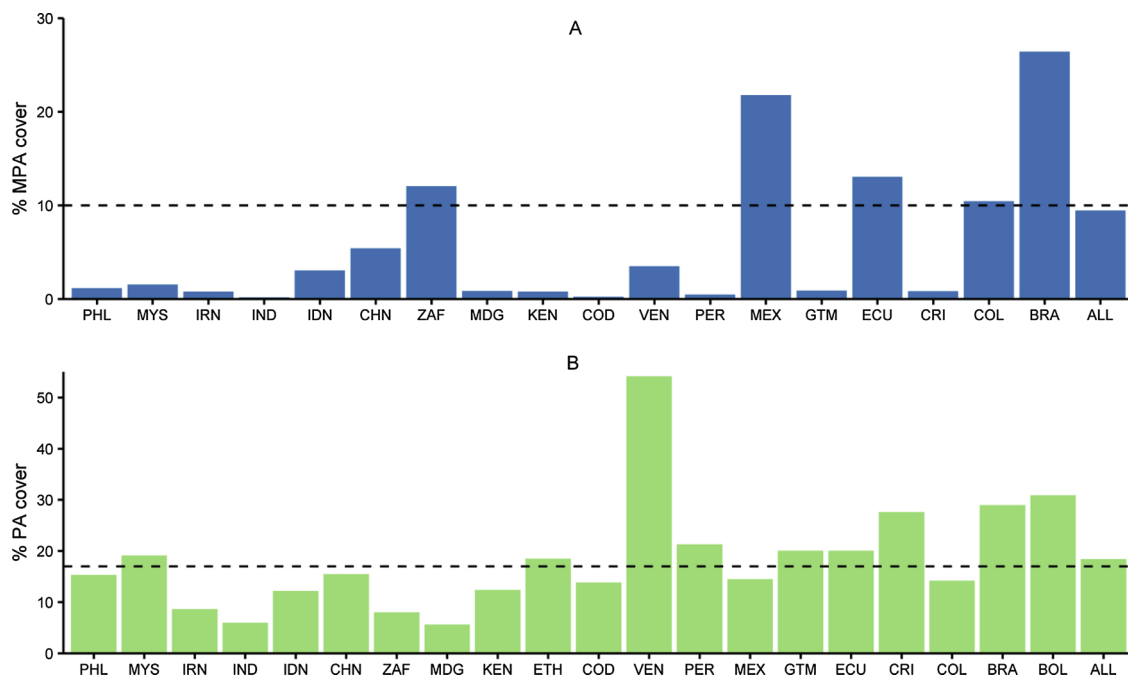


Fig. 1. Current status of the quantitative elements of Target 11 in each of the LMMCs, and for all LMMCs together (ALL): percent coverage for coastal and marine areas in jurisdictional waters (A) and terrestrial and inland waters (B). Dashed lines show the global target.

elements of Target 11 in the LMMCs as of May 2018. Overall, coverage of marine protected areas in jurisdictional waters⁵ across all LMMCs was 9.5%, with five countries passing the 10% global target (Mdn = 1.4%; Fig. 1A). This compares to 16.8% global coverage for marine areas under national jurisdiction and 7.3% for the entire ocean (UNEP-WCMC, 2018b). For terrestrial protected areas, 18.4% of the area of all LMMCs was covered, with nine countries passing the 17% global target (Mdn = 15.4%; Fig. 1B); compared to 14.8% terrestrial coverage at the global level (UNEP-WCMC, 2018b).

3.2. Status of the qualitative elements of Target 11

Fig. 2 presents a summary of the current status of the qualitative elements of Target 11 in the LMMCs, for which indicators are available and global assessments have been completed.

⁵ Jurisdictional waters include territorial waters and Exclusive Economic Zones, EEZ (200 nm from baseline). Sixteen of the 20 LMMCs are Parties to the United Nations Convention on the Law of the Sea, and all but the two land-locked countries have claims to maritime jurisdiction; see: https://www.un.org/Depts/los/LEGISLATIONANDTREATIES/PDFFILES/table_summary_of_claims.pdf.

3.2.1. Connectivity

The coverage of protected-connected lands (lands that are both protected and connected, using EC-JRC's ProtConn indicator) assessed at the country-level in the LMMCs ranges from 0.8% to 37.0% (Mdn = 8.7%; Fig. 2A), compared to the global average of 7.5% (Saura et al., 2018). Five of the 20 LMMCs (25%) have at least 17% coverage by protected-connected lands; compared to 30% of all countries that have reached 17% (Saura et al., 2018). Though the ProtConn indicator could potentially be applied to marine ecoregions with some adaptations (Saura et al., 2017), this has yet to be examined.

3.2.2. Ecological representation

Mean target achievement (MTA) for countries within the LMMCs ranges from 31.7% to 95.6% for terrestrial ecoregions (Mdn = 68.2%) and from 7.6% to 94.1% for marine ecoregions (Mdn = 57.4%; Fig. 2B). This compares to MTA at the global level of 66.6% for terrestrial ecoregions and 60.5% for marine ecoregions. As well, 357 of 823 terrestrial and 101 of 232 marine ecoregions have reached their respective coverage targets globally (EC-JRC, 2018).

3.2.3. Areas important for biodiversity

Based on the Key Biodiversity Areas Standard (IUCN, 2016b) as a proxy for representation of areas of particular importance for biodiversity, average protected area coverage of KBAs for countries in the

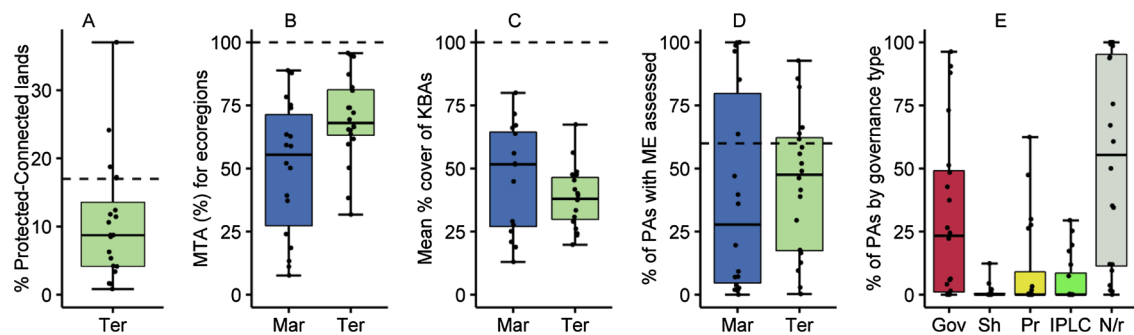


Fig. 2. Current status of several qualitative elements of Target 11 in the LMMCs: percent cover of protected-connected lands (A); mean target achievement (MTA) for marine and terrestrial ecoregions (B); mean percentage area of Key Biodiversity Areas (KBAs) covered by protected areas (C); percent of protected areas with reported management effectiveness (ME) assessments (D); and governance diversity (E) (Gov = Government, Sh = Shared, Pr = Private (Pr), IPLC = Indigenous Peoples and Local Communities, N/r = Not Reported). All plots show median, inter-quartile range, maximum and minimum, with dots displaying values for individual countries (n = 20 for terrestrial, Ter, and n = 18 for marine, Mar). Dashed lines indicate the target for the element.

LMMCs ranges from 13.0% to 80.0% of the area of marine KBAs (Mdn = 51.7%), and from 19.8% to 67.4% for terrestrial KBAs (Mdn = 38.0%; Fig. 2C). Globally, the mean percentage area covered by protected areas is 44.3% for marine and 46.6% for terrestrial KBAs (BirdLife International, UNEP-WCMC & IUCN, 2018).

3.2.4. Effective management

In the LMMCs, 25.2% to 92.7% of the area of terrestrial (Mdn = 47.6%) and 6.8% to 100% of the area of marine protected area networks (Mdn = 27.8%) have completed protected area management effectiveness assessments (PAME) reported in the GD-PAME (Fig. 2D). As of May 2018, six of the 20 (30%) LMMCs have met the 60% assessment target for terrestrial protected areas, while the target has been met by six of the 18 (33%) countries with marine territories (Fig. 2D). At the global level, 21% of countries for terrestrial and 16% of countries for marine protected area networks have met the 60% assessment target (UNEP-WCMC, 2018a). Other aspects of effective management, including conservation outcomes, are not represented by this metric.

3.2.5. Equitable management

The proportion of protected areas under shared governance in the LMMCs ranges from 0% to 12.4% (Mdn = 0%), while the proportion of sites with Indigenous Peoples and Local Communities (IPLC) governance ranges from 0% to 29.5% (Mdn = 0%; Fig. 2E). Across all LMMCs, the total proportion of sites under shared governance is 0.7%, with 8.6% sites under IPLC governance; this compares to 3.3% and 0.6%, globally (UNEP-WCMC & IUCN, 2018a). However, a large proportion of protected areas (8.9% at the global level and 23.5% in the LMMCs) still do not have their governance type reported to the WDPA (Fig. 2E). At the site level, no indicator is currently available to measure or aggregate data on governance quality including equity.

3.3. Changes in the status of Target 11 from 2016 to 2018

Between April 2016 and May 2018, global protected area cover increased from 14.7% to 14.8% for terrestrial areas, and from 10.2% to 16.8% for marine areas under national jurisdiction; coverage increased from 4.1% to 7.3% for the global ocean (UNEP-WCMC, 2016; UNEP-WCMC, 2018b). Within the LMMCs, reported terrestrial coverage decreased in five countries and increased in seven, falling from 19.0% to 18.4% across all LMMCs. Marine coverage increased in 10 countries, showing a three-fold increase across all LMMCs, from 2.9% to 9.5%. The number of ecoregions reaching the 17% and 10% conservation targets increased from 351 to 359 for terrestrial and from 84 to 101 for marine ecoregions globally (EC-JRC, 2018). The LMMCs contributed to the increased protected area coverage of four of these marine ecoregions; however, there was a net decrease in the number of terrestrial ecoregions reaching the 17% target in the LMMCs. Global MTA for this

element saw similar changes, increasing from 54.6% to 60.5% for marine ecoregions, and from 65.7% to 66.6% for terrestrial ecoregions.

Connectivity has only been evaluated for 2016 using the ProtConn indicator, so no changes can be assessed. However, looking at the longer-term trends as assessed using the Protected Area Connectedness Index, there was almost no change between 2000 and 2012 (CSIRO, 2018). Between 2012 and now, there have only been limited increases in terrestrial protected area cover, so changes in connectivity are expected to be minimal.

Mean percentage area of marine KBAs covered by protected areas showed a slight increase from 44.1% to 44.3% globally, while there was almost no change for terrestrial KBAs (BirdLife International, UNEP-WCMC & IUCN, 2018). Within the LMMCs, two countries (Madagascar and Democratic Republic of Congo) showed a small increase in protected area coverage of terrestrial KBAs, and one country (Madagascar) showed an increase in coverage of marine KBAs.

During this period, there was some improvement in the reporting of completed PAME assessments, as recorded in the GD-PAME, both within the LMMCs and globally (Coad et al., 2015; UNEP-WCMC, 2018a).

At the global level, the proportion of sites under shared governance increased from 1.8% to 3.3%, while the proportion of sites under IPLC governance showed no significant change, remaining at 0.6%. In the LMMCs, over the same period, there was an increase in the proportion of sites governed by IPLCs and no change in the proportion of sites with shared governance. There was no noticeable change in the proportion of sites without governance type reported.

3.4. Analysis of LMMCs' national biodiversity commitments

In total, 741 commitments were extracted from different sources, with the largest portion of commitments derived from GEF-5 and GEF-6 projects (n = 347), followed by NBSAPs (n = 261) and national priority actions—including responses to the workshop questionnaire and information on status, gaps and opportunities (n = 133). The number of commitments per country varied from 16 in Democratic Republic of Congo to 75 in China (Fig. 3). Neither Bolivia nor Kenya had submitted revised NBSAPs as of November 2018. However, all LMMCs had protected areas projects under GEF-5 or GEF-6.

Based on the analysis of national biodiversity commitments, the likelihood of implementation for 25% of these commitments in the LMMCs is strong (score of 3), reflecting the presence of lists of actions with detailed plans for their implementation. For commitments pooled across all LMMCs, significant differences ($\chi^2 = 65.6$, $p < 0.001$, $df = 6$) were found between commitment scores for the seven qualitative elements of Target 11 (Fig. 4A), though the effect was small ($\epsilon^2 = 0.068$). A post-hoc test showed that commitment scores for effective management, equitable management, and integration were

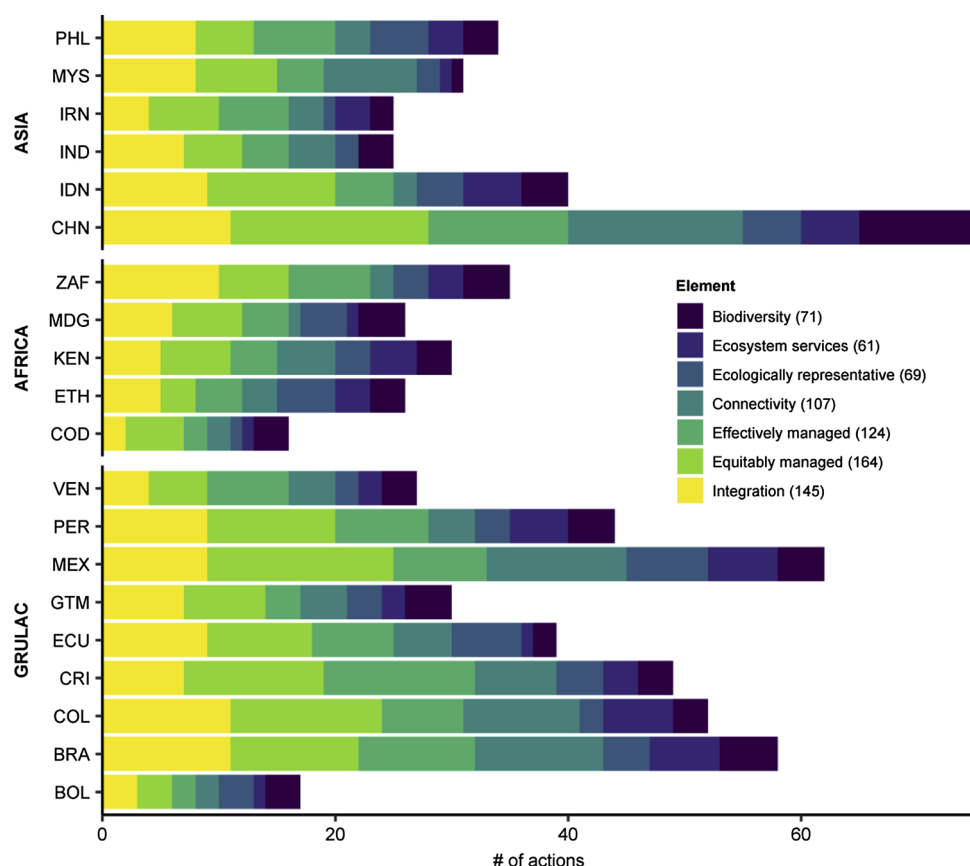


Fig. 3. Number of commitments for each qualitative element of Target 11, by country. The total number of commitments for each element is shown in brackets.

significantly higher than those for the remaining elements (Fig. 4A). Significant differences ($\chi^2 = 149.5$, $p < 0.001$, $df = 2$) were also found between commitment scores from the three different sources, and the effect was relatively strong ($\epsilon^2 = 0.229$). Actions from GEF projects received higher scores than those from either NBSAPs or national priority actions (Fig. 4B).

3.5. Potential contribution of LMMCs' commitments for elements of Target 11

If LMMCs' national biodiversity commitments are implemented as proposed, marine protected area coverage will increase in 12 countries (Fig. 5A), adding 192,214 km², and terrestrial protected area coverage will increase in 15 countries (Fig. 5B) adding 1,106,418 km². This would increase coverage across all LMMCs to 10.2% for marine

(Mdn = 3.8%) and to 21.3% for terrestrial protected areas (Mdn = 18.1%). Of these commitments, 227,230 km² in terrestrial and 144,475 km² in marine protected areas show the highest likelihood of implementation (Fig. 5).

For the qualitative elements of Target 11, if actions are completed as proposed, progress may be most noticeable for integration and equitable management, followed by management effectiveness (Fig. 6), when assessed against the gaps outlined in Table 3 for which indicators or proxies are available. A larger number of countries had multiple clear action plans that directly addressed some aspect of the proposed gaps for the element (country-score of 4) for both the elements of integration (7 countries) and equitable management (8 countries). The remaining elements had fewer countries providing multiple clearly-defined action plans: connectivity and effective management (3 countries), ecological representation and areas important for ecosystem

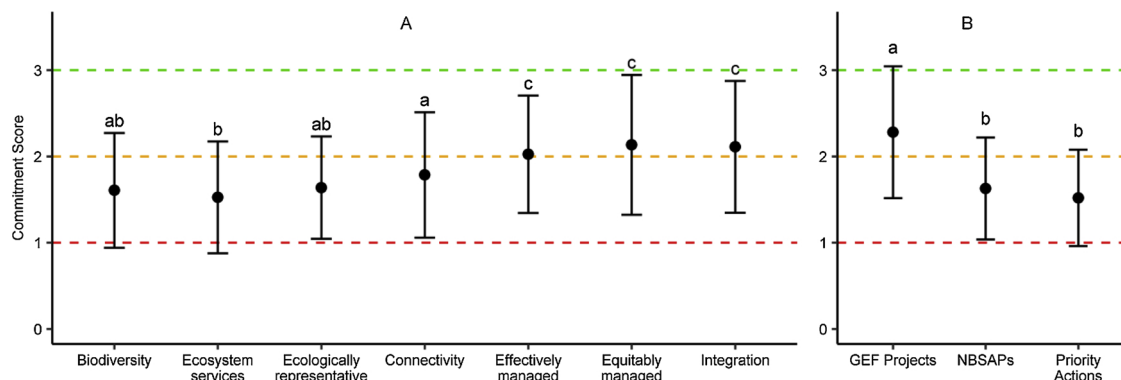


Fig. 4. Commitment scores (mean \pm SD) based on their likelihood of implementation by 2020, compared by element (A) and by commitment source (B). Letters "a", "b" and "c" represent statistically significant differences in scores, at a 95% confidence level.

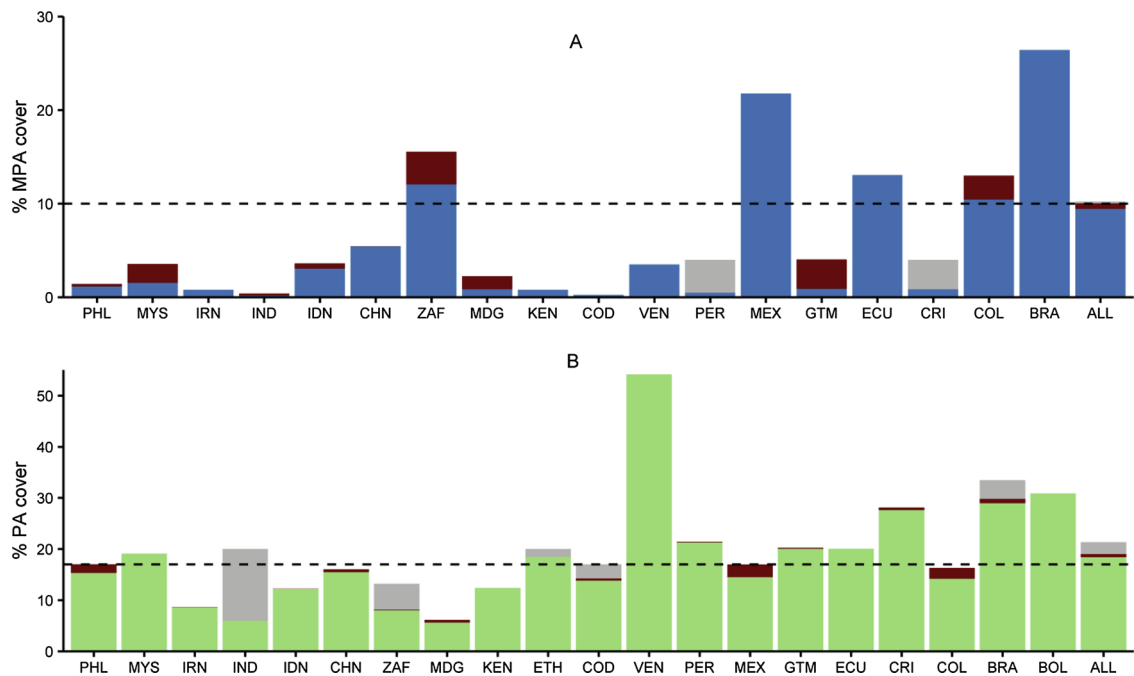


Fig. 5. Increase in protected area coverage by 2020 if all commitments are implemented as proposed, for coastal and marine areas (A) and terrestrial and inland waters (B). Dashed lines show the global target. Commitments shown in dark red have the highest likelihood of implementation; the remaining commitments are shown in light grey.

services (1 country), and areas important for biodiversity (0 countries). For equitable management, where there were several gaps that could be addressed (Table 3), commitments from the LMMCs primarily related to improving governance diversity (mostly increasing co-management) and mechanisms for equitable benefit sharing. Fewer actions addressed social, governance, or equity assessments ($n = 5$), mitigating negative impacts ($n = 3$) or reporting governance types ($n = 1$).

4. Discussion

4.1. Progress on the quantitative elements of Target 11

Recent progress in Target 11, in the LMMCs and globally, is most noticeable through the improvement in protected area coverage of marine environments. The LMMCs contributed just over one-sixth of the more than 9 million km^2 of new marine protected areas added in national waters over the last two years. For example, both Mexico and

Brazil established large marine protected area networks, now protecting more than 20% of their national waters. The LMMCs also contributed to improved coverage in at least 13 marine ecoregions, with four of these now surpassing the 10% marine conservation target (EC-JRC, 2018). If all commitments are implemented as proposed, they will increase marine protected area coverage by over 190,000 km^2 , which is 0.8% of the marine territory in the LMMCs, 0.14% of global marine area under national jurisdiction, and 0.05% of the global ocean. A majority of this area (144,475 km^2) has a high likelihood of being delivered by 2020.

Despite a net decrease in reported terrestrial protected area coverage in the LMMCs of over 230,000 km^2 , and a net decrease of two terrestrial ecoregions meeting the 17% conservation target, there was still a slight improvement at the global level. The decrease in terrestrial protected area cover resulted from changes in four countries: China, where most national level protected area records were temporarily removed from the WDPA for re-assessment (though they were not de-

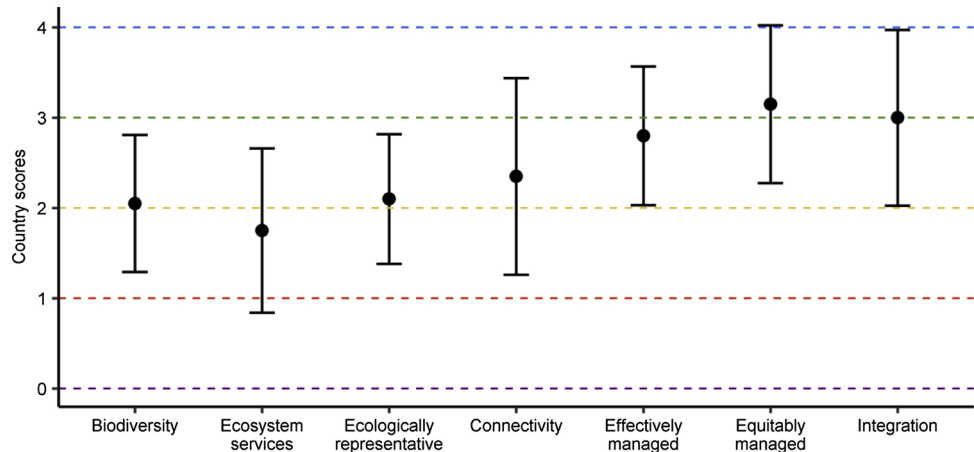


Fig. 6. Country-level scores (mean \pm SD) for the qualitative elements of Target 11. A score of 4 indicates that a country has multiple clear actions that directly address some aspect of the element as outlined in Table 3.

gazetted); South Africa, where a complete update of national-level records saw eight reserves re-classified as UNESCO Biosphere Reserves, which are not included in analyses of global protected area cover; Guatemala, which provided a complete update of their protected area records; and Peru, where 'Zona de Amortiguamiento' (buffer zones for existing protected areas) were removed, as they do not meet the IUCN protected area definition (UNEP-WCMC & IUCN, 2018b). These decreases bring attention to the issue of protected area downgrading, downsizing, and de-gazettement (PADDD), which is often related to increased natural resource access and exploitation (Mascia & Pailler, 2011). The challenge of PADDD further necessitates the need for accurate and timely reporting on protected area cover, both increases and decreases, especially in the remaining year-and-a-half for progress on the Aichi Targets (Lewis et al., 2017). However, there was also increased terrestrial coverage in some individual countries: for instance, the largest terrestrial site added to the WDPA in 2017 was Bassin de la Lufira, in Democratic Republic of Congo, with an area of 43,684 km² (UNEP-WCMC & IUCN, 2017), bringing coverage in that country closer to the 17% target indicated in their NBSAP. Completion of proposed actions in the LMMCs would also increase terrestrial protected area coverage by over 1 million km², which accounts for 2.9% of the terrestrial area of these countries, and 0.8% globally. This represents over a third of the 2.2% that is required to reach the 17% global target. Of this area, 227,230 km² has the highest likelihood of implementation, and would increase global coverage by 0.2%. There are further opportunities for increasing coverage, beyond reliance on increasing protected area cover, discussed in Section 4.

4.2. Analysis of national biodiversity commitments for the qualitative elements

When considering the qualitative elements of Target 11, there was significant variation in the size and scope of the LMMCs' national biodiversity commitments. Scores of individual commitments varied depending on source (Fig. 4B), with commitments from NBSAPs and national priority actions typically phrased as shorter action statements or broader biodiversity strategies, goals, or targets, often without highlighting measures for implementation. These commitments often lacked more detailed plans of actions and on average, received lower scores than commitments derived from GEF projects. In contrast, due to the requirements of the GEF Grant Programme and co-financing, the commitments from GEF-5 and GEF-6 projects were found to be action-oriented, with more detailed work plans, and as a result are more likely to be implemented.

Comparison of mean individual commitment scores between elements for all sources (Fig. 4A) showed higher scores for effective management, equitable management, and integration; likely a result of more extensive action plans or proposals for these elements. Part of the difference in mean commitment scores between elements may also be attributable to a change in focus of GEF funding over the past decade (Global Environment Facility Independent Evaluation Office (GEF IEO), 2016). GEF funding for protected area projects has shifted towards a greater emphasis on integration into landscapes and seascapes and mainstreaming with productive sectors, and away from the establishment of individual protected areas (Global Environment Facility Independent Evaluation Office (GEF IEO), 2016). This may explain some of the higher scores for protected area integration and effective management compared to the representation elements. The lower mean commitment scores for areas of importance for biodiversity and ecosystem services, ecological representation, and connectivity could also be attributed to the fact that few commitments address specific regions, corridors, or mechanisms for connectivity; that ecosystem services are poorly or ambiguously understood (Hummel et al., 2017); the fact that national frameworks for conservation prioritisation may not align with the ecoregions used for reporting at the global level; and the fact that few proposals for new protected areas provide the specific areas (e.g.

KBAs) where they will be implemented. However, it is important to note that using KBAs as an indicator for protection of areas of importance for biodiversity is imperfect, while protection of key biodiversity areas is a good proxy for progress on the Target 11 element; there is no requirement for countries to include KBAs within protected areas (IUCN, 2016b). Integrating the KBA approach with systematic conservation planning may offer insights when prioritizing between sites for appropriate management action (Smith et al., 2018).

For the qualitative elements of Target 11, estimating progress that will occur from implementation of actions in the LMMCs is more difficult. However, the country-level analysis of biodiversity commitments (Fig. 6) indicates that some of the gaps remaining for the qualitative elements of Target 11 may be addressed in the LMMCs. Across the LMMCs, the elements of integration and equitable management consistently received the highest scores, followed by effective management. This suggests that actions in the LMMCs more directly addressed the proposed gaps for these elements. It likely also relates to the fact that integration and equitable management were the elements with the largest number of commitments (Fig. 3). This difference was most noticeable for GEF projects (which showed the highest likelihood of implementation), where these two elements accounted for more than half of all commitments recorded. It should be noted, however, that the scale and ambition of suggested gaps that could be addressed by 2020 (Table 3) varies significantly between elements, which may have impacted these country scores. For instance, the gap for integration is a somewhat general statement, which may be addressed by equally general statements in the national biodiversity commitments. The lower mean country scores for areas important for biodiversity may reflect the ongoing trend of protected areas being located away from areas with high numbers of threatened vertebrate species (Venter et al., 2018).

The gaps outlined in Table 3 may be considered incomplete, and were developed only as a guide for enhancing progress. There are further indicators and gaps associated with each element that are not captured in that list. Table 4 outlines the general themes and types of actions present in the LMMCs' biodiversity commitments; it provides an overview of which gaps were most commonly addressed, and where actions addressed aspects of the element not included in the proposed gaps (SCBD, 2016a).

When comparing the types of actions commonly appearing in LMMCs' biodiversity commitments (Table 4) to the gaps outlined in Table 3, it is clear that the scale and ambition of suggested gaps varies significantly between elements, and does not account for the full range of actions that may be proposed to address progress by 2020. The suggested gaps for most elements are rather broad and may not fully encompass all important aspects of each element. For connectivity, the proposed gap (creating more corridors) was only addressed by a few countries, with most actions focused on enhancing connectivity through sustainable forest management. While improved management is certainly important for enhancing or maintaining connectivity (Botsford et al., 2009; Saura et al., 2018), it is not captured in the gap proposed for addressing this element (SCBD, 2016a). Similarly, for ecological representation and coverage of areas important for biodiversity, while proposed actions will likely have positive impacts for these elements, they generally do not directly address the proposed indicators (Table 4). For ecosystem services, the largest portion of actions addressed carbon sequestration, as this is regularly reported in GEF projects, while fewer actions from NBSAPs or national priority actions addressed this element. There is an overall need for improved mapping and reporting, and the development of coherent and comprehensive indicators for all elements.

Although protected areas can be effective tools for conservation (Barnes et al., 2016; Gray et al., 2016), many are facing increasing threats from human pressures (Jones et al., 2018). Therefore, effective management is needed to ensure protected areas produce positive conservation outcomes. To date, global reporting of progress on the 'effectively managed' element of Target 11 has focused on the

Table 4
Themes and types of actions derived from national biodiversity commitments.

Element of Target 11	Themes and types of actions
Ecologically representative	Most actions addressed sustainable management, with only 11 addressing expanded protected area cover for specific ecoregions (or other categories) and 2 more mentioning expanded coverage 'for all biogeographic zones'. Nine actions address mapping or gap assessments and nine mention general improvements to ecological representation (non-specific).
Areas important for biodiversity	More actions dealt with protection of threatened species or ecosystems (24) and improved management (6) rather than expansion of PAs to cover KBAs. Other actions dealt with identifying or updating KBAs.
Areas important for ecosystem services	Most actions dealt with carbon sequestration; 8 actions related to water or wetland services and 5 related to identifying or mapping ecosystem services. Other actions (12) addressed ecosystem service valuation.
Well-connected	Most actions dealt with sustainable management of areas between protected areas (especially forests) to enhance connectivity. Only 9 addressed new corridors, 7 addressed creating new protected areas to enhance connectivity, and 3 addressed transboundary protected areas.
Effective management	More than 20 actions addressed management plans, and over 20 addressed monitoring or surveys; 13 actions addressed protected area financing, 13 addressed management capacity and 10 indicated general improvements for management effectiveness (ME). Fewer actions directly addressed ME evaluations or increasing PAME scores.
Equitable management	The highest proportion of actions addressed procedural equity, especially in relation to participation. At least 20 actions addressed benefits, and 18 actions addressed components of recognition. 24 aimed to improve governance diversity, 5 addressed social, governance or equity assessments and only 1 directly addressed reporting of governance types.
Integrated into the wider land-and-seascapes	Many actions dealt with sustainable management in specific sectors (e.g. agriculture, forestry or fisheries) and sustainable livelihoods, both within and beyond protected areas. Ten actions dealt specifically with sustainable management in protected area buffer zones.

completion of management effectiveness assessments (Gannon et al., 2017; UNEP-WCMC & IUCN, 2016). Reporting of completed PAME assessments is one aspect that is higher in the LMMCs than the global average. However, data from PAME evaluations, on its own, is unlikely to provide adequate information to assess the performance of protected areas (Coad et al., 2015). Additionally, the GD-PAME, as it currently stands, only presents information on the year of assessment and the assessment methodology, without data on the results of the evaluations. In the LMMCs, a significant proportion of actions for management effectiveness focused on management plans, monitoring and surveys, with fewer actions focusing on sustainable financing or management capacity (Table 4). This is concerning given the fact that funding and capacity are considered some of the most critical factors associated with positive conservation outcomes in protected areas (Geldmann et al., 2018; Gill et al., 2017). There is a need for more information on conservation outcomes in protected areas, and a better understanding of their relation to specific management inputs (Geldmann et al., 2018); aspects which should receive greater focus in a post-2020 biodiversity framework. There is also a need for a simple set of indicators that can be used to properly report on management effectiveness (Coad et al., 2019).

For equitable management, the identified gap is multi-part, with some components more easily addressed. The gaps most commonly addressed in LMMCs' commitments included the improvement of governance diversity (primarily with increased co-management), followed by actions addressing distributional equity and components of recognition, mostly with respect to traditional knowledge (Table 4). However, the largest number of actions addressed procedural equity (almost all with respect to participation), although this was not included as a gap in Table 3. Both participation (an aspect of procedural equity) and benefit-sharing (an aspect of distributional equity) are regular components of GEF projects, accounting for their frequent appearance within actions of the LMMCs. Progress on the 'equitably managed' element of Target 11 will require improvements in the diversity, quality, effectiveness, and equity of protected area governance. Although the reported diversity of protected area governance types has been increasing, this reveals little about governance quality, effectiveness, or equity. Methodologies to assess effective and good governance (including equity) at site level have been developed and tested in several countries (Borrini-Feyerabend et al., 2013; Franks & Booker, 2018). Going forward, more systematic application of governance and social assessments at the site and system level would enhance progress on this element. Additionally, following the equity framework developed by Schreckenberg, Franks, Martin, and Lang (2016)), a set of 10 indicators

covering the different dimensions of equity has been proposed, which could provide a means to report on this element of Target 11 (Zafra-Calvo et al., 2017). In 2019, the first global assessment was undertaken (Zafra-Calvo et al., 2019). Results showed that the aspect of social equity with the highest score was benefit sharing, where ~80% of respondents said that protected areas had at least a weak contribution (Zafra-Calvo et al., 2019). The aspects of social equity with the lowest scores (where a majority of respondents perceived that protected areas did not contribute) were: effective participation in decision-making; recognition of the rights and diversity of local people (statutory and customary rights); access to justice; and transparency (Zafra-Calvo et al., 2019). Actions in the LMMCs may begin to address some of these lagging aspects of social equity, though increased action is needed. The recently adopted voluntary guidance on governance and equity in protected areas also provides a range of suggested steps that could be implemented to support 'equitable management' (CBD, 2018a). The IUCN Green List of Protected and Conserved Areas is one initiative aimed at recognising sites that are effectively and equitably managed and deliver positive conservation outcomes (IUCN & WCPA, 2016), and Parties have been invited to promote the IUCN Green List as a voluntary standard (CBD, 2016b).

4.3. Other opportunities

Further enhancement of the elements of Target 11 may come from the inclusion of other effective area-based conservation measures (OECMs; Dudley et al., 2018). A definition of OECMs and criteria for their identification was recently adopted (CBD, 2018a), and it is now up to Parties to begin mapping and reporting these sites. This will allow for their inclusion in the WDPA and their consequence for elements of Target 11 to be assessed. This additional area will have a positive impact on both quantitative and qualitative elements of Target 11.

Additionally, privately protected areas, and territories and areas conserved by indigenous peoples and local communities (ICCAs), could both provide further opportunities for increasing progress in Target 11, as both are generally under-reported in the WDPA (Bingham et al., 2019). As noted by Corrigan et al. (2018), IPLC-governed protected areas are an important complement to other protected areas, and offer important benefits for an effective, representative, and equitable global protected area estate. Of the 38 million km² of land managed by or under the tenure rights of indigenous peoples globally, approximately one-third (10.6 million km²) is located in the LMMCs (Garnett et al., 2018). Globally, indigenous lands account for 37% of all remaining natural lands (based on Human Footprint data), and a higher

proportion (67%) of indigenous lands can be classified as natural, compared with lands under other forms of tenure (44%) (Garnett et al., 2018). Using this information, at least 2 million km² of the unprotected indigenous lands in the LMMCs can be estimated to have a low human footprint, some of which may contribute to Target 11, although the specific extent has yet to be determined.

The integration of indigenous lands into protected and conserved areas frameworks, may offer an important opportunity to increase recognition and support for ICCAs (Jonas et al., 2017), however the scale-up of incorporation of OECMs and ICCAs into national reporting on progress towards Target 11 warrants the employment of necessary safeguards relating to the rights of IPLCs. OECMs may be a more appropriate designation to recognise the conservation being carried out by IPLCs, however indigenous lands should not be considered *de facto* protected areas or OECMs. With the potential of indigenous lands to complement and enhance existing protected and conserved area networks and strategies (Garnett et al., 2018), full participation of IPLCs must be ensured. There must be free, prior, and informed consent, including for the establishment, governance, planning, monitoring and reporting of protected and conserved areas on IPLCs' traditional territories (lands and waters); appropriate recognition afforded to collective rights, especially pertaining to land tenure; respect for their self-determination, local and cultural institutions, and traditional knowledge; and support to their efforts to develop and maintain sustainable livelihoods. Respect and recognition of IPLC lands and waters within existing protected areas is also required (Stevens et al., 2016). Some of these safeguards are reflected in the criteria for identification of OECMs (CBD, 2018a).

4.4. Gaps remaining, broader implications, and next steps

There are still commitment gaps remaining that will need to be addressed for elements of Target 11 with lower commitment scores and country scores (connectivity, ecological representation, areas important for biodiversity, and ecosystem services). All three are related to the spatial arrangement of protected and conserved areas. As such, commitments to add or expand protected areas, support and recognise ICCAs, and report on OECMs and privately protected areas may all have positive impacts for these elements. The next step will be to map these new additions with respect to KBAs, ecological regions and connectivity, in order to better understand their impact. Work is underway to obtain spatial data for these new sites to assess their implications for these elements. Spatial conservation prioritisation can help to ensure the effective placement of new protected areas (Moilanen, Wilson, & Possingham, 2009). Despite some differences in data and methodology, systematic conservation planning and the KBA approach both offer important benefits for conservation policy (Smith et al., 2019).

Indicators are still lacking for several elements of Target 11, notably integration, and the coverage of areas important for ecosystem services (CBD, 2016). Voluntary guidance has been developed to address the integration of protected areas and OECMs into wider landscapes and seascapes and mainstreaming across sectors (CBD, 2018a). The guidelines provide a range of suggested steps for the integration of protected areas into wider landscapes and seascapes and mainstreaming across sectors, though indicators for tracking progress on this element will still need to be developed. One example could be examining socio-economic indicators of the population within or neighbouring protected areas. Sites effectively integrated into the surrounding landscape and/or seascape should promote positive socio-economic impacts, or at least be neutral. A recent study analysed socio-economic conditions and aspects of human well-being for households surrounding protected areas, finding no evidence for a likelihood of negative impacts (Naidoo et al., 2019). Ecological spillover effects could also be analysed, examining "leakage" and "blockage" effects of protected areas on non-target, neighbouring areas (Fuller, Onidei, Brook, & Buettel, 2019). Several studies have attempted to map ecosystem services globally, often

focusing on those services which can be assessed using remotely sensed data, for instance carbon and water (de Araujo Barbosa, Atkinson, & Dearing, 2015; Naidoo et al., 2008). Despite remaining data gaps, a range of indicators which could support national-level evaluations have been proposed for different ecosystems (Maes et al., 2016).

The commitments and opportunities from LMMCs have significant potential to not only enhance progress in Target 11, but also to contribute to other Aichi Biodiversity Targets and the stated requirements of multilateral environmental agreements. To understand these contributions, an ongoing analysis is investigating links between the national biodiversity commitments of LMMCs and obligations under six major multilateral environmental agreements and other Aichi Biodiversity Targets. Initial findings indicate contributions and co-benefits of the implementation of Target 11 commitments for the countries' other international obligations, implying the existence of important linkages that can help simplify implementation, data gathering, monitoring, and reporting. Identification of synergies may also generate information that will be relevant to leverage support for conservation investment and to make more efficient use of available funding sources (Smith et al., 2019). Progress on implementation of actions on Target 11 will also have implications for several targets of the Sustainable Development Goals (SDGs), such as targets 14.5 and 15.1 which directly relate to protected area coverage, as well as several other SDG targets (e.g. 6.6, 13.1 or 15.4). Opportunities could also be explored with respect to regional fisheries management organizations (RFMOs), which generally include area-based strategies for protecting fisheries resources. Some area-based fishery management measures may produce potential co-benefits to biodiversity, some of which may qualify as OECMs, and offer opportunities for advancing sustainable management of marine resources, which could arise from strengthening links between these organizations and conservation actors. This could build on past efforts under the CBD to include the regional fisheries bodies in the Ecologically or Biologically Significant Marine Areas (EBSAs) process and in the Sustainable Ocean Initiative dialogue conferences, which engaged all regional fisheries bodies and all regional seas conventions.

Discussions regarding the potential nature of a follow-up to the Aichi Targets have already started (e.g. SCBD, 2018), and a decision regarding the process for preparing a post-2020 global biodiversity framework was recently adopted (CBD, 2018b). Various suggestions for features of a post-2020 target for area-based conservation have also been proposed. Some of these include protecting all remaining intact wilderness (Watson et al., 2018), focusing specific retention targets on the minimum area needed to achieve particular goals like carbon storage or watershed protection (Maron, Simmonds, & Watson, 2018), or shifting the focus of future targets to protected area quality (Barnes, Glew, Wyborn, & Craigie, 2018; Coad et al., 2019). This shift in focus towards measurable conservation outcomes is important as there is concern that increased growth in protected area cover has not been matched by increased management budgets (Adams, Iacona, & Possingham, 2019; Coad et al., 2019). In some cases, depending on the starting state of the landscape and the dominant threats facing biodiversity, improved management would be recommended before protected area expansion (Adams et al., 2019). Similar results were found by Kuempel, Adams, Possingham, and Bode (2018) for the marine realm, where on average, conservation outcomes were improved by a focus on enforcement rather than expansion of MPAs. As the window of opportunity to designate additional protected areas is closing fast, with human population growth and ecosystem degradation, targeted expansion of protected areas is still needed. However, these additions need to focus on areas important for biodiversity, as well as increasing ecological representation and connectivity. In many cases, a combination of expansion and enforcement is likely optimal for ensuring conservation (Kuempel et al., 2018).

Regardless of the specific nature of the post-2020 biodiversity framework, significant progress in Target 11 could provide

encouragement for setting more ambitious goals for the future. Assessment and implementation of national biodiversity commitments, along with the additions from OECMs, ICCAs and privately protected areas will continue over the next 18 months. This, along with their monitoring and reporting, in line with COP decision XIII/2 paragraph 9(d), may help develop baselines and best practices for the post-2020 framework (CBD, 2016b). This is being supported by the Global Partnership on Aichi Target 11, launched in November 2018, with the aim to facilitate the implementation of proposed actions and commitments in all sub-regions. This is also in alignment with Sustainable Development Goal 17, which advocates for strengthening and revitalizing global partnerships for sustainable development.

5. Conclusions

The LMMCs contain a wealth of biological and cultural diversity, and their contribution to progress in Target 11 is noteworthy. However, the Aichi Biodiversity Targets are global in nature and their achievement will require efforts and commitments from all countries. The national biodiversity commitments in the LMMCs, if implemented as proposed, will increase terrestrial and marine protected area coverage, while enhancing the status of other elements of Target 11. Many of the national biodiversity commitments submitted by the LMMCs for both quantitative and qualitative elements of Target 11 showed a strong likelihood of implementation. Based on a country-level analysis of all commitments, the elements which may show the most progress within the LMMCs are integration and equitable management, owing to their prevalence within GEF-funded projects. Additional opportunities to further progress in the LMMCs could come through the recognition and support of ICCAs, increased reporting on privately protected areas, and the systematic collection of information on OECMs. There are also at least 2 million km² of indigenous lands outside of current protected areas networks with a low human footprint in the LMMCs; some of these areas may contribute to Target 11, although the specific extent has yet to be determined. Furthermore, national biodiversity commitments for the elements of Target 11 may provide benefits and co-benefits for other Aichi Targets, targets of the SDGs, and the obligations of other multilateral environmental agreements.

Going forward, the continued facilitation and support of partnerships such as the LMMCs is critical, and collaboration from all actors will be necessary in order to reverse or halt the decline of biodiversity and avert the biodiversity crisis. Addressing this crisis requires identification of appropriate actions, tangible implementation strategies and resources including: national and regional-level commitments, sustainable funding, human and technical capacity, coordination among multiple agencies and sectors, cooperation among key stakeholders, and communication at all levels. Together, the LMMCs have made considerable efforts to enhance progress in Target 11, and serve as an example for collaboration, willingness, and engagement at the national and regional level. The LMMCs will support global efforts towards the 2050 Vision for Biodiversity, conserving, valuing, and restoring biodiversity, maintaining ecosystem functions and delivering essential benefits to ensure humanity's ability to live in harmony with nature.

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