Review comments on the draft monitoring framework for the post-2020 global biodiversity framework				
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Comments				
Table	**Page**	**Colum n letter**	**Row number**	**Comment**
0	0	0	0	We support the need to select appropriate, fit-for-purpose indicators but also want to highlight that successful implementation will also rely on robust **biodiversity information** that underpins credible indicators that accurately inform progress towards goals and targets.
0	0	0	0	While the identification of global indicators is key to cross-comparable measures on targets and goals to monitor national and global performance on biodiversity frameworks, it is also critical to identify the mechanisms and to build capacity for the development of indicators that can be self-computed by the Parties to track and inform the national progress towards the biodiversity framework. To ensure globally comparable indicators that the nations take ownership of and that they can trust to use in their planning and reporting, a two way exchange between global institutes (e.g. UNSD, UN SEEA, GEO BON) and the Parties (e.g. government agencies, observation networks, scientific communities) will be essential to establish. This can be supported by the existing CBD mechanisms such as the NBSAP Forum, the BIP Dashboard and the UN Biodiversity Lab . Utilizing indicators derived from Essential Biodiversity Variables (EBVs) will facilitate this exchange through the provisioning of indicators derived, in part, from national data sources while allowing standard methodology for global aggregation. Indicators at national scales utilizing national data are best positioned to inform effective conservation policy actions.
0	0	0	0	We will need the capacity to integrate across the different components of the 2050 goals to be able to inform on trends overall within a goal. This will be mostly critical for helping Parties to **prioritize** synergistic actions to best achieve goals, rather than simply reporting progress, but it is also important for the effective implementation of the framework nonetheless.

0	0	0	0	We note an issue of consistency among the components of Goal A (species, genes and ecosystems): only genetic diversity does not have a 2030 milestone. There should be a genetic milestone as with species and ecosystems. While it is not known how much genetic diversity is needed, for how many species, to avoid large losses to society and nature, a threshold proposed by agricultural geneticists has been to conserve 95% of genetic diversity within species. If 95% of genetic diversity within "all species" is not feasible, this could be changed to "all species, or as many as possible, with a minimum of 90% of species." The following should be achievable: Maintaining [95%] of genetic diversity and halting any further loss, within at least [90%] of species by 2030, with a goal by 2050 of developing and initiating strategies that achieve conditions that prevent any future loss of genetic diversity for all species (see Hoban et al 2020 https://doi.org/10.1016/j.biocon.2020.108654). We provide more detailed comments on potential monitoring elements and indicators below in the table.
0	0	0	0	A significant improvement of this framework is the acknowledgement of the critical role of biodiversity related information for the implementation and monitoring of the framework within Target 19.1. Nonetheless, we suggest that indicators reflecting the degree to which biodiversity (i.e. genes, species and ecosystems) is being monitored should be added for both goals and targets. For instance, we suggest that "Number of species and populations in which genetic diversity is being monitored using DNA based methods" would be a relevant indicator for both Goal A5 and Target 19.1.
0	0	0	0	In the current version of the framework, components and elements of targets capture the actions required to achieve desirable conservation status of nature, to reduce threats, and to meet people's needs. The Essential Biodiversity Variables (UNEP/CBD/SBSTTA/17/INF/7) can serve to measure the progress on goals as they measure the state and benefits of nature in multiple dimensions. The EBVs can then be combined with ancillary information (e.g. areas and methods of sustainable management practice) to derive indicators that can inform the progress on targets if consistent temporal and spatial data is available across datasets.
0	0	0	0	A suite of Essential Biodiversity Variables (EBVs) and Essential Ecosystem Services Variables (EESVs) have future projections into 2050 based on the IPCC's Shared Socio-economic Pathways (SSP) and Representative Concentration Pathway (RCP) scenarios from Biodiversity and Ecosystem Services Scenarios-based Model Intercomparison (BES-SIM) (Kim et al. 2018, https://doi.org/10.5194/gmd-11-4537-2018 ; Pereira, H. et al. 2020, https://doi.org/10.1101/2020.04.14.031716). There is an ongoing development of biodiversity-centered, multiscale and participatory scenarios and modelling framework by IPBES named "Nature Futures Framework (NFF)", which envisages to address the lack of biodiversity and sustainability policies in scenarios and help identify multiple alternative pathways (policy and management options) into sustainable futures (Rosa et al.

				2017, https://doi.org/10.1038/s41559-017-0273-9; Pereira, L. et al. 2020, https://doi.org/10.1002/pan3.10146 - scheduled 17 Sept). The observation-based EBVs and EESVs can provide scientific ground for evidence-based and spatially explicit future planning for conservation which could further inform the CBD and its Parties on the key levers for change and potential milestones for future goals and targets through.
0	0	0	0	The selection criteria for the indicators (e.g. published methodology, cross-scalability, reproducibility, traceability, commitment for sustained production) and processes (e.g. collation of indicators, selection of criteria and evaluators, evaluation) should be transparent and engaging until their eventual adoption in the post-2020 global biodiversity framework at COP15. The indicators gaps should be informed widely to scientific communities around the globe to maximize their engagement and contributions to maximize conservation effectiveness and impact. Indicator selection, particularly for Headline Indicators, should be a balanced and inclusive process by which global and national indicator experts are brought together in order to ensure a credible selection process that ensures a high degree of buy-in for the selected indicators and the selection of truly scalable indicators allowing for consistent national to global target tracking.
0	0	0	0	Given that many impacts on biodiversity are driven by global trade, whereby developed countries consumption patterns export their impacts to developing and often highly biodiverse regions, targets and indicators that address and monitor the impacts of global trade on biodiversity loss would be important in order to ensure appropriate and effective action that mitigates demand driven biodiversity loss (e.g. Marques et al., 2018, https://dx.doi.org/10.1038/s41559-019-0824-3).
1	2	A-D	1-14	The ecosystem area part of Goal A (and its components and monitoring elements), A1 and A2, poses two fundamental challenges to monitoring: 1) It assumes that all natural ecosystem types can increase simultaneously, which, however, is mathematically impossible in a finite world. The majority of all transitions between ecosystem types does not happen between natural and artificial ecosystems (e.g. cropland. urban), but between different types of (semi)natural ecosystems (Remelgado & Meyer, in prep.). Thus, if one natural ecosystem type gains regionally, one or more other types must lose. 2) It is currently not reflected that ecosystem distributions are naturally highly dynamic, as they not only respond to anthropogenic pressures but also to natural climate oscillations and other Earth-system processes (ISBN 978-1-4419-9504-9). Thus, ecosystem targets/indicators relying on any static baseline of "desirable ecosystem distributions" are problematic, as no baseline that is sufficiently narrow to be practical should be expected to be "naturally stable" even over periods of just a few decades. Moreover, this means that many ecosystem types are increasing anyway due to various processes that are not clearly anthropogenic, meaning that countries might easily achieve

				increases in areas of different ecosystem types without any biodiversity-promoting policies. In fact, regional ecosystem areas are not declining *on average* over the past 3 decades but instead include regional winners and losers (Remelgado & Meyer, in prep.). More clarity is thus needed on which specific ecosystems ought to increase and where. This might be guided, for example, by their importance for specific biodiversity features (e.g. rarity- weighted number of species dependent on each ecosystem type), by their global/regional threat status, or by relative national stewardship of countries for particular ecosystem types, but it should ideally not be guided by any static, historical baselines. In general, differentiated areal goals, targets and indicators are desirable, that address both: *i)* the regionally/globally threatened status of specific ecosystem types (exemplary target: "X% increase in regionally/globally threatened ecosystem types"), and *ii)* the inherent spatiotemporal dynamics of most ecosystem distributions (exemplary target: "X% of land is managed in a way that it allows for changes between/distributional shifts of (semi)natural ecosystem types"). Availability of global annual data time-series (since 1992) for scalable indicators is given for 59 ecosystem types corresponding to IUCN species habitat classes (Remelgado & Meyer, in prep.). Specific indicators are still in conceptual development phase.
1	2-3	A-B	1-28	More clarity is needed regarding the level of classification intended for defining "natural ecosystems". For instance achieving a net increase across very broadly defined ecosystems (e.g. "forest", "grassland" etc) is not necessarily a good outcome for biodiversity if it is achieved by biasing actions away from specific ecosystem types and communities most in need of attention. For example, a net increase in the area, integrity and connectivity of "forest" could be achieved through gains in more extensive, less-threatened forest types, outweighing (and therefore masking) simultaneous losses in highly depleted/threatened types, with perverse consequences for species-level biodiversity. The Biodiversity Habitat Index (Table 3, row 19) is available for all terrestrial ecosystems, including forests.
1	2-3	A-B	1-28	It is not necessary that area, connectivity and integrity all need to achieve the same % increase. The goal could also be met by addressing one of the elements, for instance greatly increasing the integrity without increasing the area.
1	2-3	B-C	15	For the fragmentation part of this Goal (and especially in the selection/design of indicators), it is crucial to distinguish between likely natural and likely human-caused fragmentation as targets and indicators should specifically focus on the latter (as, e.g., in fragmentation of forests by cropland). Availability of global annual data time-series (since 1992) for scalable indicators of ecosystem fragmentation that is confidently human-caused (i.e., by agriculture or built infrastructure) is given for 59 ecosystem types corresponding to IUCN species habitat classes (Remelgado & Meyer, in prep). Specific indicators still in conceptual development phase.

1	2	B	15	Tree Cover Loss (listed in row #2) would also be a relevant source for calculating fragmentation and quality.
1	3	B	29-35	It is needed to clarify that "reducing the number of species that are threatened [...]" means the net number of threatened species resulting from both removal of existing species from, and addition of new species to, the total list of threatened species.
1	2-4	A	1-49	A very significant and laudable aspect of Goal A is the strong link made between the state (area, connectivity, integrity) of ecosystems, and the state of biodiversity at species and genetic levels. This focus is, however, largely lost when the goal is split into individual components – i.e. there is no explicit connection made between the components, and associated indicators, dealing with ecosystems (A1 and A2) and those dealing with species and genetic diversity (A3 and A4). An opportunity exists to rectify this shortcoming through either adding an integrative component to the goal (i.e. A7), or extending the current component A3, to address the connection between outcomes for ecosystems and species. This would then need to be supported by the application, and further development, of indicators expressly designed to estimate expected levels of species extinctions as an explicit function of change in the area, connectivity and integrity of ecosystems. One option for achieving this is the flexible framework of habitat-based biodiversity indicators developed over recent years by CSIRO, of which the Biodiversity Habitat Index (Table 3 row 19) is a specific manifestation. By linking best-available information on ecosystem condition or intactness, and spatial variation in species composition, with habitat-connectivity and species-area relationship (SAR) analysis, this general approach effectively integrates multiple components of ecosystem state (area, connectivity, integrity, compositional variation etc) into a single high-level indicator expressed in units of proportional species persistence (or conversely extinction) – see, for example, Di Marco et al 2019 (https://doi.org/10.1111/gcb.14663). Such an indicator can also provide a more effective foundation for prioritizing actions to protect or restore ecosystems – i.e. by integrating the expected contributions that any change in ecosystem area, connectivity and integrity, resulting from a proposed action, are expected to make to enhancing species persistence. It should be noted that, while the Biodiversity Habitat Index currently employs one particular ecosystem-condition dataset (derived from downscaled global land-use) CSIRO's overall analytical framework can potentially be applied to any other source of data on ecosystem condition, intactness or integrity. See, for example, Mokany et al 2020 (https://doi.org/10.1073/pnas.1918373117) for a recent global application of this same framework employing the Human Footprint dataset.
1	2-4	A	1-49	The diversity and health of communities could be considered in Goal A as an additional Component. Several indicators are already available that can inform on changes in local species richness, functional diversity, or mean species abundance for

				instance. Those indicators are listed in the review table of indicators.
1	2	B	1-14	For the marine realm we suggest the addition of "trends in the surface area and plankton composition of productive surface ocean regions". A baseline map of the location and extent of different habitats of the deep ocean has been established and trends are available in areas of high resource use or of potential exploitation. Two indicators are suggested for this monitoring element in the second review table ("Seascapes ecosystem distributions" and "Phytoplankton functional types and size distribution").
1	2	B	14	The monitoring elements for freshwater ecosystems is lacking, and it is recommended to add "Trends in area of freshwater ecosystems".
1	2	B	1-14	A further monitoring element could address the extent to which national increases in natural ecosystem areas depend on decreases in other countries (mediated through international trade). Many countries that historically underwent periods of reduction of natural ecosystem areas later undergo periods of partial recovery, which, however, does not necessarily reflects net reductions in their national biodiversity impacts if commodity imports from other countries simultaneously increase (doi.org/10.1146/annurev-environ-090710-143732; i.e., countries may buy their restoration potential by effectively outsourcing biodiversity impacts of their consumption to other countries). Such an additional monitoring element might track the net changes in global natural ecosystem areas for which countries are responsible. Appropriate indicators will become feasible in the next few years, based on global gridded time-series of ecosystem extents, commodity-specific production areas (www.luckinet.org) and established environmental accounting tools (e.g., DOI: 10.1021/acs.est.9b03554)
1	2	A, B	15, 16	Goal A is "The area, connectivity and integrity of **natural ecosystems** increased by at Least...". Thus, the expression of A2 should be "**Natural Ecosystem** integrity and connectivity (terrestrial, freshwater and marine ecosystems)."
1	4	C	36	The monitoring element "trends in (genetic) diversity of wild species" in the draft document is currently blank. "Wild species" encompass between 90 and 99% of all species- this is a huge biodiversity monitoring gap. We propose that the CBD incorporates three recently proposed indicators in development, for which data is available. These three indicators should be good proxies for the genetic diversity within wild species. They are based on well-developed population genetic theory, have a sound methodology, and are in published journal articles (Hoban et al 2020, https://doi.org/10.1016/j.biocon.2020.108654 and Laikre et al 2020, https://doi.org/10.1126/science.abb2748).

				They are all under active development by the GEO BON Genetic Composition Working Group in partnership with IUCN CGSG, GBIKE, and the SCB Conservation Genetics Working Group. They are usable, understandable, and connected to management actions, and we expect detailed methodology and datasets available in the second half of 2021. They should be able to be updated annually and to be disaggregated to country level. These three indicators cover three areas: preventing genetic erosion, maintaining genetic diversity including adaptations, and increasing knowledge of genetic diversity within wild species. Those three indicators are detailed below as well as in the review table specifically dedicated to indicators.
1	4	C	36	Suggested indicator for trends in (genetic) diversity of wild species: "Number of populations within species with effective population size (Ne) above 500 versus those with Ne below 500" or "Number of genetically resilient populations" (shorter version). This proposed indicator "determines rates of inbreeding, loss of genetic variation, and loss of adaptive potential." This is based on well-established and well regarded theoretical framework and research (see Hoban et al., 2020, https://doi.org/10.1016/j.biocon.2020.108654). Effective population sizes smaller than 500 will result in genetic erosion and reduced ability to adapt to environmental change (Jamieson and Allendorf, 2012, https://doi.org/10.1016/j.tree.2012.07.001), which is particularly important in a rapidly changing world. The data underlying this indicator can be calculated from numerous data sources but in particular can be calculated as a rough approximation using populations' census size. Hoban et al (2020) recommend using 10% of populations' census size. One of the most useful databases to derive this indicator might be the Living Planet Index (Table 3, line 51). Although directly monitoring genetic data using DNA samples from individual organisms would be preferred, such monitoring remains relatively rare, expensive and highly taxonomically and spatially biased. This indicator is pragmatic: effective population size is known in many studies and simulations to track fairly well the actual genetic diversity at the DNA level (e.g. number of unique genetic variants).
1	4	C	36	Suggested indicator for trends in (genetic) diversity of wild species: the "proportion of distinct populations maintained within species". The loss of distinct wild populations will result in large losses of genetic diversity within species, including the loss of unique traits and adaptations. As Hoban et al (2020, https://doi.org/10.1016/j.biocon.2020.108654) write, "Conservation's historic focus on species extinctions has neglected the loss of diversity as species' ranges shrink and millions of populations disappear (Ceballos et al., 2017, https://doi.org/10.1073/pnas.1704949114)." Being a proportion, this must have a denominator, which should be some baseline, preferably from historic records, including GBIF, museum and herbarium specimens, remnants such as fossils, or indigenous and local knowledge. The Living Planet Index (Table 3, line 51), the PREDICTS database, or the Species Habitat Index (Table 3,

				line 127) could be appropriate as a data source for this indicator. Distinct populations would be those with some minimum genetic distinction, occurrence in a unique environment, or geographically distant.
1	4	C	36	Suggested indicator for trends in (genetic) diversity of wild species: "Number of species and populations in which genetic diversity is being monitored using DNA based methods" or "genetic monitoring index" for a shorter name. For countries and biodiversity organizations to successfully safeguard genetic diversity, they need knowledge on the amount of genetic diversity within and among populations (populations here being a broad term referring to in situ wild populations and ex situ/ captive/ managed populations). Knowledge is needed on where unique genetic diversity is, how genetic diversity is changing, which environmental drivers cause changes in genetic diversity, and how genetically connected are populations. Management of genetic diversity relies on this knowledge. This indicator would be composed of the number of populations in which within-species genetic diversity has been measured in a publication, published in online databases (e.g. GEOME, BOLD, GenBank), and/or where such data is collected to inform conservation. This indicator is also relevant to track progress towards Target 19.
1	4	C	36, 37, 41	The indicator "Comprehensiveness of conservation of socioeconomically as well as culturally valuable species" is included under both "cultivated plans, farmed and domesticated animals" and "wild relatives.". It is a fairly good indicator of protection of genetic diversity, it has global coverage and is disaggregated and is easily updated. It represents how much of a species' geographic range is protected in situ or ex situ (e.g. via seed banks). This indicator could easily be applied to all species, not just "valuable" species and we recommend that it be expanded to all species. Thus "comprehensiveness of conservation" could be included under wild species, if it were calculated for such species. Nonetheless it must be clear this represents an area of land protected or genetic material conserved ex situ and does not necessarily track genetic diversity change in wild populations.
1	4	C	38	The indicator "Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities" is included under "Trends in the diversity of cultivated plans, farmed and domesticated animals." We emphasize that this indicator could use additional wording to make sure it reflects conservation of genetic diversity. Specifically, the words, "resilient, representative and redundant" should be added prior to "genetic resources". It is well known that seed and gene banks may not capture sufficient amounts of species' genetic diversity due to limited sampling within a species as well as degradation or use over time. Sampling for seed and gene banks must encompass as much of the species' geographic distribution as possible (e.g. be representative), must sample extensively within populations typically 30 to 60 individuals (e.g. be resilient- high amount of genetic diversity), and must be at least duplicated in order to account for normal

				loss or use of these resources and for disasters (e.g. be redundant). Moreover this indicator tends to focus on agricultural seed and gene banks but we suggest to include data from zoos and botanic gardens which hold millions of accessions, often in very well curated databases (Mounce et al 2017, https://doi.org/10.1038/s41477-017-0019-3). We therefore recommend that after "conservation facilities" the following text be added "(e.g. seed or gene banks, botanic gardens, zoos, germplasm repositories and other well curated facilities)"
1	4	C	40	Included under "Trends in the diversity of wild relatives" is "Red List Index (wild relatives of domesticated animals)." However, the scientific consensus is that the Red List Index is not sufficient for monitoring genetic diversity. It has been shown that genetic diversity does not correlate to the Red List status (Willoughby et al 2015, https://doi.org/10.1016/j.biocon.2015.07.025). A change in the Red List status indicates a nearness to extinction. It does not necessarily relate to loss of genetic diversity within and among populations. The Red List Index is a relatively weak proxy whereas our proposed indicators above ("Number of genetically resilient populations" and "proportion of distinct populations maintained within species") would be more relevant to genetic diversity. We recommend that the Red List Index be removed from indicators of genetic diversity.
1	4	C	39	The indicator "Proportion of local breeds classified as being at risk of extinction" is included for "cultivated, farmed and domesticated" species. Generally local breeds are classified as at risk due to small effective population size. This should be a fairly good indicator of loss of genetic diversity within such breeds (genetic erosion or genetic drift) as well as loss of breed diversity itself (essentially equivalent to loss of distinct wild populations). We do suggest that this indicator could be subsumed into an indicator we propose above for trends in the diversity of wild species, "Number of populations [or breeds] within species with effective population size (Ne) above 500 versus those with Ne below 500." Genetic erosion within small populations or breeds occurs by the same genetic process.
1	4	B	36-41	The use of "diversity of" in column B under A5 could be changed to "genetic diversity within" for clarity. The original CBD declaration of 1992 and previous Global Biodiversity Outlooks used genetic diversity as "within species" diversity.
1	4	A	42-50	Unlike the other components of Goal A, this component (Protection of critical ecosystems) is defined in terms of an action (protection), rather than a desired state of biodiversity, and would therefore belong better under Action Targets rather than Goals. Alternatively, the component should be rephrased and include monitoring elements and indicators that go beyond the coverage of area based conservation measures (to avoid redundancy with Target 2).
1	4	B-C	42-50	The monitoring framework and indicators for the marine system focus on nearshore and coastal areas and do not consider open ocean areas. The global biodiversity framework being for the entire globe, it should ideally not be entirely constrained to

				national jurisdictions. Countries do regulate the ships that enter harbors within their national jurisdictions, and by this means could regulate the activities and impact of those ships outside of their jurisdictions (this would also apply to Targets 1,5,6,8).
1	4	C	46	We would like to highlight that the Protected Area Coverage of Key Biodiversity Areas is likely to be biased towards available information on the distribution of certain taxa (e.g. birds) which should be reflected more clearly in the monitoring element. As well, since many countries do not have areas that meet the KBA criteria, this measure risks motivating conservation action within each country to focus on their own biodiversity hotspots and taking into account any outsized responsibility for a particular species (e.g. endemics or majority of range of certain species found within a country's borders)
1	4	A-C	42-49	Freshwater systems should be explicitly mentioned under this component (i.e. dedicated monitoring elements and/or indicators).
1	6	A-C	64-67	Current monitoring elements and indicators for B2 (nature's material contributions) do not seem to align closely with Goal B's central statement to maintain or enhance nature's contributions (i.e., through conservation and sustainable use). As this Goal is not about using nature's contributions more, but about using them more sustainably, the question of sustainability should be more explicitly addressed by the respective monitoring elements. For example, purposeful indicators might measure the effectiveness of deriving benefits from nature's contributions. This would ideally be expressed as total benefit per total costs, where costs would include both any potential reductions in long-term nature's contributions resulting from their use, and the net impacts of any human co-production factors (technologies, etc.).
1	5-6	C	51-71	At the moment for goal B, the listed indicators are either biophysical or socio-economic but do not integrate both and thus fail to capture Nature's Contributions to People (e.g. "Nature's contribution to the mitigation of water risk", "crops dependency on pollination"). There are opportunities to include indicators that better reflect the IPBES framework of Nature's Contributions to People with existing models developed by e.g. InVEST, GLOBIO. We have listed some of those indicators in the appropriate review table.
1	5	B-C	54	This should clarify if the "trends in pollination and dispersal of seeds and other propagules" refers to wild plants or crops or both.
1	5	B-C	58-59	Under "trends in regulation of freshwater quantity, quality, location and timing", there should be an indicator of nature's contribution to the ambient water quality.
1	5	B-C	62	Under "trends in regulation of hazards and extreme events" there should be an indicator of nature's contribution to risk reduction (e.g. Coastal risk reduction; Chaplin-Kramer et al. 2019 Science, https://dx.doi.org/10.1126/science.aaw3372) .
1	6	C	65	Suggested indicators for "trends in the provision of food and feed from biodiversity": "Pollination contribution to crop production" and "Rangeland productivity for livestock, fisheries, wild plants and bushmeat".

1	6	C	68-71	Suggested indicators for "Nature's non-material contributions including cultural": Access and use of natural areas.
1	5	B	62	The monitoring elements should be "Trends in regulation of **natural** hazards and extreme events".
1	6	B	64-67	The monitoring elements of "Trends in the provision of **freshwater** from biodiversity" should be added.
1	6	A,B	72-76	We suggest to add two monitoring elements: "Trends in the conservation and sustainable use of genetic resources", and "Trends in the use of traditional knowledge related to genetic resources".
2	8	A-B	1-5	The ability of the Parties of the CBD to address spatial planning in the global ocean areas needs to be clarified. At the moment, countries only have jurisdiction over Exclusive Economic Zones but not the high seas. There is a separate process to develop protections for Biodiversity Beyond National Jurisdiction (BBNJ) it is not clear how this fits in the development of target 1. Or does this mean that the target considers the EEZs exclusively (i.e. ±36% of the global ocean areas)?
2	8	A	1-5	"Spatial planning" requires a clear definition. This target also needs to ensure that spatial planning is also directed towards places, and ecosystems, most in need of such attention – i.e. systems most vulnerable to ongoing threatening processes, potentially resulting in the most significant losses of biodiversity.
2	8	A	1-5	The (national) targets for land/sea areas under spatial planning should be 100%, as lower numbers could create perverse incentives and potentially result in unintended negative spillover effects, without actually being any more feasible: Given competing demands for land/sea areas from multiple SDGs, "spatial planning addressing land/sea use change" will in the best scenario mean "integrated land/sea-use planning" (ILP). In ILP, the spatial allocation of areas to different goals (food production, mining, biodiversity conservation, etc.) is planned in an integrated fashion, thereby enabling spatial optimization of area allocation to reconcile trade-offs between goals. ILP thus already implies that substantial land/sea portions may be "planned for" non-biodiversity-friendly uses. A target should thus strive for 100% of national territories under ILP, as any lower percentage would imply that the rest is without any planning. However, such non-designated governance regimes typically cause even higher rates of environmental degradation than even commodity-production oriented regimes (i.e., on top of any land/sea portions that will anyway be planned for biodiversity-unfriendly uses). Note that putting 100% of national territory under ILP in no way impairs a country's ability to allocate whatever areas they see fit

				to non-biodiversity uses, and as such is no less politically feasible than 50% under ILP. Rather, ILP covering the entire territory for which an administrative agency is responsible is a precondition for sound decision-making for multiple land-based goals (incl. biodiversity) while avoiding unintended negative spillover effects (doi.org/10.1016/j.gloenvcha.2018.08.006). Given currently limited capacity for ILP in many countries, we additionally propose a capacity-focused monitoring element (exemplary questions to be tracked: Do legal frameworks for integrated land-use planning exist? What proportion of national & subnational state agencies is legally obliged to do ILP? Do planning agencies have planning capacities, incl. access to spatial data on different planning objectives?). Additionally to national targets of 100%, a global target ("X% of the most biodiverse countries have ILP") and/or global indicators ("National-biodiversity-weighted percentage of countries with ILP") could be useful, as global biodiversity losses from land use could be substantially reduced by ILP in just a few "leverage" countries (doi.org/10.1111/gcb.14076).
2	8-9	C	6-22	The Biodiversity Habitat Index (Table 3, line 19) is available for all terrestrial ecosystems, including forests.
2	9	B	21-22	The monitoring element "Trends in forest and agriculture as a proportion of total land areas" would be more effective if it reflected that many countries are naturally mostly covered by non-forest ecosystems. Most simply, this element could be changed to tracking the proportion of total land area that is any "natural/semi-natural ecosystem". Availability of global annual data time-series (since 1992) for scalable indicators of natural/semi-natural ecosystems is given (Remelgado & Meyer, in prep.).
2	9	C	24	The Global Ecosystem Restoration Index (GERI) could be an indicator for this monitoring element. This indicator is already listed in another document open for review ("INDICATORS FOR THE POST-2020 GLOBAL BIODIVERSITY FRAMEWORK") where the information has been updated.
2	10	C	31	Additional to the ProtConn indicator is CSIRO's Protected Area Connectedness Index which has global coverage and can be disaggregated to national and other scales (E.g. watershed).
2	10	C	30-34	The Global Ecosystem Restoration Index (GERI) could be an additional indicator for this monitoring element.
2	10-12	A-C	35-52	"Well connected", "effective" and "areas particularly important for biodiversity" all require clear definitions, and ideally need to be expressed in some quantitative manner, to avoid too much emphasis being placed solely on the overall 30% areal target.
2	10-11	A-C	35-38	Target 2.1: As for Aichi Target 11, a crucial challenge will be ensuring that proportional Protected Area coverage is assessed at an appropriate level of classification of "natural ecosystems". Achieving 30% protection across very broadly defined ecosystems, e.g. "forest", "grassland" etc, is not necessarily a good outcome for biodiversity if this is achieved by biasing

				protection away from specific types/communities of ecosystems most in need of such protection. For example, a net increase in the protection of "forest" could be achieved through gains in more extensive, less-threatened forest types, outweighing (and therefore masking) gaps in the protection of highly depleted/threatened types, with perverse consequences for species-level biodiversity.
2	11	A	39-42	It should be clarified how "areas of particular importance for biodiversity" will be defined. KBAs is one approach to define those but should not be the only one.
2	12	C	48	For selected countries for which spatial information on land-tenure regimes is openly accessible, an annual to triannual indicator of the effectiveness of different governance regimes in preventing biodiversity-harmful land-use change will be provided soon (proof-of-concept in development phase). Developing this indicator for more countries ultimately depends on countries' open-data policies for, and regular maintenance of, cadastral databases (particularly large gaps in accessibility currently exist for private land parcels).
2	14	B	72	The monitoring element "trends in monitoring of invasive alien species" could be refined to "trends in monitoring of the distribution and abundance of invasive alien species". This monitoring element is also relevant for draft Target 19.
2	20	A-C	117-126	The formulation of current target components and monitoring elements implies a largely site-focused perspective. Additionally, they should ideally address cross-scale and cross-distance relationships (e.g., spillovers through trade, policy leakage, etc.; doi.org/10.1016/j.gloenvcha.2018.08.006). The wording "reducing productivity gaps" in Target 9, as well as indicators 117-119, 124, and 125 all have potential for negative spillovers (unless part of broader-scale planning), and are thus individually not informative on changes in net biodiversity pressures. To improve this, area targets should ideally be replaced or complemented by efficiency and effectiveness targets (e.g., "reduced net impacts on local and distant biodiversity per unit output of all combined inputs, including all areas").
2	20	A-C	124	We suggest the reference to "mariculture" together with "aquaculture".
2	24	B	147-148	We suggest to rephrase the monitoring element to "Trends in the number of countries that have adopted legislative, administrative **and/**or policy frameworks **or measures** to ensure fair and equitable **access, utilization and benefit sharing of genetic resources**".
2	27	C	159	We note an indicator gap in line 159. Effective and feasible indicators might focus on "leverage points" in global governance systems. For example, it seems feasible to track i) the proportion of stock exchanges with regulations for listing publicly traded companies that consider biodiversity, ii) the proportion of large institutional investors (retirement funds, etc.) that consider biodiversity in their portfolio management, and iii) the proportion

				of nationally listed, publicly-traded companies that mention biodiversity in their Corporate-Responsibility-related documents.
2	28-30	A-C	162-179	Off-site biodiversity impacts of production and supply-chains should be more explicitly addressed in the monitoring elements and indicators, including impacts in other countries/subnational regions (e.g. through trade) and spillover effects within regions (e.g., environmentally friendly land uses displacing other land uses to formerly natural areas). More focused indicators on specifically biodiversity footprints would be desirable (and feasible with available data). To enable targeted policy responses, these should separately track national and distant biodiversity impacts of production, consumption, exports, and imports.
2	29-30	B-C	180-186	Across monitoring elements, generic concepts such as "renewable", "ecological", or "environmentally friendly" would ideally be replaced with focused concepts such as "reducing net impacts on biodiversity". The emphasis on renewable-vs.- non-renewable seems misguided, since what ultimately matters are net biodiversity impacts, which, however, are often unrelated to renewable-vs.-non-renewable distinctions (e.g., localized non-renewable resource use may have smaller net impacts than spatially extensive, renewable resource use).
2	31	B	193	An additional monitoring element might track the extent to which people are enabled to choose biodiversity-friendly products by having access to appropriate information. For example, indicators could measure i) whether legal frameworks permit flagging biodiversity footprints on products, ii) the extent to which countries/sectors require such flagging, and iii) the extent to which countries/sectors regulate/have standards for self-declarations of environmental friendliness (e.g. via sustainability- related labels and product marketing, etc.). Generally, "environmentally friendly" should be replaced with "biodiversity-friendly" to avoid spillover effects between environmental domains (e.g., bioenergy-based products may be low-carbon but damaging biodiversity).
2	35-36	B	212-218	An additional monitoring element could measure the effectiveness of spatial targeting of financial flows (invest where impacts are greatest). Such an element could also support feedback between remote responsibility for biodiversity impacts and remote financial engagement (polluter-pays principle). For example, by combining data on bilateral financial aid flows and remote biodiversity impacts, an indicator could feasibly be derived that measures the extent to which the relative provision of financial resources to other countries reflects the relative remote impacts on those countries' biodiversity through supply chains.
2	36-37	C	226-231	Most of the indicators listed for the "trends in the availability of biodiversity related information" only consider information at the species level, and ignore information on e.g. genetic diversity, species traits, ecosystem distributions and functions, which are critical to produce other indicators of progress, included at the national scale. The list of indicators for this monitoring element should reflect the complexity of biodiversity, beyond species occurrences. One example is the indicator "Number of species

				and populations in which genetic diversity is being monitored using DNA based methods" suggested above for Goal A. In addition, "trends in monitoring of the distribution and abundance of invasive alien species" (suggested above for Target 5) could be considered an indicator for target 19.
2	36-37	B	226-231	As biodiversity change happens as part of human-environmental systems, a parallel monitoring element would ideally track trends in availability of reliable and up-to-date information on non-biological aspects that are critical for understanding biodiversity change, such as direct and indirect drivers (e.g., primary *in-situ* data as well as subnational statistical data on different land-use aspects, land governance, supply-chains, etc., under "FAIR" data principles).
2	36-37	B	226-231	On Target 19.1. Availability of reliable and up-to-date biodiversity related information we suggest the following additional monitoring element: trends in number of Parties with biodiversity observation systems that collect repeated observation across all levels of organization of biodiversity. Potential indicators for this monitoring element could be "Increase in the number of Parties that have established sustainable and operational biodiversity monitoring programs and networks" and "Change in the proportion of the national indicators being generated by data collected by the national biodiversity observation network" .
2	36-37	B-C	226-231	Considering that the availability of information is the focus of target 19.1, we suggest that the openness of data should also be considered as a monitoring element and/or translated into an indicator. One example of an indicator could be "Proportion of the biodiversity observations generated that is made publicly available", or "proportion of biodiversity observation that responds to the "FAIR" principles, i.e. that is Findable, Available, Interoperable and Reusable".