

REGIONAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES FOR EUROPE AND CENTRAL ASIA							
Comments external review second order draft - Chapter 4							
Reviewer Name	Chapter / SPM	From Page	From Line	To Page	To Line	Comment	Response
Ilija Gasan Osojnik Črncvec	0	0	0			local and native breeds are two interchangeable terms, for greater clarity, I would recommend only one expression is used for the whole publication.	The two terms address slightly different issues, as local breeds denotes breeds present only in a distinct region, and native breeds denotes breeds which had sufficient time to adapt to specific local conditions.
Brendan Coolsaet	0	0	0			All documents include big differences in the quality of the writing. Everything should be thoroughly proof-read and edited by native speakers.	This has been done throughout
Brendan Coolsaet	0	0	0			Use of genetic resources and Nagoya protocol are notably absent in most of the chapters	Limited or unequal access to NCP or genetic resources is now mentioned where appropriate.
Brendan Coolsaet	0	0	0			For reviewing purposes, it may be useful to indicate the gender-balance and 'discipline-balance' within the group of authors (could be illustrated with a gauge at the beginning of each doc for example). This will facilitate identifying biases	The complete authorship is listed at the beginning of each chapter. Statistics on gender and disciplinary balance are available from the ECA TSU and IPBES Secretariat
Germany	0	0	0			We believe that the regional ECA assessment generally has a comprehensive and scientifically sound structure. However, linkages between the chapters, especially for chapters 6, are not that strong yet. For instance, it is not clear in how far chap. 6 builds upon the findings and insights of the analyses within the previous chapters. While the review work, analyses and evaluations made in these chapters are by themselves very insightful, linking more strongly back to the status and trends chapter as well as the drivers/scenarios/visions and pathways chapters would be very useful. For instance, the 'status and trends' chapter 3 might help identify where policy action is most needed and the 'drivers' chapter 4 determines the underlying drivers which need to be addressed by policy action. Giving more weight to these chapters in the discussion of policy options might help to derive more region-based options. As it stands now, many key messages of chapter 6 are of a more general nature.	A comprehensive attempt has been made to cross-reference the different chapters to ensure consistency between them. All chapter texts were screened for potential opportunities for governance or management action and these opportunities are now mentioned in chapter 6 with reference to the chapter of origin.
Germany	0	0	0			This assessment shows some imbalances regarding a lack of coherence in the use of terminology: This can lead to different understandings and also to misinterpretations. For instance, at its last Plenary, the IPBES had agreed to use the term "nature's contributions to people" (NCP) as a synonym for the term "ecosystem services". Unfortunately, the term NCP is now being used in the assessment frequently in a modified form and therefore inconsistently. This aspect needs to be addressed in the assessment as well as in the SPM.	Terminology was systematically checked across the full report
Germany	0	0	0			There are significant contributions and benefits arising from agro-ecosystems. The increase in food, feed and timber production and resulting food security has been mentioned, but not thoroughly discussed. We would therefore ask the authors to extend this discussion and provide a more balanced perspective on the increase in food security over the last decades. Furthermore, information on traditional varieties and breeds or on genetic resources for food and agriculture is missing. Thus, the contributions of agriculture to the biological diversity in the agricultural sector have not been completely considered so far.	We have attempted to address this comment by taking a more balanced perspective on the relative contributions of nature to people especially with respect to food and fibre provision in chapter 2. We have also increased the treatment of genetic diversity of crops and animal breeds in chapter 3.
Germany	0	0	0			Regarding knowledge gaps - please provide a section at the end of each chapter to present the relevant knowledge gaps that were identified from the reviews (for chapter 3 it's missing). It is referred to in the SPM, p. 81. 233 that relevant knowledge gaps are identified, so please ensure that all knowledge gaps identified throughout the individual chapters are then summarized and assessed in the corresponding section of knowledge gaps and uncertainties towards the end of each chapter.	Knowledge gaps have been identified for each chapter, as well as being summarised as a box in the SPM
Germany	0	0	0			Some of the chapters (particularly 2, 3, 4, 6) are very long and readers easily lose track as to what type of information is currently presented. Please try to synthesize the information as much as possible and if a lot of information is to be presented provide short summaries or highly important findings.	All of the chapters have been reduced considerably in length
Germany	0	0	0			There are still some gaps, placeholders or work in progress in the SOD. This makes it partly difficult to comment. Please fill these gaps effectively.	Gaps have been filled throughout the document
Germany	0	0	0			We urgently request the chapter authors to ensure that all facts and figures contained in the chapters are accurately cited and adequately referenced with up-to-date sources. We also encourage chapter authors to cross-check whether the same facts and figures on a specific topic are being used throughout the assessment. Please make sure that all key messages are backed up by facts and figures.	The use of evidence sources has been comprehensively checked across the document, especially including those that integrate across chapters
Germany	0	0	0			Please explain all abbreviations when first used and then use them coherently afterwards (e.g. ILKP in the SPM)	All abbreviations have either been spelled-out or defined on first use
Belgian government - Hilde Eggermont (IPBES National Focal Point)	0	0	0			All documents include big differences in the quality of the writing. Everything should be thoroughly proof-read and edited by native speakers.	The document has been comprehensively reviewed by native English speakers
Belgian government - Hilde Eggermont (IPBES National Focal Point)	0	0	0			Use of genetic resources and Nagoya protocol are notably absent in most of the chapters	Limited or unequal access to NCP or genetic resources is now mentioned where appropriate.
Belgian government - Hilde Eggermont (IPBES National Focal Point)	0	0	0			For reviewing purposes, it may be useful to indicate the gender-balance and 'discipline-balance' within the group of authors (could be illustrated with a gauge at the beginning of each doc for example). This will facilitate identifying biases	The complete authorship is listed at the beginning of each chapter. Statistics on gender and disciplinary balance are available from the ECA TSU and IPBES Secretariat
Belgian government - Hilde Eggermont (IPBES National Focal Point)	0	0	0			no reference to Nature-based solutions, though very relevant in this assessment (i.e. in the different Chapters and SPM)	The NBS concept is referenced where there is literature and evidence to support its use
Anatolij Khapugin	0	0	0	0	0	Through the whole assessment, there are many cases of mixture English (British+American): e.g. ch.1, p. 12, line 333 (prioritize) vs. ch.1, p. 4, line 83 (recognised), etc. I think, some one of English forms should be used through the whole assessment. Also, there are many mistakes (or it is a lack of standards of formatting) for references style. I would recommend check it through the whole assessment. I didn't add concrete recommendations because I don't know what format of references and references style should be used	The document language has been systematically edited by native English speakers
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0			We would recommend that the IPBES Core Indicator 'Marine Trophic Index' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net. This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Dirk Zeller (email: d.zeller@oceans.ubc.ca).	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0			We would recommend that the IPBES Core Indicator 'Proportion of local breeds, classified as being at risk, not-at-risk or unknown level of risk of extinction' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net. This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Roswitha Baumung (email: Roswitha.Baumung@fao.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.

UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Core Indicator Percentage of Category 1 nations in CITES is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Tom De-Meulenaer (email: Tom.DE-MEULENAER@cites.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Core Indicator 'Nitrogen + Phosphate Fertilizers (N+P2O5 total nutrients)' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Francesco Tubiello (email: francesco.tubiello@fao.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Core Indicator 'Trends in Pesticide Use' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Francesco Tubiello (email: francesco.tubiello@fao.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Core Indicator 'Percentage of Undernourished People' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Carlo Cafiero (email: Carlo.Cafiero@fao.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Wetland Extent Trend Index' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Sarah Darrah (email: Sarah.Darrah@unep-wcmc.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Trends in invasive alien species vertebrate eradications' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Shyama Pagad (email: s.pagad@auckland.ac.nz)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator RAMSAR areas is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Maria Rivera (email: RIVERA@ramsar.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Number of countries with national instruments on biodiversity relevant tradable permit schemes' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . These indicators are country-specific, so they can be disaggregated by countries in your region. However, given the incomplete country coverage, any regional aggregates cannot be taken to represent the entire region. Currently we have data on about 58 countries. (Just to note, we also have information on countries with biodiversity-relevant taxes in place). More information on this is available from the indicator Focal point Katia Karousakis (email: Katia.KAROUSAKIS@oecd.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Trends in potentially harmful elements of government support to agriculture (produced support estimates)' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator is available for the OECD as a whole and has not been disaggregated as such. The original data on (total) government support to agriculture is available on the OECD website by country. More information on this is available from the Indicator Focal point Katia Karousakis (email: Katia.KAROUSAKIS@oecd.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Better Life Index' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . The data is available for only 38 countries and therefore it would be difficult to be used regionally as IPBES has classified these. More information on this is available from the Indicator Focal point Katia Karousakis (email: Katia.KAROUSAKIS@oecd.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Protected area coverage of terrestrial, marine and freshwater ecoregions' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Ed Lewis (email: Edward.Lewis@unep-wcmc.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Growth in species occurrence records accessible through GBIF' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Tim Hirsch (email: thirsch@gbif.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Robert Hoft (email: robert.hoft@cbd.int)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Information provided through the financial reporting framework, adopted by decision XII/3' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Robert Hoft (email: robert.hoft@cbd.int)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the IPBES Highlighted Indicator 'Number of world natural heritage sites per country per year' is used in this assessment. Indicator information is available from the IPBES Indicator portal and the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Douglas Nakashima (email: D.Nakashima@unesco.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Trends in Loss of Reactive Nitrogen to the Environment' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Albert Bleeker (email: Albert.Bleeker@pbl.nl)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Wild Bird Index (forest & farmland specialist birds)' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Richard Gregory (email: richard.gregory@rspb.org.uk)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Climatic impacts on European and North American birds' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Richard Gregory (email: richard.gregory@rspb.org.uk)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.

UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Ocean Health Index' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Benjamin Halpern (email: halpern@nceas.ucsb.edu)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Cumulative Human Impacts on Marine Ecosystems' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Benjamin Halpern (email: halpern@nceas.ucsb.edu)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Shyama Pagad (email: s.pagad@auckland.ac.nz)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Biodiversity Barometer' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Rik Kutsch Lojenga (email: rik@ethicalbiotrade.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Red List Index (impacts of utilisation)' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Tom De-Meulenaer (email: Tom.DE-MEULENAER@cites.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Water Quality Index for Biodiversity' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Hartwig Kremer (email: hartwig.kremer@unep.org)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	0	0	0		We would recommend that the Indicator 'Number of Parties to the CBD that have deposited the instrument of ratification, acceptance, approval or accession of the Nagoya Protocol' is used in this assessment. Indicator information is available from the BIP website www.bipindicators.net . This indicator can be disaggregated/made available for this region, more information on this is available from the Indicator Focal point Beatriz Gomez (email: beatriz.gomez@cbd.int)	Chapter author teams made use of these core/highlighted/further indicators as far as possible given the delivery late in the process.
EU: Frank Wugt Larsen (EEA)	0	0	0		A few points on references: 1) In general, there is a need to systematically check references in the chapters. Specifically, EEA reports are not referenced consistently, e.g. in some chapters it is EEA XXXX, while in other chapters European Environment Agency XXXX. 2) Chapter 3 doesn't seem to contain any reference to EEA materials, which seems a bit odd given the many relevant EEA publications. 3) Some EEA references are not the most current one, e.g. Climate change, impacts and vulnerability in Europe 2012 is referenced although there is 2016 report.	References have been systematically checked and standardised throughout the document using the Mendeley bibliographic software.
EU: Frank Wugt Larsen (EEA)	0	0	0		As during last review, we would like to point you to relevant information hosted by the EEA for which we believe a consultation by authors could improve the ECA report. In general, we will also refer to the EEA/ETC BD document 'Information note to IPBES secretariat on EEA and EU information' (http://bd.eionet.europa.eu/Reports/ETCDBDTechnicalWorkingpapers/PDF/Information_IPBES_on_EEA_EU.pdf), which was shared with the ECA TSU in 2015. Several reports provide a good starting point to find relevant information, incl. EEA, 2015 European environment – state and outlook 2015 (SOER 2015, in particular, thematic briefings and SOER synthesis); EEA 2016. Mapping and assessing the condition of Europe's ecosystems. Progress and challenges; EEA, 2015, State of Nature Report 2015; EEA, 2015, State of Europe's Seas; EEA, 2016. European forest ecosystems – state and trends. In general, the EEA website (http://www.eea.europa.eu) also provides access to a wealth of relevant indicators and assessments.	EEA sources are highly appreciated and cited throughout the assessment.
Thomas Brooks	0	0	0		Overall: the ECA assessment is looking really good - many congratulations to all the authors. I have focused the great bulk of my comments on issues directly related to data mobilised for the ECA against IUCN standards, especially in the light of the provision of these data for IPBES in https://www.nature.com/articles/sdata20167 , and of IUCN's strategic partnership with IPBES in general.	Thanks for the comment
Switzerland: José Romero	0	0	0		General: establish a glossary as part of this report and include in the glossary words like "cohesiveness", "regulatory", "material", "non-material" NCPs; "trophic level"; "biotic homogenisation".	A glossary has been created as suggested
Switzerland: José Romero	0	0	0		General: in this report, the concept of "trade-off" is used in a rather negative sense, while generally a trade-off is a situation reached for the satisfaction of divergent views and interests, which is considered to be a positive solution. We wonder if this rather negative use of trade-off in the report would be correctly translated in the other non-English languages. For example, in French, we would rather think of a happy outcome when a trade-off (e.g. a compromise, a good deal) is done in front of irreconcilable antagonisms. If the use in this report is more in a negative sense, then why not qualify trade-offs as e.g. "harmful". We hope that the English speakers authors understand our point and find a way out to address it in English as well as in the other non-English languages.	Trade-off is here consistently meant to indicate a negative relation between two variables of interest, e.g. between two NCPs. Mitigation of a trade-off would correspond to your "happy outcome".
The Netherlands: Astrid Hilgers	0	0	0	0	(Financial) cost-benefit analyses for policymakers/society are missing, as it is important to name such considerations explicitly. Also, certain concepts should be defined more precisely. This goes, among others things, for Natural Capital.	Discussion of the economics of ES (valuation) has been increased in the document, especially in Ch2
Ramsar Secretariat	0	0	0	0	We recommend that as in the regional assessments for Africa and the Americas, the area of Ramsar Sites, wetlands protected under the Ramsar Convention as internationally important by sub-region, be included in this assessment as an indicator. See: https://rsis.ramsar.org/	Done in chapter 3.
IPBES Knowledge and Data Task Force (KD TF) / Task Group on Indicators (TGI)	0	0	0		This review provides feedback from the IPBES Knowledge and Data Task Force (KD TF) / Task Group on Indicators (TGI) on the use of IPBES core indicators in your assessment. We see potential for inclusion of additional core indicators and for the more consistent use of the standardized visuals provided. For information on core indicators potentially relevant to a given chapter, please see http://www.ipbes.net/indicators (or see the tab named, "core indicators" in this spreadsheet) and check the indicator trend graphs shared by your TSU. For the trends of IPBES core indicator, standardized visualizations should be used as much as possible to ensure the consistency between and within the assessments. The KD TF/TGI aim to follow up with specific recommendations in the near future. In the meantime, do not hesitate to reach out to them through your TSU or the KD TF TSU (ipbes.kdtsu@gmail.com).	Chapter author teams made use of the core indicators as far as possible given the delivery late in the process.
Kremena Gocheva	0	0	0		The draft assessment is an impressive and very informative work. It can, also, be seen that the drafting and peer review process are flexible enough to incorporate very recent work despite the long drafting cycle. It would be helpful to incorporate a feedback mechanism from stakeholders as well, for collecting new information that becomes available on a running basis. For example, the Bulgarian mapping and assessment outside NATURA 2000 - some 66% of the country - for ecosystem condition and biophysical valuation of ecosystem services was completed in April, 2017. IBER-BAS has mapped six of the nine ecosystem types in Bulgaria, and had the lead role in developing the underlying methodological framework. However, the final reports are under verification and publications upon it are still to follow, with findings being systematized. Similarly, work is underway in other countries too. Therefore, at the current stage the comments are somewhat generic and limited to the general approach (Chapter 1) but it would be suitable, if such a mechanism existed, to keep contributing beyond June 26 until the report is ready. It may be good to allow for submitting links to new publications on a regular basis, so the report authors would get up-to-date information in a timely manner.	Thank you for the suggestion concerning new literature. The IPBES guidelines requires us to establish a cut-off date for literature (April 2017), but we have attempted to be flexible in incorporating more recent, but highly important, material.

						The assessment's description in Chapter 1 appears anthropocentric without a clear focus on humans as part of Nature. Since the Assessment clearly notes (Table 1.1, Figure 1.2) that the IPBES has a scope overarching earlier assessments such as MA, TEEB, MAES by providing a holistic view on Nature, the introduction, too, may need to put more emphasis on the socio-ecologic system as a single entity rather than merely a source of benefits to humans.	
Kremena Gocheva		0	0	0		This could lead onto introducing insights at the win-win and lose-lose options, including the ecosystem disservices, as well as a more systemic view at the continuum of states in which the socio-ecologic system is evolving over time. It would bring out more clearly the NATURE component of the IPBES CF, in particular its Mother Earth and Systems Values categories which appear to be underrepresented in the current draft. Their equivalent in Western science appears to be not the entire body of knowledge on biodiversity and ecosystems but rather the parts of ecology that treat ecosystems from the energy/emergy/entropy/information theory points of view.	Chapter 1 has been edited considerably to adopt a more comprehensive socio-ecological systems approach as well as recognising the intrinsic value of nature and pointing out non-material relational values.
Jean-Paul Hettelingh	Ch.4	0	0			The chapter is well written. While it is important to acquire detailed knowledge of direct and indirect drivers of impact on biodiversity and NCP, it is recommended that, where possible, links between (direct) drivers and impacts are specified more clearly. E.g the authors may wish to use Figure 2.1 more explicitly for target setting. Substantiation of this recommendation is provided in the course of this review.	Done. A whole section 4.5.1 Effects of Land use change on biodiversity and NCP has been added. All sections 4.4 - 4.8 include effects on biodiversity and NCP.
Mark Rounsevell	Ch.4	0	0			The chapter is much improved on previous versions. However, it is much too long (and over the word/page limit), which will require some serious editing to reduce. Much of the text is more of a literature review than an assessment. So page reductions could be mostly achieved by being more synthetic. There are also several places with too much focus on status and trends, rather than drivers per se. This could also be reduced considerably to avoid overlap with Ch3. There is also a lot of contextual information that could be reduced (avoiding overlap with Ch1), and some repetition.	Length has been reduced but not according to the original plan of 35,000 words. Trends = trends of the direct driver, that's how we assess direct drivers. We have reduced the text on status and trends of ecosystems.
Markus Fischer	Ch.4	0	0			I agree with Mark's comments. Except for: Ch4 is supposed to present status and trends of drivers, I think this is fine. Only, if it would present status and trends of ecosystems and BD, it would overlap with Ch3.	see above.
Markus Fischer	Ch.4	0	0			Some more general comments: - reduce general descriptions - minimise redundancy of trends in extent and quality UoA with ch3 - make sure text is referenced - reference all figure legends or at least make clear, where the data/concept of the figure comes from; e.g. if needed say that this summarises section 4.x.x.x. - avoid strong language, which may sound prescriptive	All done!
Sigrid Kusch	Ch.4	0	0			Chapter 4 contains many useful information and presents valuable insights. At the same time, it is very long. Please consider shortening the chapter, for the benefit of readability.	We did so except for two sections, Land use change and Climate change.
Bruno Fady	Ch.4	0	0	0	0	Genetic diversity is not mentioned at all in this chapter, which means that drivers of change that affect this crucial component of biodiversity are not considered. It is a pity and should be corrected	4.4.1.1 discusses genetic diversity of fish. 4.5.1.1 discusses GMO. 4.5.1.6 and 4.7.1.1.1 discuss genetic diversity at length.
Germany	Ch.4	0	0			Please provide references consistently for all facts, numbers, percentages, etc... Cyrillic references might be good to be spelled in English	Done.
Germany	Ch.4	0	0			Please make sure all tables/figures are well explained and correctly referred to in the text (e.g. fig. 4.2, Box 4.4)	Done.
Germany	Ch.4	0	0			There is a strong imbalance between examples from the EU and other parts of ECA. Please provide a more balanced picture throughout the chapter by including more examples from other parts.	Done, especially for land use change where contexts vary considerably among the sub-regions. The EU still dominates in 4.6 Pollution due to data limitation.
Germany	Ch.4	0	0			There are still quite a few unnecessary repetitions throughout the chapter. Please check.	Done.
Germany	Ch.4	0	0			Please check the chapter for language	Done.
Germany	Ch.4	0	0			Some of the figures- the causal loop diagrams- are highly complex and not easy to grasp. Please make sure that these diagrams are as simple as possible (and as complex as unavoidable) and well explain the key insights that these diagrams provide. It would be important to present the information in such a way, that other chapters could build upon them (e.g. chapter 5, 6).	The CLDs have been revised. Some CLDs aim to illustrate the main aggregated causal relations while other CLDs try to capture context-dependent relations.
Germany	Ch.4	0	0			Chapter 4 investigates in detail dynamically interacting drivers and underlying factors that influence biodiversity and NCPs. To visualize those interactions, causal loop diagrams illustrate the complex relationships and causations between drivers. While we very much appreciate the idea and need to illustrate those complex interactions, we find the current way of visualization very hard to understand. It is extremely difficult to find suitable entry points in these diagrams to start understanding the relations. We do not have a straightforward idea how to improve the causal loop diagrams substantially, but we think that if there is a way to reduce and better structure- maybe cluster- the diagram or provide help how to "walk through" it this could be very beneficial. As the diagrams look like now, we fear that all information will simply get lost because readers do not get clear messages from looking at those diagrams. Additionally, for some of the diagrams, a reference in the text is missing (e.g. 4.36-4.38) - these diagrams need to be well embedded in the accompanying text.	See above. The CLDs illustrate on the text; we made efforts to simply and structure all CLDs to make it easy to read.
Germany	Ch.4	0	0			In sub-chapter 4.5.3 and its sub-chapters various parts are still missing. Please provide all missing parts and fill all gaps.	Done.
Marie Stenseke	Ch.4	0	0			Definition of forest is lacking or at least reasoning about the fact that the term forest has different meanings in different parts of ECA, and how that is handled in the chapter (and in the assessment)	There are many terms in the assessment that have multiple interpretations. There is no space to do it and many definitions are included into the glossary.
Marie Stenseke	Ch.4	0	0			The causal loop diagrams are not enough validated by scientific references, and can therefore not be presented as results of the assessment. They seem to be a mixture of diverse features, and they do not communicate in a satisfying way. Notwithstanding that they probably have been most useful in processing the chapter, I suggest delete.	We agree that some CLDs are hard to understand, see above. We still decided to keep them to enable comparisons e.g. between sub-regions.
Marie Stenseke	Ch.4	0	0			The human use of the sea is not sufficiently covered: shipping, ports, marinas, windpower, recreational activities. Moreover, the increase in human use of marine and coastal waters, in the last decade also encouraged in EU by the policy on Blue Growth, is largely missing	4.4.3.1. assesses effects of mass tourism on coastal areas. A new section 4.5.6 "Changes in Urban Development" assesses this further
Andrew Wade	Ch.4	0	0			Congratulations to all the authors and review editors on excellent work to collate and present the material. The chapter is impressive.	Thanks.
The Netherlands: Astrid Hilgers	Ch.4	0	0	0	0	The CAP was not the major incentive for intensification of agriculture in 1950s, as it only came into force in 1962.	Changed. See 4.5.2.3.2
The Netherlands: Astrid Hilgers	Ch.4	0	0	0	0	The chapter is well written. While it is important to acquire detailed knowledge of direct and indirect drivers of impact on biodiversity and NCP, it is recommended that, where possible, links between (direct) drivers and impacts are specified more clearly. E.g the authors may wish to use Figure 2.1 more explicitly for target setting.	See above (first comment)
ECA values liaison group	Ch.4	0	0			When applicable, i.e. when different value types are mentioned or discussed, please refer to the values table and definitions in Chapter 1 that introduces and defines all value types in the assessment. This will be suggested to each ECA chapter	We discussed this in Prague and settled for using "biodiversity and NCP" since we found "nature" to vague for a scientific concept.
ECA values liaison group	Ch.4	0	0			Convert "ecosystem services" to "nature's contribution to people" in lines: 723,731,737,738,754,1018,Table 4.7 (2208),2361,2688,3787,3873,5339,5350.	Done. We only mention the concept "ecosystem service five times in the whole chapter now, in relation to empirical citations.
ECA values liaison group	Ch.4	0	0			Note the frequent use of the term biodiversity loss which has different meanings depend on author so it would be good to understand what they individually mean and what might be understood they think of as biodiversity!	Like most scientific work we use "biodiversity loss" as a broad category.

ECA values liaison group	Ch.4	0	0		<p>There are many different uses of the word "values", as listed with line numbers below. Please consider reconciling these where they refer to the same thing, clarify, and especially try to refer as much as possible to the valuation table in Chapter one (where relevant):</p> <p>Term line number</p> <p>Bio-cultural value 128</p> <p>Climate values 318</p> <p>Value (indigenous knowledge of biodiversity) 512</p> <p>High value species 879</p> <p>High nature value 1356,1808,3140</p> <p>Agricultural value 2181</p> <p>Regional values and beliefs Table 4.7 (2808)</p> <p>Economic value 2220,2519</p> <p>High value trees 2223,3224</p> <p>Aesthetic value 2246,4999</p> <p>Natural value 2282, 2838</p> <p>Socio/cultural value 2309</p> <p>Recreational value 2361</p> <p>Cultural values 2412, 3992</p> <p>Social values 2482, 2789</p> <p>Landscape values 2500, Box 4.6 (2778)</p> <p>Financial net values 2552</p> <p>Property values 2791, 2802</p> <p>Land value 2792, 2800</p> <p>Wood values 2802</p> <p>Conservation value 2839, 5029</p> <p>Protected area value 2897</p> <p>Problem solving value 3098</p> <p>Medicinal value 3230</p> <p>Non-timber forest product value 3371</p>	<p>Well, when the authors of a particular scientific text use one concept it would be risky for us to "translate" this to a standardised concept. This could in fact obfuscate or misrepresent rather than clarify. If we wrote our own analysis, then we would be more concerned by using consistent language.</p>
					<p>Pasture sustainable value 3371</p> <p>Threshold value 3474, 3546</p> <p>Religious value 3992</p> <p>Projected value 4052</p> <p>Temperature change mean value 4082</p> <p>Acidification value 4463</p> <p>Invasion threat value 5157</p> <p>Trade value 5163</p> <p>Items in bold need clarification (31 terms)</p> <p>Value terms used in text that need differentiation:</p> <p>Term line number</p> <p>Bio-cultural value 128</p> <p>Climate values 318</p> <p>Value (indigenous knowledge of biodiversity) 512</p> <p>High value species 879</p> <p>High nature value 1356,1808,3140</p> <p>Agricultural value 2181</p> <p>Regional values and beliefs Table 4.7 (2808)</p> <p>Economic value 2220,2519</p> <p>High value trees 2223,3224</p> <p>Aesthetic value 2246,4999</p> <p>Natural value 2282, 2838</p> <p>Socio/cultural value 2309</p> <p>Recreational value 2361</p> <p>Cultural values 2412, 3992</p> <p>Social values 2482, 2789</p> <p>Landscape values 2500, Box 4.6 (2778)</p>	
					<p>Financial net values 2552</p> <p>Property values 2791, 2802</p> <p>Land value 2792, 2800</p> <p>Wood values 2802</p> <p>Conservation value 2839, 5029</p> <p>Protected area value 2897</p> <p>Problem solving value 3098</p> <p>Medicinal value 3230</p> <p>Non-timber forest product value 3371</p> <p>Pasture sustainable value 3371</p> <p>Threshold value 3474, 3546</p> <p>Religious value 3992</p> <p>Projected value 4052</p> <p>Temperature change mean value 4082</p> <p>Acidification value 4463</p> <p>Invasion threat value 5157</p> <p>Trade value 5163</p>	

ECA values liaison group	Ch.4	0	0			Please review across the Chapter the places where the use of the term "biodiversity" could be adapted to reflect IPBES jargon such as "Nature (biodiversity and ecosystems)" and/or Nature and its contributions to people. See for instance: summary lines 201, 211, 215, 243,542, 764. This is especially important in more general synthetic statements and findings, to align with the other eca chapters and CF. Especially, statements as 'biodiversity and NCP' can in several occasions be replaced by 'Nature and its contributions to people', except when specifically biodiversity as an underpinning feature is referred to.	Done. However, we discussed in Prague whether to use "Nature and its contributions to people" but settled for "biodiversity and NCP". However we used nature's contributions to people" 65 times and "material contributions of nature" and "material contributions to people" a few times. So we have followed the wip.
ECA values liaison group	Ch.4	0	0			Check that all subregions are covered roughly equally in terms of values.	in terms of values=?
Kristina Raab	Ch.4	0	0	0	0	A section 'synthesis of indirect drivers' akin to the section 4.9 on 'direct drivers' is missing - this may give the impression that one is more important than the other type of driver... please ensure the insights on indirect drivers area also synthesised to make sure their importance is recognised too.	Good point! We added this!
Kristina Raab	Ch.4	0	0	0	0	I don't think section 4.10 as separate section is justified, nor do I think it should be the concluding section of the whole chapter. The obvious parts (inter-regional connections exist, hence flows exist) belong in the introduction and/or section 4.2. Parts that require information from later sections should be merged into 4.9, which would then include the information on connections between regions, a synthesis of direct drivers, and a synthesis of indirect drivers.	Good! We moved Inter-regional flows to a new section 4.2.5 instead.
Kristina Raab	Ch.4	0	0	0	0	I think the last section of the chapter should refer to the title of the chapter, so include direct and indirect drivers and synthesize what we've learned in the chapter	Done.
Kristina Raab	Ch.4	0	0	0	0	Sections 4.7.3.4 and 4.7.3.5, 4.7.3.6.3 and 4.7.3.6.4 contents are not differentiated by system, but 4.7.3.6.1 & 2 are. Please make this consistent. Please mention why other systems are missing, or include them if possible.	Done.
Kristina Raab	Ch.4	0	0	0	0	The information on evolution (1 sentence) is too little, please expand. Key words: fisheries-induced evolution but effects are known from large terrestrial predators too. References by http://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(07)00273-X ; http://science.sciencemag.org/content/318/5854/1247.summary ; http://onlinelibrary.wiley.com/doi/10.1111/faf.12007/full ; https://www.researchgate.net/publication/250218882_Fisheries-Induced_Evolution_Present_Status_and_Future_Directions ; http://www.pnas.org/content/110/30/12259.short PROJECTS: FishACE and FinE, M. Heino, U. Dieckmann, A. Rijnsdorp, E. Dunlop;	We chose not to get into more detail on this but instead focus on drivers.
Kristina Raab	Ch.4	0	0	0	0	See https://www.shipmap.org/ for inclusion of information on the extent of the driver marine shipping (for IAS for instance, disturbance and potentially pollution)	Thanks for this beautiful map, however, we did not use it.
Mark Snethlage	Ch.4	0	0			In this table, suggestions are made for maps to illustrate some sections of the different chapters. A document with a number of examples (referred to below) is available at: https://tinyurl.com/ECA-Maps ECA sharepoint site login required	We do not understand the comment.
Mark Snethlage	Ch.4	0	0	0	0	there is a mixed use of "ecosystem services" and "nature's contributions to people". Should this be uniform?	Yes. We changed almost all "ecosystem services" unless in five cases where we cited the ref.
Mark Snethlage	Ch.4	0	0	0	0	discussions on CE and EE (in particular Russia and Ukraine) agriculture, forestry and protected area trends and drivers are very lengthy, detailed (lots of dates and data) and have a strong historic perspective, to the point that the key messages are lost.	The text was shortened and re-written considerably.
ECA values liaison group	Ch.4	0	0			Please double check the use of the term 'worldview' to ensure it is used consistently, and consistently with IPBES wording and meaning, or at least it is clear from the context what exactly is meant.	We deleted this term, only use world views three times in citations to refs.
PESC-4: Levon Aghasyan	Ch.4	0	0	0	0	Caucasus region is not sufficiently included in chapter 4. There is enough information on this region. See for example CBD National Report of Armenia: Link: https://www.cbd.int/doc/world/am/am-nr-05-en.pdf	is assessed explicitly in sections 4.5.5.3 and 4.7.1.1.2. Georgia is mentioned under 4.7.1.2. Otherwise Caucasus is assessed in terms of Eastern Europe (85 times)
PESC-4: Rainer Schliep	Ch.4	0	0	0	0	The causal loop diagrams are used throughout the chapter but should be reworked to be clearer in their messages. They are more like mindmaps than a clear figure for a global audience to understand.	Was done - simplified and re-structured.
PESC-4: Kristina Raab	Ch.4	0	0	0	0	The causal loop diagrams are used throughout the chapter but should be reworked to be clearer in their messages. They are more like mindmaps than a clear figure for a global audience to understand.	same as above
PESC-4: Kristina Raab	Ch.4	0	0	0	0	A figure showing the (cor-)relations between indirect drivers and biodiversity loss could be interesting to add to this chapter and make it much more policy relevant.	We define indirect drivers as having no direct effect on biodiversity loss. This is consistent to the IPBES conceptual framework. However, it has some direct effects on NCP according to IPBES CF. See 4.2.2
PESC-4: Levon Aghasyan	Ch.4	0	0	0	0	Effects of mining are insufficiently covered by the chapter, these are important in many countries, esp. surface mining. 4.4.4 p37 is not sufficient as it does not address the impacts on biodiversity, but just describes the topic. See Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014 (https://www.cbd.int/doc/world/am/am-nr-05-en.pdf)	Effects of Mining has been assessed further since the SOD, see section 4.4.4. However, our focus is on the drivers.
PESC-4: Kristina Raab	Ch.4	0	0	0	0	Effects of offshore drilling are insufficiently covered in chapter 4. Should be included in the appropriate sections, e.g. 4.4.4. It is mentioned, but insufficiently under Fishing and Protected areas sections. This needs to be addressed more overall.	See above.
PESC-4: Kristina Raab	Ch.4	0	0	0	0	Noise pollution including underwater noise and its effects on (marine) biodiversity should be included, not excluded from the assessment (line 3410 page 113). On noise on land, see Buxton et al Science 356 p531 (2017): 'Human-produced noise doubled background noise levels in a majority of protected areas and substantially affected critical habitat areas for endangered species.' I suspect there will be good references in there to terrestrial noise pollution in general. For marine noise pollution see the following references. I am no expert on this, just searched briefly and this is what I found. Impact on fish and others: https://doi.org/10.1016/S0378-5955(00)00213-6 , https://link.springer.com/chapter/10.1007%2F978-1-4419-7311-5_84 (reference list looks more useful than abstract); European commission: http://ec.europa.eu/environment/integration/research/newsalert/pdf/FB7_en.pdf ; OSPAR report: http://qsr2010.ospar.org/media/assessments/p00436_JAMP_Assessment_Noise.pdf ; marine mammals chapter of book on underwater noise: https://link.springer.com/chapter/10.1007/978-1-4419-7311-5_3 . From PEW website http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2015/09/the-effects-of-underwater-noise-on-marine-life : Bruce W. Hanna et al., "Managing Anthropogenic Underwater Noise in the Northwest Territories, Canada" in The Effects of Noise on Aquatic Life, ed. Arthur Popper and Anthony Hawkins (New York: Springer, 2012), 625–627, http://link.springer.com/chapter/10.1007%2F978-1-4419-7311-5_142 . Convention on Biological Diversity, "Scientific Synthesis on the Impacts of Underwater Noise on Marine and Coastal Biodiversity and Habitats." (Paper presented at the Convention on Biological Diversity, Montreal, April 30 to May 5, 2012), https://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-12-en.pdf . Ann E. Jochens et al., Sperm Whale Seismic Study in the Gulf of Mexico: Synthesis Report, OCS Study MMS 2008-006, Minerals Management Service (2008), 3–5, http://www.data.boem.gov/PI/PDFimages/ESPIS/4/4444.pdf . Emily Tripp, "Seismic Blasting in the Atlantic: The Real Story," Marine Science Today (Feb. 11, 2014), http://marinesciencetoday.com/2014/02/11/seismic-blasting-in-the-atlantic-the-real-story/#wzz3fmuUb2v . Tana Worcester, Effects of Seismic Energy on Fish: A Literature Review, Canadian Science Advisory Secretariat (2006), http://www.dfo-mpo.gc.ca/CSAS/Csas/DocREC/2006/RES2006_092_e.pdf . Rosalind M. Rolland et al., Evidence That Ship Noise Increases Stress in Right Whales, Proceedings of the Royal Society B 279, no. 1737 (2012): 2363–2368, doi:10.1098/rspb.2011.2429.	Thanks for this comment. It was hard to draw the line on what types of pollution to include. The Millennium Ecosystem Assessment almost exclusively focused on nutrient and organic pollution so we have already a much broader assessment. Of the "novel" categories we chose to include ground-level (tropospheric) ozone, light and plastic pollution (Section 4.6 intro).
PESC-4: Kristina Raab	Ch.4	0	0	0	0	Please include light pollution in the assessment if it is not there yet. Reference e.g. (only quick search by non-expert): http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0079250 ; CBD report: http://starlight2007.net/pdf/proceedings/P_Deda.pdf ; https://www.researchgate.net/publication/47634612_Light_Pollution_as_a_Biodiversity_Threat	We did (already in the SOD).

PESC-4: Kristina Raab	Ch.4	0	0	0	0	Especially in chapter 4.4: hydrocarbon extraction not mentioned at all, which destroyed the Caspian Sea. (incl. through pipeline construction, causing fragmentation as well). This should be included. This is relevant to the Black Sea, Caspian Sea and other regions as well. See for example 1. Zonn, I. Environmental issues of the Caspian, in Kostianoy, A. & Kosarev, A. (eds.) The Caspian Sea Environment, the Handbook of Environmental Chemistry, Volume 5P 2005. 2. Efendiyeva, I. Ecological problems of oil exploitation in the Caspian Sea area, Journal of Petroleum Science and Engineering, Vol. 28, Issue 4, December 2000, pp 227-231 3. de Mora, S. et al. An assessment of metal contamination in coastal sediments of the Caspian Sea, Marine Pollution Bulletin, Vol. 48, Issue 1-2, January 2004, pp 61-77 4. Ivanov, A. & Zatyagalova, V. A GIS approach to mapping oil spills in a marine environment, International Journal of Remote Sensing, Vol. 29, Issue 21, 2008	Thanks for this comment. We added fossil fuels in the section 4.4.4 "Mineral and fossil fuel extraction" and this focuses on the Caspian Sea
Finnish Government	Ch.4	1	326	1	326	remove "scenario"	Done
PESC-4: Kristina Raab	Ch.4	2	33	3	87	Table of contents is very general. Both for the reviewers and the readers of the final draft it would be extremely helpful to be able to navigate to relevant sections of expertise and/or interest by looking at a (much) more detailed table of contents. Please insert this in the final version of the assessment, and in future review processes please make the full table of contents (incl tables and figures) publicly available to facilitate the engagement of reviewers and lower the threshold to contribute. The length of the chapters is much more manageable if relevant sections can be readily identified from the start; and also the complementarity of contents within and among chapters can better be assessed if tables of contents can be viewed and compared.	The TOC is already over one page. We decided not to include fourth level of headings because that would make the TOC too long.
Mark Rounsevell	Ch.4	4	90	4	90	Needs confidence language throughout	Done.
Mark Rounsevell	Ch.4	4	90	4	90	I have the impression that there are more key findings in the text as a whole than is represented here, for individual drivers, e.g. invasives	Added.
Germany	Ch.4	4	90	6	186	Please provide levels of confidence similarly for all main messages of the Executive Summary.	Done
PESC-4: Kristina Raab	Ch.4	4	90	6	186	Some of the bold statements in the Executive Summary (e.g. lines 139, 148) don't have the qualifying statements (like 'well-established'). It would be better if each statement were consistently accompanied by a qualifying statement. (Or consistently unaccompanied)	Done
Mark Rounsevell	Ch.4	4	91	4	98	This is an abstract, not an executive summary. Exec Sum shouldn't say what the chapter did, but give key findings I'd suggest deleting this whole 'key finding' since it isn't one	Changed to Ex Sum format
Mark Rounsevell	Ch.4	4	95	4	95	Causes or cause?	Changed
Markus Fischer	Ch.4	4	100	4	101	Include confidence term for "Climate change is of particular importance since it often accelerates changes in other drivers"?	Done.
Thomas Brooks	Ch.4	4	100	4	100	Delete "is of particular importance since it" unless there is explicit evidence for this. The fact that it accelerates other drivers does not make it "of particular importance" per se.	Done
Markus Fischer	Ch.4	4	101	4	104	Confidence terms lacking in whole para- except for one statement?	Done
Gunay Erpul	Ch.4	4	111	4	115	What is the regional trend for this? One or two explanatory sentences help!	Sub-regional trends are in the chapter, not ExSum
Marie Stenseke	Ch.4	4	111			rephrase: Do not use the word drivers for agriculture, forestry and urbanisation, since that is not how drivers are defined in the chapter	We clarified that we mean CHANGES in agriculture etc.
Markus Fischer	Ch.4	4	112	4	115	Again, confidence terms are lacking. Similarly for bold and non-bold text in all following messages, I'll not reiterate, but we need confidence language.	Done
Mark Rounsevell	Ch.4	4	121	4	121	This is good for nature, no?	Yes. We changed this.
Markus Fischer	Ch.4	4	121	4	121	Fallow areas would be better than natural, I guess.	Changed
Mark Rounsevell	Ch.4	4	122	4	122	Also good for nature?	Changed
Markus Fischer	Ch.4	4	122	4	122	As CH4 is on trends in drivers, it is probably ok not to always mention the effect on biodiversity.	Done
ECA values liaison group	Ch.4	4	128			'bio-cultural values' should be replaced with 'cultural values'	Done
Gunay Erpul	Ch.4	5	135	5	137	This SPM bullet point could be split into 2. Current one may be too inclusive.	Changed
Markus Fischer	Ch.4	5	136	5	136	"armed conflicts" is also mentioned below. avoid doubling.	Done
Markus Fischer	Ch.4	5	141	5	145	This is really important and possibly the most important statement relating to the "tragedy of the commons". It would be very good to also make statements beyond the EU, either by naming the situation, if known, or by stating a knowledge gap.	Difficult to get info on taxes. Internationally it is the EU pushing for tax reforms so it is important to have figures on EU here
Mette Skern-Mauritzen	Ch.4	5	151	5	152	Unprecise - Europe has two cod stocks; one in the North Sea that is (has been?) overfished, and on in the Barents Sea that has not been overfished the last decades, and is now the biggest cod stock in the world.	Thanks. Now clarified in 4.4.1.1
Markus Fischer	Ch.4	5	158			Is "collapse" a pc term? May be "end"?	Was change into 'dissolution'
Gunay Erpul	Ch.4	5	158	5	164	What is the message here? Is it good to turn back to agriculture in those areas? If it is, what are the upsides? Especially black soils (very rich in soil organic carbon are under scrutiny since they have got intrinsically higher soil biodiversity and wider soil ecosystem services and their proper management is very important in terms of climate change, food security and land degradation.	The key messages were re-written. This particular part was removed.
Marie Stenseke	Ch.4	5	158		171	These two conclusions/summaries are not at present related to the task of the assessment, and seems not to be results from the assessment. It needs to be clarified how these two aspects relates to biodiversity and NCP, or they should not be part of the summary.	Land abandonment and armed conflicts are drivers of changes in biodiversity and NCPs. There are references that support it.
Kristina Raab	Ch.4	5	158	5	164	The fall of the iron curtain also had some positive effects on biodiversity in some areas, e.g. the Danube area at the border between Slovakia (Bratislava/Devin) and Austria has become protected because it was a largely undisturbed habitat during the iron curtain times.	We do not present evidence related to the effect of the iron curtain fall on biodiversity.
Gunay Erpul	Ch.4	5	165	5	171	Armed conflicts are issued here in detail. No need to reissue it before and above (see comment for lines 135 - 137)	OK
Markus Fischer	Ch.4	Ch.4		6	176	Is "collapse" a pc term? May be "end"?	Changed.
Gunay Erpul	Ch.4	6	182	6	183	"Migration of migrated to Europe" from Turkey is unclear here.	Changed.
Finnish Government	Ch.4	6	185	6	186	This could be specified, e.g.: 1) new people are not fully aware of the local "rules", for example the every-man's right in Nordic countries; 2) the motivation to protect nature in the new country may be weak; 3) immigrating people may typically have high motivation to increase their standard of living in the new country	Changed.
Gunay Erpul	Ch.4	7	194	7	194	Can abbreviation "NCP" be introduced?	Yes, done.
Marie Stenseke	Ch.4	7	196		199	Rephrasing needed. Human interaction with non-human species implies pressures for change as well as frictions, see e.g. Beilin, et al. 2014 (already in the list of references) and Eiter, S. & Potthoff, K., 2007. Improving the factual knowledge of landscapes: Following up the European Landscape Convention with a comparative historical analysis of forces of landscape change in the Sjødalen and Stålshimmen mountain areas, Norway. Norwegian Journal of Geography Vol. 61, 145-156,	We have changed to: "These biodiversity networks of interacting organisms respond to a set of environmental factors such as climate, soil, or water conditions. Social-ecological systems also include human activities (direct drivers) that modify almost all of these ecosystem interactions and environmental factors, and the underlying (indirect) drivers of these activities."
Marie Stenseke	Ch.4	7	199			... "which is often summarized under the term "global change"" is too simplistic, and not necessary. Delete.	Deleted
Germany	Ch.4	7	200	7	201	"It is thus important to understand the status and trends of the human-modified drivers that affect biodiversity and ecosystems and thereby nature's contributions to people". Later on (in section 4.1.4, p. 8, line 250-268) you write about anthropogenic or anthropogenically-influenced drivers. Are these the same drivers you previously referred to as 'human-modified'? Please (i) clarify and (ii) make sure to stick to the same wording (throughout the assessment) in order to avoid confusion or misunderstandings. Are there any non-human modified drivers, that have an impact on biodiversity and ecosystems, and if yes, pls explain why they are not considered?	Thanks. We have clarified that we only assess anthropogenic drivers in this chapter (4.1.4)
Mark Rounsevell	Ch.4	7	201	7	204	Could probably delete this sentence, since the points are made in Ch1	OK
Thomas Brooks	Ch.4	7	201	7	201	Very important to retain consistency with IPBES definition of "biodiversity", which includes "ecosystems" (http://www.ipbes.net/sites/default/files/downloads/IPBES_2_INF_2_Add.1.pdf); also Pollination assessment p481, and Africa assessment SOD Chapter 1, Page 5, Lines 142-145). Therefore, delete "and ecosystems" here. This applies throughout the rest of the Chapter.	True, this is correct that biodiversity includes the genetic, species and ecosystem levels. We have changed to "biodiversity including ecosystems" when ecosystem is the focus of discussion.

Gunay Erpul	Ch.4	7	202	7	202	a is scientifically (is a scientifically)	Deleted
Germany	Ch.4	7	219	7	219	You might want to say "projected future" not "predicted future".	Yes. We had several comments on this, pointing in opposite directions. But we settle for "projected".
PESC-4: Kristina Raab	Ch.4	7	224	7	224	Clarify the first sentence about the chapter's structure: line 224. Sections 4.1, 4.2, 4.3 are not organised according to direct drivers as stated here.	Changed.
Mark Rounsevell	Ch.4	8	233			The concept was in existence (in other fields) long before the MA. At least since the 1970s, of not before.	Changed.
Jean-Paul Hettelingh	Ch.4	8	235			The "older" DPSIR framework is still used including biodiversity as endpoint. Policy support using DPSIR works in 2 directions, i.e. From drivers to Impacts through scenario analysis , and back through "optimization" . It is recommended that this chapter (and the ECA assessment in general) includes views on the manner in which the IPBES conceptual framework operates in both directions.	We do not enter this discussion
Jean-Paul Hettelingh	Ch.4	8	238			The term " complex and " complex interactions" is used very frequently throughout the report, without substantiation, and illustrated with many schemes such as Fig. 4.3, or SPM 9 etc.	Now clarified under 4.2.3: "The interaction among indirect drivers is highly complex, i.e. they are hard to trace back to a single point of origin, and their impacts are often reciprocal and not unidirectional"
Markus Fischer	Ch.4	8	238	8	249	Some sentences would better be specified to address drivers, not the whole conc framework.	Changed.
The Netherlands: Astrid Hilgers	Ch.4	8	238	8	238	The term " complex and " complex interactions" is used very frequently throughout the report, without substantiation, and illustrated with many schemes such as Fig. 4.3, or SPM 9 etc.	same as above
Kristina Raab	Ch.4	8	238	8	238	This sentence is unclear, please reverse the order of the conceptual frameworks so you don't refer at start of sentence to something that you mention only later. Suggestion: 'The conceptual framework of IPBES is more complex than the one used in the MA.'	We deleted this
Gunay Erpul	Ch.4	8	240	8	240	(green font in the IPBES framework) Is this proper reference to IPBES - CF?	We deleted this
Thomas Brooks	Ch.4	8	240	8	240	Delete "western" - scientific concepts are not just relevant in the "west".	We deleted this
Sigrid Kusch	Ch.4	8	241	8	242	Repetition/duplication "nature's contributions to people (nature's contributions to people)"	We deleted this
Gunay Erpul	Ch.4	8	241	8	242	Why is this term "nature's contributions to people" repeated within paranthesis (NCP)?	Because we want to get the reader accustomed to this abbreviation, we use NCP about 80 times and write it out 60 times (mainly in headings and introductions to sections and Ex Summary)
ECA values liaison group	Ch.4	8	241			edit the text to avoid repetitions	We deleted this
Kristina Raab	Ch.4	8	243	8	245	Unclear sentence. Suggestion: "...indirect drivers affect changes in nature (biodiversity and ecosystems) in an indirect way, but directly govern ...". You could consider italicising indirect and directly as I just did, but it is not necessary.	Has been revised
Finnish Government	Ch.4	8	243	8	243	"co-produce these contributions" what does this mean?	For example, some legal restrictions may reduce NCP to certain groups of people and some non-material contributions of nature are co-produced by people and nature (Diaz et al., 2015). (4.2.2)
Marie Stenseke	Ch.4	8	246			delete "e.g. Cultural services". Not necessary, since NCP is defined in the report	Deleted
ECA values liaison group	Ch.4	8	247			edit the sentence as follows; 'In this chapter, we focus on the effects of direct drivers on nature and nature's contributions to people and thereby on quality of life'	We have tuned down "Quality of Life" since the reviewed literature on drivers hardly focuses on this. We have changed the title of the chapter accordingly.
Marie Stenseke	Ch.4	8	251		268	The two paragraphs are not consistent. The second one, humans as parts of nature, is in line with contemporary research perspectives in social science and humanities (e.g Latour, B. (1993). We have never been modern. Cambridge: Harvard University Press. Head L (2008) Is the concept of human impacts past its use-by date? The Holocene 18: 373-377, Cronon 1995, ed., Uncommon Ground: Rethinking the Human Place in Nature, New York: W. W. Norton & Co.) Change the text in the first paragraph accordingly.	Changed.
Gunay Erpul	Ch.4	8	258	8	260	1st and 2nd part of the sentence may be harmonized as such "climate change and its effects on land use change "	Changed.
Kristina Raab	Ch.4	9	270	9	270	The message you try to convey with this box is not clear to me, despite the prompt in the first sentence. I think it would benefit from a clear/clarifying summarizing statement at the end of the box relating your message back to the 1st paragraph.	We have clarified this
Kristina Raab	Ch.4	9	270	9	270	Box: 2nd to last para, 2nd line: '(lichens)' is not a vegetation condition. Please rephrase to 'for lichens' without parentheses.	Well, lichens are ground vegetation conditions for reindeer grazing.
Finnish Government	Ch.4	9	275	11	332	Chapter 4.1.5.1: It could be considered or discussed, how meaningful it is to calculate climatic averages over so different, fragmented, and irregularly-shaped areas..? Also, how it is justified that for example boreal and temperate forests are treated as the same ecoregion?	this section has been much shortened, and is this comment now refers to the new section 4.2.6.1., where a sentence on this has been added.
Mark Rounsevell	Ch.4	9	277	9	278	Need to state why.	is given in same sentence
Gunay Erpul	Ch.4	9	293	9	293	assessclimate (assess climate)	shortened, gone
Kristina Raab	Ch.4	10	289	10	290	Here' : it is unclear to me what this refers to, please clarify	shortened, gone
Kristina Raab	Ch.4	10	291	10	291	The first sentence of this paragraph is repetition from previous page. Please start afresh here. Suggestion: 'Assessing trends in climate change drivers was a challenge.' No need to refer back to previous sections.	shortened, gone
ECA values liaison group	Ch.4	10	293			edit the text to avoid repetitions	shortened, repetitions removed
Finnish Government	Ch.4	10	293	10	293	assess climate	shortened, gone
Mark Rounsevell	Ch.4	10	304	10	308	Perhaps just refer to Ch5 here?	Not possible, as we extracted climate information for mapping trends from CMIP5 ensembles.
Finnish Government	Ch.4	10	304	10	304	remove "provided by and"	moved to 4.2.6.1., shortened
Finnish Government	Ch.4	10	306	10	306	remove "as scenarios"	shortened
Finnish Government	Ch.4	10	307	10	308	...however, the most significant differences will be visible only during the last half of the century.	this is not part of this assessment
Mark Rounsevell	Ch.4	10	321	10	323	This sentence doesn't make sense to me	shortened, improved
Finnish Government	Ch.4	10	322	10	322	...scenario WERE included...	corrected
Kristina Raab	Ch.4	11	328	11	328	equivalent information for the marine environment is missing, please add.	now included in, but in chapter 1.
Finnish Government	Ch.4	11	328	11	329	Map includes larger area than ECA.	now corrected
Finnish Government	Ch.4	11	328	11	329	"...biomes, based on the terrestrial.....(Olson et al. 2001), and reclassified..."	shortened, no longer relevant
Amor Torre-Marín	Ch.4	11	329	11	329	When referring to IPBES units of analysis please replace the term 'biome' by unit of analysis (in all the chapter)	done!
Finnish Government	Ch.4	11	331	11	332	The text is very short and gives limited information	Methods for Indirect drivers has been changed completely.
Mark Rounsevell	Ch.4	12	335			ECA region?	Methods for indirect drivers has been changed completely.
Kristina Raab	Ch.4	12	336	12	336	lines 336 and 339 Numbers are missing 'xx'	Deleted
Mark Rounsevell	Ch.4	12	339			How many?	Deleted
Mark Rounsevell	Ch.4	12	345	12	360	Put in a box, or in an annex?	We have finally deleted this.
Germany	Ch.4	12	345	12	360	The list of abbreviations might be better placed e.g. in an appendix.	We have finally deleted this.
Jean-Paul Hettelingh	Ch.4	13	383		384	Land cover change can be independent of landuse, but e.g. Caused by excessive deposition of nitrogen (grasses becomes hedges; heather becomes grass etc"). The NCP impacts of the change of landcover could use more attention, since it implies governance and decision making (ch 6) that should operate via air pollution abatement conventions and regulations.	We developed this section and deleted land cover change as a direct driver sub-category and instead integrated it into the other sub-categories

Marie Stenseke	Ch.4	13	383	14	413	Water use change is missing; aquaculture, recreation activities, shipping, marinas, harbours, marine wind power, nwnwith consequences not only by pollution and extraction but also by taking away living environments, disturbing by noise and occupying space etc.	We admit that we did not assess all possible sub-categories of direct drivers. We assess coastal changes as part of urbanisation in KM3 in ExSum; in relation to desalination (4.4.3.1); sediment extraction (4.4.4.2); Coastal urban development in The Mediterranean in a new section (4.5.6)
Markus Fischer	Ch.4	13	384	13	386	This needs to be stated explicitly as a key message in the exec sum (were currently climate change is more prominent)	Done
Kristina Raab	Ch.4	13	394	13	399	Great to have a clear definition here. I assume though that the term has been used or defined earlier though. Is there a policy on when/how to define terms? (e.g. defining at first use, or reiterating each time, or referring to glossary)	Yes, we use this section to define drivers and sub-drivers.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	14	412	14	412	Correct date from 2015 to 2016. Also line 6640.	This part has been radically shortenend
Thomas Brooks	Ch.4	14	412	14	412	Correct date from 2015 to 2016. Also line 6640.	corrected
Kristina Raab	Ch.4	15	343	15	343	Something seems to me to be missing to explain why this information was just stated... 'Hence, we do the same as the G & L reference just mentioned, or however, we do it differently' something like that - linking it to your own work here.	This part has been radically shortenend
UK: Karsten Schonrogge	Ch.4	15	384	15	386	Some reference of what "stable" should mean in the context would be good. Eurostat talks about a steady increase in roundwood production between 1995 - 2007 within the EU28. After a drop during the financial crisis roundwood production apparently jumped by 10.1% (http://ec.europa.eu/eurostat/statistics-explained/index.php/Forestry_statistics)	We address the issue of Domestic Material Consumption and how it has not decreased except for the financial crisis in both ExSum and 4.4.4.
Gunay Erpul	Ch.4	15	426	15	434	SOC enhancement and maintenance of soil biodiversity increase the resilience of the soil for food production, especially its ability to withstand disruption due to human-induced climate change.	Yes. Not clear how we should revise text...
Gunay Erpul	Ch.4	15	426	15	434	Increasing land use intensity and associated soil organic matter loss are placing the greatest pressure on soil biodiversity, and numerous studies report soil biodiversity declines as result of the conversion of natural lands to agriculture and from agricultural intensification	Yes. Not clear how we should revise text...
Marie Stenseke	Ch.4	15	440		442	Drivers as frictions has to be included in the reasoning (see e.g. Beilin, et al. 2014 (already in the list of references) and Eiter, S. & Potthoff, K., 2007. Improving the factual knowledge of landscapes: Following up the European Landscape Convention with a comparative historical analysis of forces of landscape change in the Sjødalen and Stølsheimen mountain areas, Norway. Norwegian Journal of Geography Vol. 61, 145-156)	We have read that drivers can be classified into pressures, frictions and attractors but we did not use this classification in this general assessment of 20 odd driver categories...
Markus Fischer	Ch.4	15	443			"...more or less...": Be more specific	Has been revised
Marie Stenseke	Ch.4	15	446			ILK traditions, norms and beliefs must not be mentioned as a category of its own - included in the first bullet: Values, beliefs, social norms. If there should be a specific ILK- bullet, it needs to be better expressed in what way that differs from other humans (we all have norms and beliefs)	Done
PESC-4: Levon Aghasyan	Ch.4	Ch.4		15	447	Subpoint under Scientific & technological indirect drivers in table 4.3 should more explicitly include non-technological solutions too. So e.g. 'New solutions including technologies' or 'Nature, social and technology-based solutions'. An example we discussed were advances in anti-venom medicines (which allows for fewer preventive killings of snakes for instance), or new vaccine developments. But incentives and insights into behaviour could also be relevant.	Thanks. We changed to "innovation"
PESC-4: Kristina Raab	Ch.4	15	447	15	447	Subpoint under Scientific & technological indirect drivers in table 4.3 should more explicitly include non-technological solutions too. So e.g. 'New solutions including technologies' or 'Nature, social and technology-based solutions'. An example we discussed were advances in anti-venom medicines (which allows for fewer preventive killings of snakes for instance), or new vaccine developments. But incentives and insights into behaviour could also be relevant.	Thanks. We changed to "innovation"
Mark Rounsevell	Ch.4	16	462			Converted to what?	Deleted
Kristina Raab	Ch.4	17	499	17	499	The explanation of urbanisation and migration is missing - you mention a list of factors at the start of the paragraph but detail only some, and skip urbanisation and migration (mentioned in line 493-4). Please make this consistent.	We made these paragraphs shorter. Urbanisation and migration are mentioned more under 4.3.3.
Kristina Raab	Ch.4	17	506	17	506	The reference seems a little odd to explain the concept of culture, (title: Anthropogenic drivers of ecosystem change), is there a reference you could use that specifically addresses this concept?	This is developed later. Here is just a definition
Kristina Raab	Ch.4	17	506	17	506	please add 'and genders' to the list of where cultures can emerge and can be mixed among. (so before 'along')	OK
PESC-4: Kristina Raab	Ch.4	17	514	17	529	Section currently focuses on 'technology' rather than 'science and technology' in general. Please strengthen the science part. Also the reference from the 70s is likely out of date and a more recent overview should be included.	Innovation in medicine and agriculture is sometimes referred to as "technologies". We have included the role of institutions here, as well as transformation to a green economy.
Kristina Raab	Ch.4	17	518	17	521	there seems to be a contradiction in this paragraph: 'technology is neither good nor bad' (hence one might infer: neutral) and later it says 'technology is not neutral'. Can you maybe clarify this?	Thanks. We have clarified that technology CAN BE SEEN as neither good or bad
Jean-Paul Hettelingh	Ch.4	17	543			Pollution in this Figure 4.3. is not linked to "land cover change" which is well established as consequence of excessive nitrogen deposition/nutrient input (well described in para 4.6 p. 112 and following; Aichi 8). It is recommended to complete Fig. 4.3 to relate between biodiversity and NCM targets addressed in this report (entities of Fig. 2.1 ?)	This Figure has changed.
Mark Rounsevell	Ch.4	18	453	18	454	I think you're missing an important arrow here from 'economic drivers' to 'demographic drivers' and not just the other way around. For example the economy affects birth rates, death rates and migration, which are central to demography. Also, don't demographic drivers affect cultural drivers, e.g. the effect of age profile on cultural appreciation?	Yes, we have informed the graphic designer about this, hope it comes through.
Markus Fischer	Ch.4	18	453	18	454	Give reference of state that this summarises the text.	OK
Marie Stenseke	Ch.4	18	541		542	Some arrows seems to be missing: in the upper left box arrows from economic drivers, institutional drivers and Science & technology drivers to cultural drivers. In the bottom left box: one arrow from invasive species to land use change, and arrows from natural resource extraction as well as pollution to land use change. Overall, the arrows needs, however, to be based on scientific literature.	Well, we see Cultural drivers as the fundamental indirect driver of ecosystem change. We try to include only the most important arrows.
Kristina Raab	Ch.4	18	542	18	542	You could add the words 'Direct' and 'Indirect' beside the boxes in the figure to make the figure more clear for visual people.	Done
Sigrid Kusch	Ch.4	20	608	20	612	It is stated: "However, substantial trade-offs may result from a lack of mainstreaming." It is not clear what that means (mainstreaming?). And the relevance to the information provided in the next sentence is particularly unclear. The cited literature "Gutzler et al. 2015" is missing in the reference list, therefore it is not possible to check what the assumptions of that assessment is and if at all this is still update. Note that policies on renewable energies have changed in Germany, and while previously the EEG strongly encouraged growth of energy crops, thus affecting biodiversity, this has now undergone changes.	We have clarified "mainstreaming" under 4.2.2 and added more refs here. Policies for renewable energy have changed, yes, but the pressure and tradeoffs persist.
Germany	Ch.4	20	608	20	614	"However, substantial trade-offs may result from a lack of mainstreaming." This statement is too simplistic and does not reflect the actual situation correctly. We request a revision as follows: However, in particular with regard to the cultivation of biomass crops potential detrimental effects can result in land use change, substantial reduction in biodiversity, increased soil erosion risk and need for increasing efforts for ground water protection and restoration. Besides which, projected food demand and droughts are likely to increase irrigation which may cause water conflicts (Gutzler et al. 2015). Hence, the contribution of biomass cultivation to the climate protection and sustainability goals is very limited. This is not true, however, for the usage of residual and waste material such as manure and garbage for energy production.	Thanks, we developed this argument
Germany	Ch.4	21	617	22	680	(Indirect) Economics Drivers - this is a summary of various analyses / views, which is already known. Additionally, the transition between the paragraphs are not very smooth, maybe due to the fact, that different people worked on this section. Overall, this section could be a bit more in detail, with more examples and the definition of economic drivers is partly inefficient (also in Chapter 4.2.2.)	This has been developed
Germany	Ch.4	21	618	21	619	It is beneficial to mention somewhere, that the decrease in material intensity is beneficial... for a non economist, this is not always apparent / obvious.	Yes, we do this more in the Third Order Draft
Germany	Ch.4	21	618	21	631	It is also important to recognize the "Rebound Effect", since a decrease in material intensity or increase in energy efficiency could result in such problems.	We do several times, 4.2.2 and 4.3.2

Germany	Ch.4	21	618	21	634	Energy and resource efficiency is not the same and should be treated separately. This also applies to the relationship between resource efficiency and material intensity. Please clarify the differences and the similarities	Agree. We focus on resource efficiency, mentioned 11 times. Energy efficiency is mentioned mainly in 4.4.4 as one aspect of resource efficiency policies.
Germany	Ch.4	21	628	21	631	It might be useful to explain the material flow account and input output models, to illustrate the movement and ratio of materials.	Well, we have no space to describe the models for how to measure this. We use Eurostat as ref.
Germany	Ch.4	21	638	21	646	The environmental kuznets curve is a hypothesis explaining the relationship of income per capita and the environmental degradation. You might consider this here as well.	We have developed the section on decoupling and rebound effect, but not in terms of the Kuznets curve
Germany	Ch.4	21	638	21	646	some dematerialization / decoupling examples would be interesting to allow readers to easier grasp the concept.	We expand on this in KM2, 4.2.2 (agriculture as example); 4.3.2 (CO2 and taxes as example); and 4.4.4.3 (resource decoupling).
Mark Snethlage	Ch.4	21	644			"Indeed, decoupling must not only be absolute (decrease in absolute terms), but also decrease sufficiently to meet the environmental SDGs (Raworth, 2014)." From the phrase, not quite clear what needs to decrease: the decoupling or the resource use	Changed to: "... However, GDP growth will have a negative effect on ecosystems unless countries succeed in absolute decoupling, sufficiently large to achieve the environmental SDGs. Relative decoupling, where resource use increases, but at a slower pace compared to GDP, is no longer an option except for low-income countries (Raworth, 2017). "
Mark Rounsevell	Ch.4	22	674			"...The financial sector is a profound driver of biodiversity loss...": Is this mentioned in the Exec Sum and SPM?	No it's not a robust finding
Marie Stenseke	Ch.4	22	681	24	741	In 4.3.3 also has to elaborate on the mobile character of the contemporary society, and not ust treat humans as permanent residents. There is a lot of temporary migration, be it for commuting, recreation and tourism (with long stays in secondary homes in other parts of the ECA regoin), seasonal or long-term labour migration or begging	We found no literature on how temporary migration and commuting affect biodiversity. However we have some text on urbanisation and tourism, see my replies above.
Mark Rounsevell	Ch.4	23	701			Need to cross-check against the figures given in Ch1	Please do, we have not.
Markus Fischer	Ch.4	23	716	23	729	Lacks referencs	Have been revised
Marie Stenseke	Ch.4	24	753		758	Adjust to the IPBES vocabulary on NCP	Done
ECA values liaison group	Ch.4	24	753	24	758	It is proposed to elaborate this text as follows, to express that "relational" is broader than only recreation: An emerging opportunity/potential for the valuing of biodiversity beyond the recognition of the provisioning of ecosystem services relates to the increasing focus on recreation and eco-tourism in Western Europe. This increasing focus has become a driver for a more heterogeneous landscape, pushing forward institutional change and the acquisition of economic subsidies (Hahn et al., 2017). Eco-tourism implies the protection of biodiversity and is expected to be protective of biodiversity albeit only part of the relational power of nature's benefit to people (Navarro and Pereira, 2012; Beillin, et al., 2014). Beyond eco-tourism the increasing popularity of spiritual refreshment and other spiritual experiences have considerable potential for the recognition of nature's contribution for people. See also other aspects of relational values and good quality of life in chapter 1 and check for consistency	Thanks! We have revised this
Marie Stenseke	Ch.4	24	755			The statemen of tourism making landscapes more heterogeneous is contradicted by much tourist research, which instead claims that tourism has a homogenizing effect (Urry 2002, The Tourist gaze, SAGE Publications, Terkenli, T. S. (2004). Tourism and landscape. A companion to tourism, 5, 339.)	Have been revised. It is not tourism per se that we discuss here (because that has negative effects on bd), but the cultural driver.
Mark Snethlage	Ch.4	24	755			Not clear from the paragraph what the positive effects of tourism may be, and the negative effects (more infrastructure, water / resource use, disturbance) associated to increasing tourism and recreation not mentioned.	Have been revised (see answer above)
Germany	Ch.4	24	760	24	760	Please explain the equation $I=P^*A^*T$.	done
Kristina Raab	Ch.4	24	760	24	760	This equation has been mentioned before but without definition - could you check that it is explained at first mention and maybe refer to the definition here ?	OK
Kristina Raab	Ch.4	25	771	25	771	unclear. Suggestion: Institutional and economic drivers (policies, research funding, taxes)...	Have been revised
Kristina Raab	Ch.4	25	776	25	783	What is this text for ? If it is intended as an example, please make this more clear.	Have been revised. Beliefs in what is progress are cultural drivers.
Sigrd Kusch	Ch.4	26	797	26	802	This paragraph is somewhat misleading or/and difficult to follow. First the information refers to the Ecological Footprint, then the text turns to consumption of materials, and Europe needing to import resources. Note that today the largest share of the Ecological Footprint is the integrated Carbon Footprint, caused by CO2 emissions.	This has been shortened and revised, some moved to 4.4.5.
Jean-Pierre Arnauduc	Ch.4	26	803	26	806	Under the generic term of "hunting", Maxwell's paper include poaching, unsustainable hunting (overexploitation) and the collection of specimen for trade. This discredits the sustainable hunting. I propose to add the following sentence at the end of the paragraph (line 806): "Here the generic term "hunting" includes poaching, unsustainable hunting and collection of specimen for traffic and trade of species."	This has been revised drastically
ECA values liaison group	Ch.4	26	804			edit the text to avoid repetitions	Done
Jean-Pierre Arnauduc	Ch.4	26	805	26	805	Strictly speaking, in reading the article, it's the addition of these 3 activities which form a "considerable therat". So, replace "are" by : "altogether is"	Changed to: Still, hunting, fishing and mining together pose a considerable threat to biodiversity (Maxwell et al., 2016).
Jean-Pierre Arnauduc	Ch.4	26	818	26	820	Sustainable biotic extraction doesn't cause natural ressource loss/depletion: replace "Natural resource extraction" by: "Overexploitation of natural resource"	We disagree. It is difficult to draw the line and say that some fish stocks are sustainably fished one year because the next year it may not. All drivers are not "bad" e.g. some land use change is good (e.g. P.A.)
Germany	Ch.4	26	818	26	818	"Natural resource extraction causes depletion of natural resources..." Even though on p. 13, line 372-373, you give an explanation for using the term 'natural resource extraction' instead of 'over-exploitation', this sentence on p. 26 reads a bit ambiguous since natural resource extraction does not necessarily lead to depletion of natural resources. To make it less ambiguous in this context, you might want to include 'may': "Natural resources extraction may cause depletion of natural resources..."	Thanks. Has been changed to "Natural resource extraction may result in depletion of natural resources"
Kristina Raab	Ch.4	26	820	26	820	These two feedback loops are unclear in figure 4.4	Has been revised
PESC-4: Rainer Schliep	Ch.4	27	827	27	827	Figure 4.4: Text states that two important feedback loops (line 820) are illustrated by this figure. But from the figure, it is difficult to find these. In general, it would be nice to cluster the contents of the loop ... it might make it easier to understand.	Has been revised
PESC-4: Kristina Raab	Ch.4	27	827		827	Figure 4.4: Text states that two important feedback loops (line 820) are illustrated by this figure. But from the figure, it is difficult to find these. In general, it would be nice to cluster the contents of the loop ... it might make it easier to understand.	Has been revised
PESC-4: Jonas Geschke	Ch.4	27	827		827	Figure 4.4: Text states that two important feedback loops (line 820) are illustrated by this figure. But from the figure, it is difficult to find these. In general, it would be nice to cluster the contents of the loop ... it might make it easier to understand.	Has been revised
PESC-4: Frederic Lemaitre	Ch.4	27	827		827	Figure 4.4: Text states that two important feedback loops (line 820) are illustrated by this figure. But from the figure, it is difficult to find these. In general, it would be nice to cluster the contents of the loop ... it might make it easier to understand.	Has been revised
PESC-4: Rainer Schliep	Ch.4	27	827	27	827	The terminology in figure 4.4 is not very clear for readers either. What is 'material intensity of GDP' and the relationship between globalisation and delay is not clear either. It seems more like a mindmap than a clear figure for a global audience to understand.	Figure has been simplified and the text explains it
PESC-4: Kristina Raab	Ch.4	27	827		827	The terminology in figure 4.4 is not very clear for readers either. What is 'material intensity of GDP' and the relationship between globalisation and delay is not clear either. It seems more like a mindmap than a clear figure for a global audience to understand.	Figure has been simplified and the text explains it
PESC-4: Jonas Geschke	Ch.4	27	827		827	The terminology in figure 4.4 is not very clear for readers either. What is 'material intensity of GDP' and the relationship between globalisation and delay is not clear either. It seems more like a mindmap than a clear figure for a global audience to understand.	Figure has been simplified and the text explains it
PESC-4: Frederic Lemaitre	Ch.4	27	827		827	The terminology in figure 4.4 is not very clear for readers either. What is 'material intensity of GDP' and the relationship between globalisation and delay is not clear either. It seems more like a mindmap than a clear figure for a global audience to understand.	Figure has been simplified and the text explains it

ECA values liaison group	Ch.4	27	830	28	847	There is nothing about effects of fishing as a direct driver on NCP. The text is very general without any references to a specific sub-region. It is mainly about ecological and economic valuations; nothing effects of finishing on social and cultural values.	Well, fish is a NCP. We have improved the text on effects.
Mette Skern-Mauritzen	Ch.4	27	836	27	838	More recent literature should be added to this paragraph, see for instance Kjesbu et al. 2014; PNAS	We have updated references
ECA values liaison group	Ch.4	28	849	28	869	The text is only about the EU; trends for EE, CE and CA are absent.	Yes, it was difficult to get information. We have added info on harmful subsidies for Russia
Mette Skern-Mauritzen	Ch.4	28	859	28	859	Suggest add to this paragraph: Nevertheless, more stocks are recovering, and te combined effects of climate warming and reduced fishing mortalities have resulted in record large stocks of e.g. mackerell in the Norwegian Sea, plaice in the North Sea and cod in the Barents Sea. The recovery of these major stocks are now impacting other parts of the ecosystems through both predation and competition. For instance, a recent collapse in the capelin stock in the Barents Sea was likely partially due to cod predation (ICES 2016, WGIBAR report), and competition with cod likely impacts the condition of marine mammals (Bogstad et a. 2016)	Thanks! Difficult to find the ref Bogstad et al 2016 on google scholar
Kristina Raab	Ch.4	28	862	28	865	a crucial inference is not stated here, please make it explicit. "Therefore the pressure on wild species is not decreased by increasing aquaculture" (currently too implicit for non-experts)	We think this is clear
ECA values liaison group	Ch.4	29	874	30	925	Terminology related to indirect drivers is inconsistent. Presented drivers of change in fishing are limited mainly to economic value of fish. Nothing about ILK related to fishing. Nothing about specific drivers by sub-regions, the text is mainly about WE	Has been revised. But ILK still missing, true.
Germany	Ch.4	29	889	29	892	"... political decision makers tend to ignore the scientific advice, ..." "Ignore" is a rather judgemental word (see also line 901, same page: "... unwillingness of governments..."). Might it not also be due to e.g. a lack of communication, mutual understanding or alternative sustainable courses of action? You might want to check the wording.	Has been revised
Kristina Raab	Ch.4	29	899	29	899	Which negative feedback loops are you referring to here ? Please clarify	Has been revised
Markus Fischer	Ch.4	30	906			Add ref or mention it summarises/is based on text of section xxx.	Done
PESC-4: Kristina Raab	Ch.4	31	926	37	1165	The balance between mineral extraction (section 4.4.4, p37, line 1165) and hunting (section 4.4.2 p 31 line 926) is off (disproportionate, too much detail on hunting compared to the effects mineral extraction has on biodiversity)	Has been reversed. Less hunting, more mining
Jean-Pierre Arnauduc	Ch.4	31	927	31	927	Add below line 927 a warning as follows: the term "hunting" is considered here only in terms of the harvest (pression) and cannot embrace hunting as a whole, in its other dimensions, including practices and actions of conservation carried out by the community of hunters, particularly for the protection and management of the habitats of the species, the fight against artificial mortalities, against invasive alien species etc...	Has been revised completely
ECA values liaison group	Ch.4	31	927	32	966	Nothing about effect of hunting on NCP	Has been added: "Management hunting also provides material (meat) and non-material contributions to people, for example by maintaining traditions and promoting social relations (A. Fischer et al., 2013).
Jean-Pierre Arnauduc	Ch.4	31	929	31	931	Delete this paragraph because it is a faithful, or even erroneous, reporting of Vié's article (overexploitation in the article includes many other practices that hunting or poaching, the second position of overexploitation in the threats is not true for birds or concerns only the area Mediterranean etc...)	Has been revised completely
Jean-Pierre Arnauduc	Ch.4	31	935	31	936	this sentence is incoherent with the one in lines 930-931 (birds). Scientific publications are informative on this topic: 1 Ecological factors and human threats both drive wildfowl population declines; P. R. Long, T. Szekely, M. Kershaw & M. O'Connell, Animal Conservation 10 (2007) 183–191 - 2); Common birds facing global changes: what makes species at risk? ROMAIN J U L L I A R D , FRE' DE' R I C J IGUET and DENIS COUVERT; Global Change Biology (2003) 10, 148–154,	Has been revised completely
Jean-Pierre Arnauduc	Ch.4	31	936	31	943	Very old data, not relevant today (1976, 1990). The only sale of ammunition is not a sufficient indicator of harvest because it includes ammunition for skeet shooting	Has been revised completely
Marie Stenseke	Ch.4	31	949		950	Delete the sentence on North Africa - the content can be added to the section on telecoupling	Removed
ECA values liaison group	Ch.4	32	968	32	1002	More about poaching – trends across ECA? Traditional hunting – trend?	Added: "This is also the focus in indigenous or subsistence hunting where cultural identity is emphasized. However, there are signs that indigenous or subsistence hunting is declining, for example in traditional communities in Faroe Islands due to the changing cultural values of younger generations (Nieminen, Roto, & Syrjämäki, 2004).
Jean-Pierre Arnauduc	Ch.4	32	975	32	978	delete the sentence: "many species.....EU Commission 2005)": First, EU Commission himself doesn't recommend hunting ban in case of species in unfavorable conservation status, but recommend management plans that involve hunter community ("It is, of course, generally not advisable to subject such species or populations to hunting, even if hunting is not the cause of or contributing to their unfavourable conservation status. However, allowing hunting of species can provide a strong incentive to manage habitats and address other factors contributing to population decline, therefore contributing to the objective of restoring populations to favourable conservation status." p.23-24 Hunting Guide: http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/docs/hunting_guide_en.pdf . Second, this is contrary with IUCN and CBD's resolutions and recommendations (IUCN: recommendation 18.24 (Perth, 1990), resolution 2.29 (Amman, 2000), resolution WCC 2012-092 (Ijeju, 2012) - CBD: decision VII/12 - 2004)	Done. Changed to "Hunter associations are powerful interest groups in many countries and the governance trend is to foster stewardship and sustainable management hunting for vulnerable species rather than imposing hunting bans
Jean-Pierre Arnauduc	Ch.4	32	983	32	983	erroneous: Ortolan bunting, golden plovers, turtle doves and quail are not allowed, and were not in 1990's and 2005's, in France for selective trapping. More, this practices are all perfectly legal by the EU Birds directive	Unclear what is meant here. Is hunting allowed or not?
Jean-Pierre Arnauduc	Ch.4	32	996	32	998	it's not an "increase in hunting pressure" because it's corresponds with exponential increase in populations of cervus elaphus, sus scrofa, capreolus capreolus....This sentence must be delete or corrected	Has been changed
ECA values liaison group	Ch.4	32	1003	33	1038	Check if all five groups of indirect drivers are covered	We assess what we find in the literature review and Institutional drivers are most common. But also demographic and of course cultural
Jean-Pierre Arnauduc	Ch.4	33	1016	33	1018	this sentence is unacceptable. Where are yhe sources? Hunter community is normally associated in governance by public authorities as it is for other ONG. This is democracy.	Has been changed. See above
Jean-Pierre Arnauduc	Ch.4	33	1019	33	1022	delete this sentence because is it not supported by the sources listed: Verissimo's paper is just for Malta and Vickery's paper says: "However, although the effects of hunting on some species may well be considerable, particularly in the eastern Mediterranean, it is probably not an important driver of declines for a large number of A-P migrants."	Changed to: "Tensions between hunters and anti-hunting groups have escalated, e.g. in Malta, with rural surveillance systems and local raids by anti-hunting groups, physical fights between anti-hunting activists and hunters or poachers, use of drones for observations, and police or army interventions (Verissimo & Campbell, 2015).
ECA values liaison group	Ch.4	34	1042	36	1104	Nothing about effect of water use on NCP. Include water grabbing in CA?	Well, water use is a main NCP.

PESC-4: Susanna Hakobyan	Ch.4	34	1044	34	1055	Caucasus: e.g. Small Hydro Powerplants (for renewable energy), don't allow fish migrations, and also cause seasonal drying up of small rivers. See for example: 1.Saulius Stakenas, Kęstutis Skrupskelis., IMPACT OF SMALL HYDRO-POWER PLANTS ON SALMONID FISHES SPAWNING MIGRATIONS., Science – Future of Lithuania / Mokslas – Lietuvos Ateitis, 2009, 1 tomas, Nr. 4, pp.80-85 2.Hakobyan S.H. Assessment of spawning conditions of endemic fish species in major tributaries of Lake Sevan. European River Restoration Conference Austria, Vienna ,11-13 September, 2013.	Thanks, however, we did not include this example since we did not include hydropower as sub-driver (no time to assess all possible sub-drivers)
PESC-4: Susanna Hakobyan	Ch.4	34	1056	35	1056	The Ararat Valley in Armenia represents a highly strategic reserve of quality groundwater resources, which to-date remain suitable for drinking purposes without additional treatment. Benefiting from these high quality resources, a significant number of private fish farms have developed over the last decades in the Ararat Valley, with rainbow trout and the Siberian sturgeon being the most common species produced. However, increasing the number of fish farms has led to an increase in the volumes of groundwater abstraction. Among different major impacts of unregulated and unsustainable groundwater abstraction in the Ararat Valley during the period of intensive fishery industry development was the decreased groundwater availability from wells and many communities have been partially or totally left without access to irrigation and/or drinking water. The RA Law on National Water Program was amended in 2015, establishing the safe rate of groundwater abstraction in the Ararat Valley at 1.1 billion cubic meters per year.The following additional relevant regulations were adopted during the period of 2013-2016 by the Government of Armenia. See Protocol Decree N 23 of May 27, 2015 "ON APPROVING STRATEGY AND NATIONAL ACTION PLAN TO COMBAT DESERTIFICATION IN THE REPUBLIC OF ARMENIA	Nice story but not included
PESC-4: Susanna Hakobyan	Ch.4	34	1062	34	1064	The Ararat Valley in Armenia represents a highly strategic reserve of quality groundwater resources, which to-date remain suitable for drinking purposes without additional treatment. Benefiting from these high quality resources, a significant number of private fish farms have developed over the last decades in the Ararat Valley, with rainbow trout and the Siberian sturgeon being the most common species produced. However, increasing the number of fish farms has led to an increase in the volumes of groundwater abstraction. Among different major impacts of unregulated and unsustainable groundwater abstraction in the Ararat Valley during the period of intensive fishery industry development was the decreased groundwater availability from wells and many communities have been partially or totally left without access to irrigation and/or drinking water. The RA Law on National Water Program was amended in 2015, establishing the safe rate of groundwater abstraction in the Ararat Valley at 1.1 billion cubic meters per year.The following additional relevant regulations were adopted during the period of 2013-2016 by the Government of Armenia. See Protocol Decree N 23 of May 27, 2015 "ON APPROVING STRATEGY AND NATIONAL ACTION PLAN TO COMBAT DESERTIFICATION IN THE REPUBLIC OF ARMENIA	Nice story but not included
PESC-4: Bakhtiyor Karimov	Ch.4	35	1037	35	1037	Pollution can affect ground water and underground (i.e. even deeper) waters, and aquifers. Overall, groundwaters were associated with much higher health risks than surface waters. Health risks can therefore increase considerably, if the downstream population must switch to groundwater-based drinking water supplies during surface water shortage. This issue should be reflected in IPBES assessment. See Tornqvist, R., Jarsjö, J., B. Karimov. Health risks from large-scale water pollution: Trends in Central Asia. Environment international, 37(2), 435-442, doi:10.1016/j.envint.2010.11.006, 2011.	Belongs to Pollution.
PESC-4: Susanna Hakobyan	Ch.4	36	1105	37	1164	Hydropower plants and aquatic (fluvial) habitat fragmentation are not mentioned at all (only freshwater use and salinisation are mentioned). Please include this as subsection in 4.4.3.2 p36. under section 'drivers trends in water use and desalination': biodiversity costs of 'integrated water management'. 'water use from energy production' (e.g. damming). This topic is very important and sensitive for transboundary issues. See for example the Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014.	Unfortunately we lacked the resources to include hydropower. We also have a word limit...
PESC-4: Kristina Raab	Ch.4	36	1105	37	1164	Hydropower plants and aquatic (fluvial) habitat fragmentation are not mentioned at all (only freshwater use and salinisation are mentioned). Please include this as subsection in 4.4.3.2 p36. under section 'drivers trends in water use and desalination': biodiversity costs of 'integrated water management'. 'water use from energy production' (e.g. damming). This topic is very important and sensitive for transboundary issues. See for example the Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014.	Thanks, however, we did not include hydropower as sub-driver (no time to assess all possible sub-drivers)
PESC-4: Kristina Raab	Ch.4	36	1105	37	1164	Hydropower plants and aquatic (fluvial) habitat fragmentation are not mentioned at all (only freshwater use and salinisation are mentioned). Please include this as subsection in 4.4.3.2 p36. under section 'drivers trends in water use and desalination': biodiversity costs of 'integrated water management'. 'water use from energy production' (e.g. damming). This topic is very important and sensitive for transboundary issues. See for example the Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014 and Forslund, A., et al. Securing Water for Ecosystems and Human Well-being: The Importance of Environmental Flows. Swedish Water House Report 24. SIWI, 2009.	Thanks, however, we did not include hydropower as sub-driver (no time to assess all possible sub-drivers)
PESC-4: Kristina Raab	Ch.4	36	1105	37	1164	The use of freshwater for energy production is missing from the freshwater section. Problem of effects of freshwater use for irrigation should be added to 4.4.3.2.1 Freshwater; and a complete new sub chapter under 4.4.3.2 should be added on use of freshwater for energy production. See Forslund, A., et al. Securing Water for Ecosystems and Human Well-being: The Importance of Environmental Flows. Swedish Water House Report 24. SIWI, 2009.	Unfortunately we lacked the resources to include hydropower. We also have a word limit...
ECA values liaison group	Ch.4	37	1150	37	1164	The trends in water use/consumption are not presented for EE and CA. See comments in the SOD text regarding moving some texts to another sections.	Added some countries. Difficult to find data
Mark Sneathage	Ch.4	37	1162		1164	Is this paragraph relevant for the section "Drivers of water use and desalination"?	Deleted
ECA values liaison group	Ch.4	37	1166	37	1181	Only one reference for the whole section - more references are needed. Effects on NCP are not covered Conflicts between mineral extraction and traditional land use are not covered More about energy mineral (coal and oil)	Section has been greatly expanded and focused on Central Asia where mining is widespread
Gunay Erpul	Ch.4	37	1170	37	1173	Loss of the biodiversity of soil??? soil biodiversity is immense compared to aboveground biodiversity: for example, ten grams of soil contains about 10 ¹⁰ bacterial cells of more than 10 ⁶ species. An estimated 360 000 species of animals are dwellers in soil. It has been estimated that the biodiversity of soil could make up as much as 25 percent of the total amount of described living species worldwide, although most of this diversity remains unknown.	We do not understand the comment.
ECA values liaison group	Ch.4	37	1182	39	1206	Done only for the EU – nothing about trends in EE and CA Trends in extraction of oil and coal are not covered	A lot on CA now
ECA values liaison group	Ch.4	39	1207	40	1229	Nothing for EE, CE and CA	A lot on CA now
Mark Rounsevell	Ch.4	39	1219	39	1222	Repeats what was said previously	has been revised
ECA values liaison group	Ch.4	40	1231	40	1260	Consider removing this whole 4.4.5 section – too general and mainly for the EU.	Thanks, we did. Only parts of it was kept under 4.4.4 Mineral extraction (since sand is also a mineral)
PESC-4: Rainer Schliep	Ch.4	42	1277	112	3396	Section 4.5 can be shortened and synthesised at sub-region level instead of national level a lot.	4.5 section was 50% shortened considerably, the synthesis was made on the sub-regional or regional levels.
Mark Rounsevell	Ch.4	42	1279			There's a lot of text here that overlap strongly with Ch1 and Ch3. Need to reduce considerably to avoid this.	The cross-chapters' issues were discussed among the relevant chapters and solved.
ECA values liaison group	Ch.4	42	1279	42	1388	Much text should be removed due to overlaps with Ch1 and Ch3 (see Mark's comments in the SOD text) Probably the whole section 4.5.1.1 could be moved from Ch4 to Ch1 or Ch3 The whole section on effects of land use change on biodiversity and NCP is absent in the current SOD; but CLAs and LAs are currently working on it.	Cross-chapter issues have been solves with Ch1 and Ch3
PESC-4: Sophiko Akhobadze	Ch.4	42	1279	46	1392	Please consider adding land productivity changes to the title and section contents: so 'Trends in land cover and land productivity change' (i.e. primary productivity), unless this is fully covered by the agriculture section already.	Land over change was removed from Ch4; this issue is presented in Ch1
Mark Rounsevell	Ch.4	42	1281	42	1289	This can be deleted, since it is covered in Ch1	Was deleted as was suggested
Ilija Gasan Osojnik Crnivec	Ch.4	42	1286		1287	Figure 4.8 - Is it possible to present this figure in a way that shows which of this change is positive (gain of foresta area) and which negative (foresta area loss)?	This figure was taken from the Forest Europé report; we can not make changes.

IPBES Knowledge and Data Task Force (KDTF)/ Task Group on Indicators (TGI)	Ch.4	42	1288	42		The graph of Forest area as a percentage of total land area can be replaced to the graph which TGI provided	This figure was taken from the Forest Europe report; we can not make changes.
Mark Rounsevell	Ch.4	42	1290	42	1296	Status and trends – delete?	Unclear. 4.5
Mark Rounsevell	Ch.4	43	1318	43	1322	Again, no need to discuss here as this is covered in Ch1 or C3	Was deleted as was suggested
Gunay Erpul	Ch.4	46	1375	46	1384	Soil sealing (soil sealing index) and the soil-related ecosystem services: In densely populated Western Europe soil sealing is one of the most threatening phenomena. The drivers are essentially economic and demographic growth. The ecosystem services that can be affected by soil sealing is on the production of biomass, and in particular of food. Also, water infiltration and purification and carbon storage are mainly reduced by the effective sealed area. Existing policies for development of settlements and infrastructure should be reviewed and adapted to take account of the value of soils, particularly where subsidies or other incentives are driving unplanned land take and soil sealing (Prokop, Jobstmann and Schöbauer, 2011).	This issue has not been captured.
Lisa P. Sousa	Ch.4	46	1375	46	1388	It could be interesting to update with data from Corine Land Cover 2012	No land cover change issue in Ch4 any more.
Markus Fischer	Ch.4	46	1385			Enlarge, hard to read	No land cover change issue in Ch4 any more.
Mark Rounsevell	Ch.4	46	1392			Again, point about Ch1 and Ch3 overlap	Was deleted
Gunay Erpul	Ch.4	48	1430	48	1441	Water erosion is active in all the cultivated mountainous and rolling areas; the worst situation is observed in Turkey, Tajikistan and Kyrgyzstan. Due to the attention paid to this threat it is controlled in most areas, especially in the EU.	Good point; however, we left just general meaning of this term.
Mark Snethlage	Ch.4	49	1472		1485	a bit confusing. Requires some grammatical polishing	The text was polished.
PESC-4: Rainer Schliep	Ch.4	49	1503	49	1505	Re 'Significant farmland abandonment': this depends on the distance to markets (e.g. in Caucasus). Private lands are not common everywhere---there must be a reason to cultivate the lands: pay for irrigation and machines etc, so if there is no market, the people will not do this. See for example: 1.Fourth National Report to the Convention on Biological Diversity Republic of Armenia, 2009 2.Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014	We refer to the most common trends and most common drivers. Unfortunately, it is hard to present diversity of all drivers that lead to farmland abandonment in the region.
PESC-4: Susanna Hakobyan	Ch.4	49	1503	49	1505	Re 'Significant farmland abandonment': this depends on the distance to markets (e.g. in Caucasus). Private lands are not common everywhere---there must be a reason to cultivate the lands: pay for irrigation and machines etc, so if there is no market, the people will not do this. See for example: 1.Fourth National Report to the Convention on Biological Diversity Republic of Armenia, 2009 2.Fifth National Report of the Republic of Armenia to the Convention on Biological Diversity, September 2014	Thanks
Mark Snethlage	Ch.4	52	1607			Ukraine is actually the fifth largest country in the ECA region: (1) Russia 17,098,246 km2; (2) Kazakhstan 2,724,900 km2; (3) Turkey 783,56 km2; (4) France 640,679 km2; (5) Ukraine 603,500 km2	The text was edited accordingly.
Mark Snethlage	Ch.4	52	1607			confusing paragraph: what is "land fund"? Confusing use of 60,354.8 thousand ha, vs 42.78 million ha. How can excessive tillage be a factor of ineffective land use, if most croplands throughout Europe are tilled?	Was polished.
Germany	Ch.4	52	1611		1614	please check dates for Germany. Share of grassland is around 30 % in Germany, share of arable land is larger (~35%). Please explain figure for US and Canada	Was removed.
Mark Snethlage	Ch.4	54	1627		1631	excessively detailed?	The text was reduced; now it is only few sentences about Ukraine.
Hanna Skryhan	Ch.4	56	1688	56	1694	the repetition of the lines 1672-1677	edited
Mark Snethlage	Ch.4	57	1736		1743	same text as page 42, lines 1290 - 1296	edited
Hanna Skryhan	Ch.4	57	1740	57	1743	the repetition of the statement	edited
Mark Snethlage	Ch.4	57	1744		1746	is this paragraph relevant to the section "dis-intensification of agriculture"?	This is related to the trend 2: Decrease of land-use intensity and abandonment of conventional agricultural land
Mark Rounsevell	Ch.4	57	1747			Or EU, given the reference?	Yes, was edited.
Mark Snethlage	Ch.4	57	1747			Machovina, B., Feeley, K. J., & Ripple, W. J. (2015). Biodiversity conservation: The key is reducing meat consumption. Science of The Total Environment, 536, 419–431. http://doi.org/10.1016/j.scitotenv.2015.07.022	This ref was not included
Marie Stenseke	Ch.4	59	1785		1813	Leisure farming and hobby horses needs also to be mentioned (as shown in figure 4.9)	The text was added; lines 2193 - 2195
Germany	Ch.4	60	959	60	961	The example given is somehow questionable. In order to protect invertebrates it would be necessary to reduce wild boar densities, whereas high population of red-deer can be accepted since it has a positive effect. However by nature wild boar are omnivore (eating also invertebrates) but red-deer is eating only plants which then leads to the mentioned stunted or no regrowth of forest trees or understorey plants	We deleted invertebrates and changed this to: "Browsing and grazing by wild ungulate game species (such as several deer species or wild boar) are a significant cause of plant species loss regardless of the type of forest management"
Germany	Ch.4	60	1829	60	1829	Please do not refer to "East Germany" but rather "former German Democratic Republic".	The text in the chapter was edited much. There is no any more references to East Germany.
Hanna Skryhan	Ch.4	61	1845	61	1847	the repetition of the statement	edited
Hanna Skryhan	Ch.4	61	1875	61	1878	the repetition of the statement 1857-1861	edited
Hanna Skryhan	Ch.4	62	1880	62	1884	the repetition of the statement 1865-1868	edited
Hanna Skryhan	Ch.4	63	1946	63	1948	the repetition of the statement	edited
Germany	Ch.4	63	1949	63	1095	Please use Germany and "former German Democratic Republic".	The text in the chapter was edited much. There is no any more references to East Germany.
Hanna Skryhan	Ch.4	64	1956	64	1957	there is no link to the box 4.4 in the text	This box was removed from the chapter.
Mark Rounsevell	Ch.4	64	1958			There is a lot of descriptive text in this section that could be considerably shortened and synthesised. There is also an emphasise on supposing that land abandonment is a bad thing, when abandonment can have positive benefits for BD and ecosystems, arising from less intensive land use (e.g. fewer chemicals) and more diversity of vegetation types.	The text was edited to make it more neutral. We also wrote that there is a lack of knowledge regarding effects of land abandonment on biodiversity and NCPs.
Kristina Raab	Ch.4	65	1991	65	1991	Colours might improve the causal loop figure but without explanation I cannot really gain any additional information/clarity from them	CLDS were edited; colours are used to indicate different groups of indirect drivers; and symbols are used to show trends in the LUC.
Mark Rounsevell	Ch.4	65	2006	65	2007	What are the ecological implications of this? Doesn't abandonment of agriculture have some benefits to BD?	The text was edited to make it more neutral. We also wrote that there is a lack of knowledge regarding effects of land abandonment on biodiversity and NCPs.
Mark Snethlage	Ch.4	66	2043			"declined from 8 kg/ha /.../ to just 28 kg/ha": either "increased", or the numbers are incorrect, or sentence is not clear	This sentence was removed.
Hanna Skryhan	Ch.4	66	2045	66	2045	is it mistake in the text?	This sentence was removed.
Hanna Skryhan	Ch.4	67	2053	70	2183	it isn't coherence in this part. To improve the language! No clear inventory of the drivers!	This part was edited considerably. The text was shortened, and re-distributed among different sections.
Hanna Skryhan	Ch.4	67	2070	67	2086	could be shorter!	Was done.
Hanna Skryhan	Ch.4	68	2125	68	2126	need in the LINK on the publications! Too populist	Unclear comment
Hanna Skryhan	Ch.4	69	2162	69	2176	what's the country discribing? Unclear	The text was clarified; the text is related to Eastern E countries.

ECA values liaison group	Ch.4	71	2210	71	2212	Because of the qualitative statements used in Table 4.8 (positive, negative, deterioration etc.) it is suggested that this table be removed and Table 4.7 only is needed. How does one estimate that a negative ecological impact has resulted? What is a negative ecological impact? Is the "liberalisation of markets" still relevant post-Trump?	Both tables wer removed.
Hanna Skryhan	Ch.4	72	2214	72	2214	the figure is not readable	Was improved by the graphic desinger
Mark Rounsevell	Ch.4	73	2217			Quite a lot of descriptive text in this section that could be cut down and synthesised.	Was done.
ECA values liaison group	Ch.4	73	2217	86	2638	To add changes in forestry in EE (got the text from the Russian experts)	Was done.
Mark Snethlage	Ch.4	73	2226			"Plinius": perhaps change into "Pliny the Elder (AD 23 – AD 79)"	The sentence was removed.
Germany	Ch.4	73	2233	73	2236	the three general types describes initially should be easy to identify in the text further down (e.g intermediate double-cohort systems = stands with two age classes are probably not self-explaining)	We do not refer to different forest management systems in the text; the short description was needed to highlight the existing differences in the FMSs.
Hanna Skryhan	Ch.4	74	2256	74	2259	the figure could be deleted	Do not agree. The photos illustrate differences in the FMs.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2302	76	2305	This statement "Compared to natural conditions, managed forests (...)" is here very generalized, because the issue is very context specific (management intensity, frequency of interventions, - native/invasive species, enrichment planting? Succession status of natural forest, climax species, ...? Etc – "managed forests" are not necessarily monocultures, and natural forests can be quite homogenous (if fire born, egg), and not in all context completely right. But well, also not completely wrong. Is it a quote from Pennanen? If so, blame on the author. If not, then make the statement a bit softer e.g. "Compared to natural conditions, managed forests are commonly characterized (...)" Or so.	The text was modified considerably.' Almost all forest management systems result in simplified forests with loss of structural complexity and biodiversity at multiple spatial scales'.
Marie Stenseke	Ch.4	76	2302			Rephrase "natural conditions". It has rightly be stated earlier in the chapter that humans are part of nature.	This phrase was removed.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2310			See PEFC data.xlxs for PEFC data (attached to email)	The data on PEFC was added.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2310	76	2312	Similar to my first remark: if the authors (Johansson et al; Kraus & Kumm) wrote this, then ignore it. Otherwise I find this sentence by far too simplistic: "To mediate the effects on biomass extraction, forest certification (...) have gained increasing support approaches." -> biomass extraction is just one out of plenty issues for which certification gained support ..	The text was edited; and now says '...a growing number of private and civil society actors have pioneered non-state voluntary instruments as a means to achieve responsible forest management that aims at maintaining, protecting and sustaining ecological, economic and social-cultural values of forests' (2513 - 2516).
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2311	76	2311	There is the "closing bracket" missing after (PEFC 2015). Should read: "To mediate (...), forest certification (32 countries, 2311 almost 95 Million hectares (FSC 2016); 23 countries, almost 84 Million hectares (PEFC 2015)) and integrated (...)"	Edited.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2323	76	2323	"... almost 1858 forest species are currently listed as threatened ..." -> of how many?	This sentence was removed.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	76	2334	76	2335	"...difficult to assess whether this increase is an effect of policy change or..." -> often most likely not an OR but AND: damaged trees / dead wood after storm etc not removed because of policy change.	This sentence was removed.
Germany	Ch.4	80	2425	80	2425	it is good to put emphasis on the Helsinki resolution, however it might also be good to relate Helsinki also to the UN Forest Instrument, since this is somehow the "sourcecode" of Sustainable Forest Management	The box was removed.
Marie Stenseke	Ch.4	80	2427	85		There is a huge imbalance between the text dealing with WE and CE, EE, CA respectively. Needs to be adjusted or commented.	The text about EE was added.
Mark Snethlage	Ch.4	80	2445			what is "different levels of considerations"?	The text was removed.
Germany	Ch.4	81	2462	81	2462	Where can the section on "protected area drivers" be found?	The box was removed.
Markus Fischer	Ch.4	81	2465			Give references	The figure was removed.
Germany	Ch.4	82	2497	82	2497	"Given uncertainties about EU subsidies, this type of farm should be a goal for dehesa farmers." 'Should' is rather prescriptive in this context; you might rather want to use e.g. 'might'.	Edited.
Germany	Ch.4	82	2499	82	2499	"... need to give way..." This is rather prescriptive. Please reformulate the sentence in a less prescriptive way (e.g.: ... might better be substituted by...)	The text sounds as follows: 'Given uncertainties about the EU subsidies, this type of farm might be a goal for dehesa farmers. Thus, the maintenance of the traditional agroforestry systems in Spain and Portugal is a good example of how a diversity of forest and woodland management regimes sustains multiple goods, services and landscape values (Linares, 2007). However, Pinto-Correia (2000) and Plieninger et al. (2004) pointed out that this requires a holistic landscape approach including conservation-incentive schemes, environmental education, and technical assistance'.
Germany	Ch.4	83	2510	83	2510	It should read "WWII", not "WW2".	Edited
Germany	Ch.4	83	2523	83	2523	Please write "former German Democratic Republic".	Edited
Hanna Skryhan	Ch.4	84	2531	85	2571	miss the history and trends of the forestry in EE	This part has been improved.
Kristina Raab	Ch.4	86	2639	95	2755	These sections are very imbalanced towards terrestrial environments (18p with hardly any information on marine protected area status and trends, though see line 2726 and mention of the Aichi 11 target), please correct this. I did not read section 4.5.4.2.2. but if it is the same there, please also include information on marine systems there!	The data on and text about MPA are included now (lines 2658 - 2684).
Kristina Raab	Ch.4	86	2639	95	2755	Unclear whether figures do or do not include marine areas. Please state whether or not this is the case and if marine PAs are not included, please add this information. Fig. 4.29 is referred to in the text (l 2645) as LAND cover so this implies terrestrial - please clarify.	The text was edited by adding 'terrestrial'.
Kristina Raab	Ch.4	86	2639	95	2755	Figures 4.30, 4.31, 4.32 and 4.33 all terrestrial. Please balance with the marine ecosystems. Chapter 3 includes some (few) infos on marine protected areas already, http://mpatlas.org/ can help too.	The text on MPA has been included into the CH4 and the text on Pas in Ch3 was moved to Ch4.
Kristina Raab	Ch.4	86	2639	95	2755	Please include information on the recent 30% target requested by IUCN members (NGOs governments etc), see MPA news (https://mpanews.openchannels.org/news/mpa-news/iucn-members-approve-30-2030-goal-mpas-%E2%80%94-most-ambitious-target-so-far-mpa-coverage). EO Wilson's Half Earth concept might be worth mentioning briefly here as well.	Unfortunately this info was not included.
Kristina Raab	Ch.4	86	2639	95	2755	What is the current MPA coverage in ECA ?	6.8%.

Marie Stenseke	Ch.4	86	2641		2642	Rephrase the sentence. The aim is most often to maintain rich biodiversity, not non-human influenced ecosystems as such (e.g the richness in seminatural pastures, grazed forests, mountain ecosystems co-created with reindeer herding etc). Replace cultural landscapes with cultural heritage. (Cities, roads etc are indeed also cultural landscapes)	This sentence was removed.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	86	2649	87	2652	Excellent use of these data on protected areas and key biodiversity areas; very important to retain.	It remains.
Thomas Brooks	Ch.4	86	2649	87	2652	Excellent use of these data on protected areas and key biodiversity areas; very important to retain.	thank you
Kristina Raab	Ch.4	87	2656	87	2656	Re the Saiga antelope, the discussion of mobile PA in the marine realm could be reflected here (since many fish stocks people want to protect are migratory species) https://www.researchgate.net/publication/267884893 The Case for Mobile Marine Protected Areas	This is a conference paper; we omitted it.
Kristina Raab	Ch.4	87	2656	87	2656	Enforcement of marine PA is also an issue, see DA Gill et al 'Capacity shortfalls hinder the performance of marine protected areas globally' Nature 543, p665	Has been included into the section 4.5.4.
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	87	2660	87	2661	Data are available in https://www.nature.com/articles/sdata20167 .	Was used to find new references.
Thomas Brooks	Ch.4	87	2660	87	2661	Data are available in https://www.nature.com/articles/sdata20167 .	Was used to find new references.
IPBES Knowledge and Data Task Force (KD TF)/ Task Group on Indicators (TGI)	Ch.4	88	2697	88		The graph of Percentage of areas covered by protected areas can be replaced to the graph which TGI provided	The figure was removed.
Germany	Ch.4	89	2703	89	2705	A legend is missing for Figure 4.31.	The legend was added.
Mark Snethlage	Ch.4	89	2723			Ukraine is actually the third largest country in Europe: (1) Russia 17,098,246 km ² ; (2) France 640,679 km ² ; (3) Ukraine 603,500 km ²	The text was edited accordingly.
Germany	Ch.4	91	2747	91	2749	Please provide an explanation for the abbreviations used in the legend of Figure 4.32.	The figure was removed.
IPBES Knowledge and Data Task Force (KD TF)/ Task Group on Indicators (TGI)	Ch.4	91	2748	91		The graph of Percentage of areas covered by protected areas can be replaced to the graph which TGI provided	The figure was removed.
Hanna Skryhan	Ch.4	91	2750	91	2751	the figure could be deleted	The figure was removed.
Thomas Brooks	Ch.4	92	2757	95	2859	Donald et al. (2007) Science on the impacts of the Birds Directive is a key reference to add here.	Was added
Kristina Raab	Ch.4	92	2764	92	2770	In the drivers section p92 it could be worth mentioning the difference between target and current status explicitly. Similar to sentence 2645-2648.	Drivers are not necessary connected to a specific policy target. The comment is not fully clear.
Marie Stenseke	Ch.4	92	2778	103		The text on protected areas needs to be complemented with more information on marine protected areas. There is a strong terrestrial bias in this section.	Was done.
Hanna Skryhan	Ch.4	92	2778	93	2779	the box could be deleted	Was removed.
Kristina Raab	Ch.4	93	2779	93	2779	Box 4.6 Remove 'land covers' and use correct formulation from Aichi target which is inclusive of marine/aquatic habitats	This box was removed.
Kristina Raab	Ch.4	94	2841	94	2841	Include marine spatial planning concepts here (Ehler Marine Policy 32 (2008) 840–843; Ehler, Charles, and Fanny Douvère. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris: UNESCO. 2009 (English). EU Europe has a Marine Spatial Planning directive that mandates every country to implement this approach. I don't have the references at hand but this could help to find some relevant resources: [EUs- Vella speech The Maritime Spatial Planning Directive is the first legislation that makes maritime planning compulsory in Europe. It is also the first that requires cross-border coordination. Our Marine Strategy Framework Directive obliges Member States to reach Good Environmental Status of their waters by 2020. It requires Member States to establish a coherent network of Marine Protected Areas. And it specifically refers to Maritime Spatial Planning as a key tool to make this happen. The Maritime Spatial Planning Directive has reinforced these objectives. It expressly calls on Member States to preserve, conserve and protect the marine environment. It requires countries to apply an ecosystem based approach to their planning activities. Importantly, it encourages cooperation and planning across borders. Why is this important? Because Member States need to cooperate to create the network of Marine Protected Areas that we have in mind. Such cooperation already exists, for instance in case of the Wadden Sea where the Netherlands, Denmark and Germany are working together to conserve the sea's ecosystems. We would need to see more of these good examples – marine ecosystems do not know borders! The same goes for further developing the network of Natura 2000 sites, and for applying the Birds and Habitats Directives to the offshore marine environment. In this way, cross-border, integrated planning will allow us to safeguard biodiversity, ensure the survival of threatened species and habitats, and increase the resilience of ecosystems to unwanted change. Experience shows that these are not empty words. A study published in Marine Policy earlier this year assessed plans in Europe, Australia and the US. They found that planning led to a host of benefits for the environment: it increased marine protection, ensured that industrial uses avoided sensitive habitat, cut carbon emissions, and reduced the risk of oil spills.	Was included into the section 4.5.4.2
Marie Stenseke	Ch.4	95	2854			Conflicts between area protection and indigenous people should also be mentioned, see eg. Elenius, Allard, Sandström, 2016. Indigenous Rights in Modern Landscapes, Routledge.	Was added
Germany	Ch.4	95	2857	95	2859	Please simplify or/ and re-structure Figure 4.34.	Was done - simplified and restructured.
Kristina Raab	Ch.4	95	2858	95	2858	EITHER Specify in figure legend that the figure is terrestrial. Land purchase and market value of land do not apply to the marine environment. Also land use is used in several elements. OR make the figure more general and integrative of the marine realm by getting relevant experts onboard and thinking of the equivalent processes. Many overlap, but not all (like buying land)	CLDs were modified; they are relevant for both terrestrial and marine Pas now.
Marie Stenseke	Ch.4	97	2924		2926	"nature management" is an awkward expression. Could landscape management or area management or traditional practices be used instead?	Now it is 'land management'
Hanna Skryhan	Ch.4	98	2958	98	2960	the statement could be deleted	The whole para was removed.
Mark Rounsevell	Ch.4	98	2965			This part might be better as a Box, to give a case study of the effect of war on BD/ecosystems.	It has been converted into the box.
Hanna Skryhan	Ch.4	98	2965	98	2967	should be clarify: whats PA is located in the ATO, their area and share from the total PA area of Ukraine	The text in the box is about the impacts of armed conflicts on habitats using the on-going armed conflict in Ukraine as an example.
Hanna Skryhan	Ch.4	98	2984	98	2988	Odessa region - is the part of ATO? Should be divided the effects in the ATO area and neighboring areas	Odesa is not mentioned any more in the text.
Hanna Skryhan	Ch.4	99	2993	99	3006	should be clarify: what kind of "many problems in Ukraine" (in regards to BES, other is clear and is not the subject of the report) link to the Crimea annexion?	This text was removed.
Hanna Skryhan	Ch.4	100	2998	100	2999	add the references	This text was removed.
Hanna Skryhan	Ch.4	100	3001	100	3001	add the references	This text was removed.
Hanna Skryhan	Ch.4	100	3004	100	3006	add the references	This text was removed.
Hanna Skryhan	Ch.4	100	3007	100	3011	references from 2001. the current situation in the Russian / Belarusian / Ukraine higher education is quite different. Should be found new publications (after 2014-2015...)	The more recent references were added.

Hanna Skryhan	Ch.4	100	3024	100	3026	amur tiger???	Siberian tiger
Hanna Skryhan	Ch.4	100	3029	100	3038	What about "Mama-86"? Very strong NGO-player in nature protection in the Ukraine Carpathians	This para was removed
Marie Stenseke	Ch.4	101	3039	101	3051	This paragraph is also true for Western Europe, see e.g. Elenius, Allard, Sandström, 2016. Indigenous Rights in Modern Landscapes, Routledge, Stenseke M (2009): Local participation in cultural landscape maintenance: Lessons from Sweden. Land Use Policy, 26(2): 214-223.	The suggested references were added.
Hanna Skryhan	Ch.4	101	3039	101	3051	it's reasonable to add the information about locals living inside of the PA and problems with land tenure and resource extraction (for example, Hutsuls in the Ukraine Carpathians	The text was edited considerably and this issue is captured partly.
Germany	Ch.4	101	3053	101	3054	Please simplify or/ and re-structure Figure 4.36. Furthermore, a reference to this Figure is missing in the text.	Was simplified and the legend was added.
Marie Stenseke	Ch.4	102	3068		3078	Seems to be more of a chapter 6 text, since this is about policy options not about existing drivers	This text is a good link to Ch6.
Hanna Skryhan	Ch.4	102	3078	102	3079	the figure is not readable	The figure was changed.
Germany	Ch.4	102	3079	102	3080	Please simplify or/ and re-structure Figure 4.37. Furthermore, a reference to this Figure is missing in the text.	The figure was simplified, and references to the figure in the text were added.
Germany	Ch.4	103	3082	103	3083	Please simplify or/ and re-structure Figure 4.38. Furthermore, a reference to this Figure is missing in the text.	The figure was simplified, and references to the figure in the text were added.
Hanna Skryhan	Ch.4	103	3082	103	3083	the figure is not readable	The figure was simplified, and references to the figure in the text were added.
Amor Torre-Marín	Ch.4	103	3085	103	3086	References to be deleted from the box and added to reference list	Done
Hanna Skryhan	Ch.4	103	3085	104	3088	delete the references from the Box 4.7	Done
Mark Rounsevell	Ch.4	104	3089			I'm wondering if some of this more general, descriptive text shouldn't be moved to Ch1?	The text was edited to make it fit better to Ch4
Marie Stenseke	Ch.4	104	3089	112		Section 4.5.5: the concept "traditional land use needs to be better defined here. The term has shown to be interpreted in different ways, e.g. what is considered to be the core in the traditional: the agricultural activity as such, which means that changes and adaption to new technology is part of the tradition and most often also necessary to keep on with agriculture as a livelihood, or is it the technique of land use, implying that museal and subsidised conservation activities would keep the tradition and it will then have more of touristic and museum functions in society, rather than food and fibre production Eriksson, C. (2011). What is traditional pastoral farming? The politics of heritage and 'real values' in Swedish summer farms (fabodbruk). Pastoralism, 1(1), 1–18, Stenseke, M. (2016): Integrated landscape management and the complicating issue of temporality. Landscape research, 41: 199-211.	There is a short definition of what traditional land use is about it. Actually traditional land use is more than agricultural land use; TLU includes also forest management (e.g., a part of agroforestry), or use of natural resource for grazing, fishing etc. Thus, TLU is multidimensional and multifunctional. We do not consider it as a museum function. Many references are included that provide evidence that TLU provide multiple benefits and maintain habitats of HCV.
Gunay Erpul	Ch.4	105	3109	105	3117	Stocks of soil biodiversity also represent an important biological and genetic resource for biotechnological exploitation. The contribution of soil biota to human health has already been immense: for example, nearly 80 percent of antibacterial agents approved between 1983 and 1994 have their origin in the soil.	We do not have references to support this fact.
Marie Stenseke	Ch.4	105	3109		3117	References needed.	Added
Marie Stenseke	Ch.4	105	3130			it is far to general to state that traditional use is likely to have been at sustainable levels. First, it depends on what is meant by tradition. Change as such is a tradition for the human society. Also, the precarious situation for biodiversity in many areas is due to land use with quite long tradition. Moreover, overgrazing, overfishing, the use of wood devastating the forests in the Mediterranean etc. show that traditional land use is far from always sustainable.	The SOD text was edited considerably. The sentence which the reviewer referred, was removed. The definition of TLU was provided, that sounds as follows 'Traditional land-use encompasses multiple non-intensive, locally adapted land-use practices based on local and indigenous knowledge that have played a significant role in the development of diverse, productive and sustainable food and material production systems (Plieninger 2006, Molnár and Berkes 2017, Parrotta et al. 2015, Parrotta et al. 2016) (Lines 2968 - 2971)
Andriy-Taras Bashta	Ch.4	107	3189			correct name - Kyzyl	Edited
Hanna Skryhan	Ch.4	110	3308	110	3324	to short	The text on RU legislation was shortened and taken into the box 4.3.
PESC-4: Sophiko Akhobadze	Ch.4	110	3308	112	3396	The Russian constitution is mentioned in a lot of detail here, this should be shortened to make the text more relevant.	The text about RU legislation is taken in the Box 4.3
Hanna Skryhan	Ch.4	112	3375	112	3396	to replace at previous pages and unite with the rest information about Russia	The text about RU legislation is taken in the Box 4.3
Mark Rounsevell	Ch.4	113	3399			Again, need to cut down on descriptive text and status and trends.	Done
ECA values liaison group	Ch.4	113	3399	134	3996	Nothing about effects of pollution on NCP Trends in pollution are mainly for WE Drivers of pollution are also presented mainly for WE	We do assess health (hormone disrupters) and other NCP. Almost all literature found is on EU (WE and CE).
Germany	Ch.4	113	3410	113	3411	Why were "gene, noise and radioactive pollution" not included in this assessment although they were identified as relevant?	Wordings changed to: "Gene pollution, noise pollution, thermal pollution and radioactive pollution were also identified as relevant, but generally to a lesser extent, and are therefore not included in this assessment"
Mark Snethlage	Ch.4	113	3410			why not?	See above
Ilija Gasan Osojnik Črnivec	Ch.4	113	3415		3416	Table 4.14: Main driver in line 3 - "Energy use" could be better replaced with "Energy production" or "Use of fossil energy carriers"?	Energy cannot be produced. W changed some places to "electricity production"
Germany	Ch.4	113	3415	113	3415	Table 4.14: 1st column, 5th line - replace "N2O and NH3" with "nitrogen oxides, volatile organic compounds incl. Methane, and CO"	Done
Germany	Ch.4	113	3415	113	3415	Table 4.14: 3rd column, 5th line - add at the end of the point "traffic, industry, product use, agriculture"	Changed to: Electricity production, agriculture, incineration and industrial processes, transportation
Mark Snethlage	Ch.4	113	3415			nice and informative summary overview. some minor comments 1) Why not harmonize the way compounds are referenced to: either by their chemical formula (N2O, CO2 etc) OR by their name (nitrous oxide, carbon dioxide etc)? 2) why not include agriculture among the main drivers of pesticides (fourth category of pollutants)? What about including deforestation among the main drivers of carbon dioxide (seventh category of pollutants)?	Done. Deforestation does not occur much in ECA region.
Oliver Lindecke	Ch.4	113	3415	3415	113	Light pollution; another main driver for disruption of reproduction and stress is polarization of light see refs. of Horváth et al.	Ref and argument included: "Unnatural polarized light sources, e.g. from building materials, can also trigger maladaptive behaviors in polarization-sensitive taxa and alter ecological interactions (Horváth, Kriska, Malik, & Robertson, 2009)."
Germany	Ch.4	114	3427	114	3427	replace "serious" with "seriously exceeded"	Deleted
Germany	Ch.4	115	3449	115	3451	You might want to include a short explanation for Figure 4.41.	Deleted
Mark Rounsevell	Ch.4	115	3450			Status and trends is Ch3 not Ch 4	Deleted
Mark Snethlage	Ch.4	115	3450			This figure does not seem to be the most appropriate to illustrate the role of pollutants / eutrophication in the conservation status of rivers and lakes ecosystems. In the State of Nature Report (EEA, 2015: https://www.eea.europa.eu/publications/state-of-nature-in-the-eu) there is a figure on page 100 which shows the ranking of pressures to freshwater habitats in the EU, indicating that pollution is the second most reported high ranked pressure and threat.	Deleted (belongs more th Chapter 3)

Jean-Paul Hettelingh	Ch.4	115	3468		3476	the para recognises the importance of N-concentration and deposition on biodiversity. Should this not lead to a conclusion, e.g. In the SPM, para. C line 123 that "landuse change, climate change and Air Pollution are the main direct drivers that adversely affect biodiversity. While the impact of nutrient inputs are well described in Ch 4, it is unclear how these findings (and examples of explicit interactions between driversd as well as impacts (I) of air pollution and climate change) are used in ch 6 and SPM.	ExSum summarises pollution (KM #9). Some of it will hopefully be included in te SPM
The Netherlands: Astrid Hilgers	Ch.4		115	3468	3476	the para recognises the importance of N-concentration and deposition on biodiversity. Should this not lead to a conclusion, e.g. In the SPM, para. C line 123 that "landuse change, climate change and Air Pollution are the main direct drivers that adversely affect biodiversity. While the impact of nutrient inputs are well described in Ch 4, it is unclear how these findings (and examples of explicit interactions between driversd as well as impacts (I) of air pollution and climate change) are used in ch 6 and SPM.	ExSum summarises pollution (KM #9). Some of it will hopefully be included in te SPM
Germany	Ch.4	117	3523	117	3524	(Jones et al. 2014) Comment: Include economic/cost-benefit analysis in the European Nitrogen Assessment (Sutton et al, 2011)	Not done, we thought Jones provided sufficient info (we had do cut the text by half)
Mark Snethlage	Ch.4	118	3577			Jones et al. 2014: not in reference list	Done
Mark Snethlage	Ch.4	118	3577			"The level of N in the atmosphere decreased by ca. 25% since 1990 in Europe (Jones et al. 2014)," what N?	Changed to: "Besides, nitrous oxide (N2O, a potent greenhouse gas, produced in soils with excess nitrogen, is increasingly emitted into the atmosphere, where it contributes to climate warming and, in the stratosphere, to the decomposition of ozone (Ravishankara, Daniel, & Portmann, 2009).
Germany	Ch.4	119	3577	119	3577	add: ... level of "reactive" N...	Done: "There are clear and well-established negative impacts of nitrogen, derived from anthropogenic reactive nitrogen (NOx and NH3) on eutrophication, soil acidification, drinking water quality
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	119	3578	119	3580	It is stated that the emissions of NH3 decreased by 39% in EU countries. The following sentence states that many reactive N forms (mainly NH3 from agriculture, ...) did not decrease so much. This is not completely consistent. Either 1 is true, or 2, but not both.	We totally revised these contradictory messages on NH3.: "Between 1980 and 2011, NOx and NH3 emissions in the European Union declined by 49% and 18%, respectively (EEA, 2014b). 94 % of NH3 emissions come from agriculture (EEA, 2016b). However, while NOx continues to decrease, NH3 emissions in Western Europe have stabilised with even slight increases in recent years (EEA, 2016b
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	119	3581	119	3581	'... experience critical loads'. Ecosystems have a critical load and these can be exceeded. My guess is that this is what you want to state here: '... most ecosystems still experience nitrogen levels, exceeding the critical loads for eutrophication'.	Changed to: "Eutrophication of marine ecosystems is perhaps more worrying than freshwater eutrophication since, although recent studies have shown a decrease in marine and coastal eutrophication, the number of marine dead zones due to hypoxia (oxygen depletion due to organic pollutants) fuelled by eutrophication has increased markedly (EEA, 2014)
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	119	3585	119	3585	We have delivered information on average depositions per region: for the ECA region this is about 4 kg N/ha/yr, which is rather different from the 10 kg/ha/yr mentioned here.	We found this new ref of your and write: "The average nitrogen deposition rate in the region is about 5 kg/ha/yr, in contrast to a background rate of 0.5 kg/ha/yr or less (The Biodiversity Indicators Partnership, 2016).
UNEP-WCMC: The Biodiversity Indicators Partnership (BIP)	Ch.4	119	3587	119	3589	It is stated that 'N deposition rate is also predicted to double in most of the terrestrial are of Europe (to 20 kg/ha/yr), with large areas, mostly in NW Europe, receiving up to 50 kg/ha/yr'. The data we delivered for the N Deposition indicator shows that the N deposition is likely to decrease for this region and that maximum levels (as a country average) are around 15 kg N/ha/yr in 2030 (and thus not 50 kg/ha/yr)	We deleted this (had a strict word limit)
Germany	Ch.4	119	3592	119	3592	"in the near future": This has already occured. See emission and deposition rates described in EEA 2015, Sutton et al 2011 and elsewhere.	Deleted
Andrew Wade	Ch.4	119	3602	119	3602	A reduction in phosphorus concentration is evident in the River Thames (UK) yet algal blooms still occur in most years. This suggests we are not yet near the limiting phosphorus concentration, that it is likely uneconomic to achieve such low phosphorus concentrations, and that other factors are controlling the blooms, such as, light and water temperature. Bowes M.J.; Loewenthal M.; Read D.S.; Hutchins M.G.; Prudhomme C.; Armstrong L.K.; Harman S.A.; Wickham H.D.; Gozard E.; Carvalho L.; 2016, Identifying multiple stressor controls on phytoplankton dynamics in the River Thames (UK) using high-frequency water quality data.	Changed to: "The internal loading of phosphorous from sediments in lakes can keep them in a state of eutrophication even when external inputs are reduced, a process that is further promoted by increased temperatures (e.g. Moss et al. 2009). Such legacy effects, i.e. phosphorous accumulation in sediments, have recently been observed in the River Thames (UK) where algal blooms still occur in most years, controlled by light and water temperature (Bowes et al., 2016).
Gunay Erpul	Ch.4	120	3605	120	3614	Nutrient imbalance occurs when inputs of nutrients (through additions of chemical and organic fertilizers or other sources are either a) insufficient to allow crops to achieve their development and yields or b) in excess of the nutrients exported during the harvest of the crops. Nutrient insufficiency contributes to food insecurity.	Deleted
Andrew Wade	Ch.4	120	3607	120	3607	See comment on Ch.2 Page 32, Line 868. Phosphorus is likely to have accumulated in the bed sediments of many river systems and therefore there may be a delay in streamwater phosphorus concentration decrease in response to reduced input loads as phosphorus moves from the streambed back into the water column.	Included. See above (our reply to your previous comment)
Andrew Wade	Ch.4	120	3634	120	3638	Reviews of the impacts of climate change on water quality include: Whitehead et al. 2009. A review of the potential impacts of climate change on surface water quality. Hydrological Sciences-Journal-des Sciences Hydrologiques 54(1); Watts et al. 2015. Climate change and water in the UK - past changes and future prospects. Progress in Physical Geography 39(1) 6-28; Arnell et al., 2015. The implications of climate change for the water environment in England. Progress in Physical Geography 39(1), 93-120. A useful summary of the likely impacts of climate change on freshwater ecosystems can be found in Kernan et al. (Eds) 2010. Climate Change Impacts on Freshwater Ecosystems, Wiley-Blackwell, pp. 314. The book focuses on the direct impacts of climate change on freshwater ecosystems and indirect effects through changed hydrology and morphology, the interaction of eutrophication and climate change, the interaction of acid deposition and climate change, the distribution of persistent organic pollutants and mercury, and considers reference conditions, freshwater ecosystem restoration in the context of climate change, modelling catchment-scale responses and decision making. The book contains useful literature reviews and summarises likely impacts. For example the following are presented: summaries of stream temperature changes in Switzerland since 1965; the effects of a deeper thermocline consistent with A2 warming on nutrient concentrations, water temperature, oxygen content and phytoplankton in Lake Valkae-Kotinen, Finland, and field experiments looking at warming in lakes and mesocosms.	Effects of climate change, see 4.7.1
Andrew Wade	Ch.4	124	3702	125	3727	This section focuses on organic pollution mainly in terms of dissolved organic carbon but earlier in the chapter and in section 4.6.2.3 organic pollution is considered in terms of industrial and sewage effluent. In section 4.2.6.2 it is noted that in general DOC concentrations are increasing whilst earlier it is noted that wastewater inputs have decreased in response to improve sewage effluent treatment. Consistency with regard to the description of 'organic pollution' is needed and clarity is also needed that in one case DOC is being considered in response to acidification recovery in upland areas whilst elsewhere 'organic pollution' from industrial and domestic waste water is being considered.	Totally rewritten section. Changed to: "However, several monitoring programmes have detected significant increases in the concentration of dissolved organic carbon since 1990 in northern Europe (Monteith et al. 2007). Water colour, an easily observable consequence of organic matter in the water, has changed markedly in lakes and rivers across the boreal zone in the past decades and this trend is likely to continue (De Wit et al., 2016). Currently, surface waters in northern waters are browning as a result of reduced acid deposition (Monteith, Stoddard et al. 2007, Garmo, Skjelkvale et al. 2014) and increased precipitation

Germany	Ch.4	125	3736	125	3759	All of this text is on acidification of fresh waters. There is a wealth of literature on terrestrial acidification.	Terrestrial acidification is assessed in 4.4.1.1 including the Figure 4.43
Jean-Paul Hettelingh	Ch.4	125	3737		3759	it is unclear why para 4.6.3.1 deals with acidification of surface waters and water chemistry in particular. The literature on acidification of terrestrial acidification may help complete the insight of the reader of the ECA assessment that acidification affects landcover involving impacts on biodiversity, ES and NCP.	See 4.6.1.1. In 4.6.3.1. we write: "Despite reduced emissions there is still a legacy effect on biodiversity. Evidence for biological recovery from anthropogenic acidification has therefore been much less obvious than changes in, for example, water chemistry (Battarbee et al. 2014). Soil and surface water acidification remains an issue in the most sensitive areas of Nordic countries, the United Kingdom and Central Europe (EEA, 2016).
The Netherlands: Astrid Hilgers	Ch.4		125 3737			it is unclear why para 4.6.3.1 deals with acidification of surface waters and water chemistry in particular. The literature on acidification of terrestrial acidification may help complete the insight of the reader of the ECA assessment that acidification affects landcover involving impacts on biodiversity, ES and NCP.	See 4.6.1.1. In 4.6.3.1. we write: "Despite reduced emissions there is still a legacy effect on biodiversity. Evidence for biological recovery from anthropogenic acidification has therefore been much less obvious than changes in, for example, water chemistry (Battarbee et al. 2014). Soil and surface water acidification remains an issue in the most sensitive areas of Nordic countries, the United Kingdom and Central Europe (EEA, 2016).
Andrew Wade	Ch.4	125	3761	126	3765	It seems a bit odd to only focus on sulphur in this section when nitrogen is also a problem in this context as noted in section 4.6.3.1.	Thanks. We now start with: "Historically, SO2 was the dominant pollutant causing acidification, but today NOx are increasingly important. Effects of terrestrial acidification from nitrogen were briefly assessed in section 4.6.1.1.
Germany	Ch.4	125	3762	125	3762	48 %: please update this, very old estimate	Done
Jean-Paul Hettelingh	Ch.4	126	3765		3766	Figure 4.48 addresses the RCP scenarios. However, these seem to be missing in chapter 5 Figure 5.4, or in fact in chapter 5 in general.	OK
Germany	Ch.4	126	3766	126	3778	When talking about scenarios, you might want to use 'projected' instead of 'predicted'.	Yes, different reviewers preferred different concepts but we stick to this.
Gunay Erpul	Ch.4	127	3794	127	3805	The large-scale use of pesticides may have direct or in-direct effects on soil biodiversity.	True, see 4.5.1.1. In 4.6.4.1 we added: "The total sales of pesticides across the EU increased from 2011 to 2014 by 4 % to just under 400 000 tonnes of active substances, despite the adoption of The Directive on the Sustainable Use of Pesticides in 2009. However, the aim of this Directive was not only to reduce the use of pesticides but to "promote the use of less harmful pesticides and provide incentives to industry to develop pesticides with less hazardous properties" (EEA, 2016).
Jean-Paul Hettelingh	Ch.4	127	3795	129	3843	Excellent para 's. Should the impact of xenochemical pollution be put under the driver name " pollution" in the same way as e.g acidification and eutrophication. Are the impacts (and pathways) on biodiversity and NCP not sufficiently different to distinguish them explicitly the IPBES conceptual framework and consequences for policy design and strategies ?	Thanks. We added heavy metals in this category because of similarities in effects.
Ilija Gasan Osojnik Črnivec	Ch.4	127	3799		3804	... as well various synthetic compounds arising from various sources acting as hormone disruptors (e.g. BPA and other bisphenols, phthalates, etc.). Additional, the list of priority pollutants (EPA) or priority substances (EEA) should be considered here, or at least mentioned accordingly.	Thanks. We added: "Various synthetic compounds acting as hormone disruptors (e.g. BPA and other bisphenols, phthalates, etc.) have direct negative effects on nature's contributions to people (EEA, 2012c).
Jean-Paul Hettelingh	Ch.4	130	3859	131	3886	Studies such as the EU FP 7 ECLAIRE project have demonstrated the interactions between ozone concentration, and Nitrogen deposition on the one hand and biodiversity (production) on the other hand. Drivers of nitrogen concentrations and ozone formation interact, but also their impacts on biodiversity and NCP. While these interactions between "pollution" and impacts on biodiversity and NCP are complex, they are sufficiently well covered in UN Convention and EU directives to be specific e.g. in Table 6.1 (chapter 6) and following text on the importance of "integrated approaches" as outlined in SPM section D.	Thanks. However, we did not want to get into these new Directives that are already covered by Chapter 6. Here, we only mention REACH and the adoption of The Directive on the Sustainable Use of Pesticides in 2009, to acknowledge there are attempts to change institutional drivers. Under "Ozone" we refer to Table 6.1 integrated approaches.
Germany	Ch.4	130	3861	130	3861	replace "N2O and NH3" with nitrogen oxide (NOx)	We were asked to cut down on the descriptive text so this is deleted.
Germany	Ch.4	130	3861	130	3861	delete "fine particle and"	deleted
Mark Snethlage	Ch.4	131	3875			phrase repeated	deleted
Ilija Gasan Osojnik Črnivec	Ch.4	131	3881		3882	... and industrial and power plants areas.	deleted text
Oliver Lindecke	Ch.4	131	3886	3899	131	Maybe considered as an "indirect effect" polarization changes light in the environment, esp. in anthropogenic habitats. Animals responsive to natural polarisation patterns get confused by this sheer change of light properties. see comments above	Added: "Unnatural polarized light sources, e.g. from building materials, can also trigger maladaptive behaviors in polarization-sensitive taxa and alter ecological interactions (Horváth, Kriska, Malik, & Robertson, 2009).
Oliver Lindecke	Ch.4	131	3905	3908	181	There is good reason to not stress sex-specificity in the argument of bats delaying their emergence due to illumination. There is no sex-specific emergence time and thus effects to bats per se can be expected. Maybe just skipping "female" is feasible. Studies so far worked with colonies consisting mainly of females, because those were easier to detect. Practical reasons therefore may overshadow the effect on both sexes only.	we had to delete the example of bats due to word limits
Germany	Ch.4	133	3964	133	3964	You might want to use 'projected' instead of 'predicted' when talking about (climate) models.	Section on Thermal pollution deleted, instead added a short section on plastic pollution
Ilija Gasan Osojnik Črnivec	Ch.4	133	3986		3995	"IPAT equation" "IPAT formula" or even more precisely "Consistently with the IPAT formula represent the impact of human activity on the environment ...", I recommend for the individual letters to be annotated within the text, i.e. "society (population - P), affluence (A) and technology (T) ... drive the processes that determine pollution or environmental impact (I) ...". Also, the reported colour circles in the figure 4.52 are not visible.	We moved the discussion on IPAT to section 4.3.5. Colours in the CLD have been changed.
Germany	Ch.4	134	3995	134	3996	Please simplify or/and re-structure Figure 4.52.	Done

Mark Snethlage	Ch.4	134	3995			Especially if the causal loop diagram is modelled on the IPAT equation, the factor of tech. innovation should at least have a mixed (either positive or negative effect on pollution. Now it looks as if it only has a negative effect (i.e. causing more pollution), while, much of the pollution can be controlled or reduced (at least in part) through tech. innovation (waste treatment, clean energies etc)	Thanks, we completely agree, this was a mistake. Now we write: "Technological innovation usually increases production and transportation but may also change the material intensity of GDP and production technology to reduce waste and pollution. Recent institutional drivers have succeeded in developing technologies for reducing some pollutants in Europe, especially point sources like air pollutants from industrial effluents (including SO ₂ , NO _x , lead) and municipal waste water. However, the drivers of xenochemicals and nutrient leakage (NH ₃) from agriculture have not successively been reversed.
Jean-Paul Hettelingh	Ch.4	134	3996			Causal loop diagrams may be confusing in the ECA if these cannot be related back to specific targets for biodiversity and NCPs. Entities of the diagram are too aggregated to be useful.	The CLDs (especially this one) is explained in detail in the text and the point is to emphasise the feedback loops and complex causation.
Mark Rounsevell	Ch.4	135	3999			A lot of the contextual, descriptive text could be cut down here. No need to re-produce the IPCC!	we shortened considerably
ECA values liaison group	Ch.4	135	3999	168	4980	IPCC – what should be in the ECA from the IPCC in order to provide needed information for the ECA without re-producing the IPCC? Should be shortened considerably	done, we specifically extracted IPCC-type information exactly to the extent of ECA sub.-regions and UoA. This information is NOT available in IPCC. Other parts were massively shortened.
Kristina Raab	Ch.4	135	3999	168	4980	there are only 2p on drivers (of climate change) in a section of 35 pages, I think this is imbalanced – too little.	now expanded, but lots of this is in IPCC.
Finnish Government	Ch.4	135	3999	140	4086	The chapter does not consider at all the changes in the length of the growing season or temperature sums. These might actually have larger impacts than just the temperature. There are figures related to changes in GS available for Europe in: Ruosteenoja K, Räisänen J, Venäläinen A, Kämäräinen M (2016) Projections for the duration and degree days of the thermal growing season in Europe derived from CMIP5 model output. Int J Climatol 36:3039-3055. doi:10.1002/joc.4535 (Figures S2, S4 for example)	The impacts section has been expanded regarding content coverage, and was then condensed (length)
Finnish Government	Ch.4	135	4004	135	4004	"...among THE observationAL datasets..."	text shortened, no longer relevant
Finnish Government	Ch.4	135	4016	135	4016	why is Israel counted in the Western Europe?	IPBES decision
Finnish Government	Ch.4	135	4017	135	4017	the map in Fig. 4.54 indicates a significant trend there, however!	text modified, corrected
Finnish Government	Ch.4	136	4022	136	4024	are the average temperatures spatial averages?	temporal averages, but these were averaged across thr region
Finnish Government	Ch.4	136	4028	136	4032	the unit should be C/100 years, and to enable easier comparison, the units should be same in Figs 4.54 and 4.55 (decade in 4.55)	units are the same as in 4.53 (now 4.52).
Finnish Government	Ch.4	137	4035			EuropeAN and Central AsiaN biomes	corrected, adjusted
Finnish Government	Ch.4	137	4038			statistically significant	done
Finnish Government	Ch.4	137	4041			...RCP 2.6 AND 1.28 to...	done
Finnish Government	Ch.4	137	4043			...RCP 2.6 AND 2.01...	done
Finnish Government	Ch.4	137	4048			higher --> largest	done
Finnish Government	Ch.4	137	4051			among THE biomes	chanegd
Finnish Government	Ch.4	137	4052			...on THE RCP scenario... (remove s from scenarios)	done
Finnish Government	Ch.4	137	4055			...on THE RCP scenario... (remove s from scenarios)	removed
Finnish Government	Ch.4	137	4056			remove projected	removed
Finnish Government	Ch.4	137	4057			...are PROJECTED for the tundra...	done
Finnish Government	Ch.4	137	4060			EuropeAN and Central AsiaN biomes	removed
Finnish Government	Ch.4	138	4066			...per model AND thick lines...	done
Finnish Government	Ch.4	138	4068			in --> under	done
Finnish Government	Ch.4	139	4074			in--> under	done
Finnish Government	Ch.4	140	4080			ensemble model --> model ensemble	done
Finnish Government	Ch.4	140	4088			...precipitation HAS occurred...	done
Finnish Government	Ch.4	140	4092			...precipitation HAS increased...	done
Finnish Government	Ch.4	141	4099			"...it is very likely that..." the changes vere not significant!	paragraph removed
Finnish Government	Ch.4	141	4103			mm/day /time unit (e.g., 100 yr)	no it is mm/day for the period mapped on the x axis
Finnish Government	Ch.4	141	4106	141	4107	In fig. 4.60, the upper and lower graphs are identical, winter months are missing	corrected
Finnish Government	Ch.4	142	4108			mm/day /time unit (e.g., 100 yr)	no, day IS "time", and the reference period is given...
Finnish Government	Ch.4	142	4119			not STATISTICALLY significant	done
Finnish Government	Ch.4	142	4121			...among THE RCP scenarios...	left as is
Finnish Government	Ch.4	142	4124			remove "range"	done
Finnish Government	Ch.4	142	4126			remove "range"	done
Finnish Government	Ch.4	142	4132			remove "in precipitations"	done
Finnish Government	Ch.4	143	4138			outside OF the natural	shortened, no longer relevant
Finnish Government	Ch.4	143	4140			among THE regions	shortened, no longer relevant
Finnish Government	Ch.4	143	4144	143	4147	temperatures should be precipitation?	corrected
Finnish Government	Ch.4	144	4157			in --> under	done
Finnish Government	Ch.4	145	4163			in --> under	done
Finnish Government	Ch.4	146	4169			EuropeAN and Central AsiaN biomes	corrected, adjusted
Finnish Government	Ch.4	146	4169			ensemble model --> model ensemble	corrected
Finnish Government	Ch.4	146	4184			...increase of 0.3-1 m (space before m) by 2100...	done
Finnish Government	Ch.4	147	4193	148	4226	very detailed information, lots of numerical values without clear context, it is difficult to see the bigger picture from the numbers	adjusted
Mark Snethlage	Ch.4	147	4197			Little Ice Age: include dates? E.g. 1300 to about 1850	done
Germany	Ch.4	148	4227	148	4248	When referring to confidence levels please use the ones determined by the IPBES guide on the production of assessments (IPBES deliverable 2a). Please check throughout the chapter.	all confidence statements have been moved to the executive summary
Finnish Government	Ch.4	148	4229			seasonally frozen ground --> layer that melts in summer	shortened, adjusted
Finnish Government	Ch.4	148	4229			change into which direction? Increase or decrease?	adjusted
Mark Snethlage	Ch.4	148	4233			"In the latter region, a considerable reduction in permafrost thickness (up to 15 m) and areal extent (up to 80 km for discontinuous and up to 50 m for continuous permafrost) has been observed over the period 1975 to 2005 (medium confidence) (IPCC 2013)." Not really clear what these figures mean: reduction in areal extent of 80 km or 50 m. Should both perhaps be in km ² , as we are talking about areas?	adjusted
Finnish Government	Ch.4	149	4266			in THE duration	done
Finnish Government	Ch.4	149	4268	149	4269	projections twice in the same sentence	adjusted
Finnish Government	Ch.4	149	4278			add ; before however	changed

Germany	Ch.4	150	4298	150	4298	Please use a different word than 'predict' or rephrase the sentence (e.g.: "According to projections there will be increased fire danger...").	done
Mark Sneath	Ch.4	150	4340		4346	Is this relevant for the section on "Trends in marine circulation and deoxygenation"?	removed
Kristina Raab	Ch.4	151	4328	151	4335	Is the NA abbreviation necessary here? To me not, I would suggest leaving it spelled out.	removed
Marie Stenseke	Ch.4	155	4489	157		The text on drivers of climate change can be made more efficient, referring back to IPCC, without so much repeating them	much shortened, and adjusted
Mark Rounsevell	Ch.4	157	4551			Avoid going into status and trends discussion here	much shortened, adjusted
PESC-4: Rainer Schliep	Ch.4	157	4551	168	4980	In section 4.7.3, effects of climate change are discussed according to symptoms, while in section 4.5 the organisation of the section (drivers of effects of land use change) is very different - please make this consistent.	all chapters have been restructured.
PESC-4: Rainer Schliep	Ch.4	157	4551	168	4980	Subsections within 4.7.3. Inconsistently address physical impacts of climate change and biological aspects of climate change	changed now
Germany	Ch.4	158	4562	158	4562	it seems necessary to elaborate further on the issue, rather than just one sentence.	this section has been rewritten, expanded and then condensed
Germany	Ch.4	158	4564	158	4568	It is not helpful to refer to Figures and definitions which are not included in this assessment. Please include them here.	Figure is removed
Kristina Raab	Ch.4	158	4575	158		The information on phenology (1p) is too little	was expanded
Amor Torre-Marín	Ch.4	158	4576			Confidence term? If so it should go between brackets. If not alternative wording should be used.	wording is changed, no longer used
Germany	Ch.4	158	4583	158	4583	In Chapter 4.7.3.3.1 'Effects of gradual climate change on phenological patterns' it should not only be mentioned that there is a close link between climate change and earlier timing of phenological events but also some of the potentially serious consequences of a change in phenology should also be named. For example some insects with non-overlapping, discrete generations may be able to develop more than one generation due to warmer temperature conditions, with the risk of losing a whole generation at the end of autumn, when conditions get unfavourable. This may lead to a potential developmental trap. For reference see: Hans Van Dyck, Dries Bonte, Rik Puls, Karl Gotthard and Dirk Maes (2015): "The last generation hypothesis: could climate change drive ectotherms into a developmental trap?". <i>Oikos</i> 124: 54–61, 2015. doi: 10.1111/oik.02066 or: http://onlinelibrary.wiley.com/doi/10.1111/oik.02066/epdf	this section has been rewritten, expanded and then condensed, the effect is included now
Kristina Raab	Ch.4	158	4583	158	4583	Please insert more information on effects on phenology/life history events. Suggestion: One of the major hypotheses relating recruitment to fish biomass centers around the match or mismatch in prey availability to predators (match-mismatch hypothesis). Small changes in growth or mortality can lead to large population changes, and temperature effects via phenology can affect life cycle closure of species (Petitgas et al 2010, 2012). An illustrative example is the North Sea anchovy, which experienced an increase in population abundance and a range expansion due to warmer temperatures (Raab et al 2013). A longer growth (and spawning) period and larger pre-winter sizes enabled it to survive winter conditions and spawn thereafter, thus closing the life cycle. REFS climate change and fish life cycles DOI: 10.1111/fog.12010; Petitgas Pierre, Secor Dave H. (2009). Mechanisms that sustain life cycle closure in space and time. ICES Annual Science Conference; Petitgas Pierre, Secor Dave H., McQuinn Ian, Huse Geir, Lo Nancy (2010). Stock collapses and their recovery: mechanisms that establish and maintain life-cycle closure in space and time. ICES Journal Of Marine Science, 67(9), 1841-1848. Publisher's official version: http://doi.org/10.1093/icesjms/fsq082 , Open Access version: http://archimer.ifremer.fr/doc/00021/13186/ Raab et al 2013 doi: 10.3354/meps10408 Influence of temperature and food availability on juvenile European anchovy <i>Engraulis encrasicolus</i> at its northern boundary	Raab 2013 and Petitgas 2010 are included. The limited space does not allow us to expand further
Amor Torre-Marín	Ch.4	158	4588			Confidence term? If so it should go between brackets. If not alternative wording should be used.	language is changed
Amor Torre-Marín	Ch.4	158	4595			Confidence term? If so it should go between brackets. If not alternative wording should be used.	language is changed
Kristina Raab	Ch.4	159	4611	159	4611	Please add: Higher temperatures also change the growth conditions for young fish (Raab et al 2013) which can result in positive population effects for species with warm water affinities. Raab et al reference doi: 10.3354/meps10408 Influence of temperature and food availability on juvenile European anchovy <i>Engraulis encrasicolus</i> at its northern boundary	Raab et al. 2013 is cited
Gunay Erpul	Ch.4	159	4612	159	4629	Soil organic carbon (SOC) and soil biodiversity are commonly linked to three dimensions of food security: increases in food availability, restoration of productivity in degraded soils, and the resilience of food production systems.	we do not have sufficient space to expand here on this in detail; food security and production systems are not targeted here; the focus is on biodiversity
Gunay Erpul	Ch.4	159	4612	159	4629	The soil organic carbon buffers the impact of climate extremes on soils and crops by (i) regulating water supply to plants, (ii) reducing erosion through runoff decrease, and (iii) providing sites for nutrient retention and release.	This is too much detail for the space we have available; crops are not targeted here; effect of rainfall variability on soils is covered
Amor Torre-Marín	Ch.4	159	4622			Confidence term? If so it should go between brackets. If not alternative wording should be used.	language is changed
Amor Torre-Marín	Ch.4	159	4624			Confidence term? If so it should go between brackets. If not alternative wording should be used.	language is changed
Mette Skern-Mauritzen	Ch.4	160	4648	160	4648	Evidence from the Barents Sea: In the Barents Sea we see shift in species communities with a take-over by boreal species and retreat in arctic species (Fosheim et al. 2016 Nature Clim Change), increasing primary and secondary production (Dalpadado et al. 2014) and in the pelagic compartments of the system (Eriksen et al. 2016), while the benthic compartment is decreasing (Jørgensen et al 2016). This rearrangement of the system alters the functional diversity (Weidmann et al.) and the structure of food webs (Kortsch et al.) that decrease compartmentalization of the system and increase system vulnerability to perturbations, such as climate change. Updates for the Barents, Norwegian and North Seas are also given by the integrated ecosystem assessment working groups by ICES (WGIBAR, WGINOR and WGINOSE); reports are available on the web	Barents sea and Fosheim both covered
Amor Torre-Marín	Ch.4	160	4649			Confidence term? If so it should go between brackets. If not alternative wording should be used.	language is changed
Kristina Raab	Ch.4	160	4654	160	4654	you can check chapter 3 p10-11 on range shift of marine species	chapter is updated
Kristina Raab	Ch.4	160	4660	160	4661	climatic conditions...future' this part of the sentence makes no sense. There always are climatic conditions, just different ones. Please rephrase, e.g. to 'areas with specific climatic conditions that are likely to disappear in the future'	complete rephrased
PESC-4: Levon Aghasyan	Ch.4	160	4660	160	4661	You could add a reference to the effects of climate change on reptiles: in high mountainous areas these are more vulnerable. See for example the following reference: Upward Altitudinal Shifts in Habitat Suitability of Mountain Vipers since the Last Glacial Maximum Link: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0138087	the example is from an area outside ECA
Harald Pauli	Ch.4	160	4664	160	4667	suggest to add after: '...(Soudzilovskaia et al. 2013).'; 'Rising temperature and widespread decreases in precipitation in the Mediterranean (Nogués Bravo et al. 2008) are likely to lead to replacement of alpine endemic plant species through species encroaching from lower elevations (Benito et al. 2011).' References: 'Nogués Bravo D, Araújo MB, Lasanta T, López Moreno JJ 2008. Climate change in Mediterranean mountains during the 21st century. <i>Ambio</i> 37: 280-285.' 'Benito B, Lorite J, Penas J 2011. Simulating potential effects of climatic warming on altitudinal patterns of key species in Mediterranean-alpine ecosystems. <i>Climatic Change</i> 108: 471-483.'	added
PESC-4: Frederic Lemaitre	Ch.4	160	4673	161	4694	I think a couple additional large-scale studies could be reported here to exemplify the complexity of climate change as a driver and of its impacts. One would be about the climatic debt of temperature range shifts induced by climate change (as observed for birds and butterflies in Europe by Devictor et al. (2012). Differences in the climatic debt of birds and butterflies at a continental scale, <i>Nature Climate Change</i> 2: 121-124). Another, the fact linked to impact, would be that study showing that range shifts linked to Climate Change imply no injustice in the effects on the EU avifauna by 2080, but rather a homogenization, which could be reported in this section (see Thuiller, W., Pironon, S., Psomas, A., Barbet-Massin, M., Jiguet, F., Lavergne S., Pearman, P.B., Renaud, J., Zupan, L. and Zimmermann, 2014. The European functional tree of bird life in face of global change. <i>Nature Communications</i> 5:3118)	added

PESC-4: Frederic Lemaitre	Ch.4	161	4706	161	4708	Lines 4706 to 4708: a good example to contribute to the part on ecological processes could be on the dampening of herbivore cycles linked to CC and their impacts on predators through trophic interacts. Cornulier and al demonstrated a consistent dampening of herbivore cycles across Europe due to a common climatic driver in Cornulier et al. (2013) Europe-wide dampening of population cycles in keystone herbivores. Science 340: 63-66. They also predicted declines in predator species in response to these changes in prey dynamics and other cascading effects linked to e.g. spill-over predation (see Terraube J., Arroyo B.E, Madders M., Mougout F. (2011) Diet specialization and foraging efficiency under fluctuating food abundance in sympatric avian predators. Oikos 120:234-244 + Millon A., Petty S.J., Little B., Lambin X. (2011) Natal conditions alter age-specific reproduction but not survival or senescence in a long-lived bird of prey. Journal of Animal Ecology 80:968-975 + Terraube J., Arroyo B.E., Bragin A., Bragin E., Mougout F. (2012) Ecological factors influencing the breeding distribution and success of a nomadic, specialist predator. Biodiversity and Conservation 21:1835-1852 + Schmidt N.M., Ims R.A., Høye T.T., Gilg O., Hansen L.H., Hansen J., Lund M., Fuglei F., Forchhammer M.C., Sittler B. (2012) Response of arctic predator guilds to collapsing lemming cycles. Proceedings of the Royal Society B 279:4417-4422 + Millon A., Petty S.J., Little B., Gimenez O., Cornulier T., Lambin X. (2014) Dampening prey cycle overrides the impact of climate change on predator population dynamics: a long-term demographic study on tawny owls. Global Change Biology 20(6):1770-1781 + Henden J.A., Ims R.A., Yoccoz N.G., Hellström P., Angerbjörn A. (2010) Strength of asymmetric competition between predators in food webs ruled by fluctuating prey: The case of foxes in tundra. Oikos 119:149-157 + Killengreen S.T., Strömseng E., Yoccoz N.G., Ims R.A. (2012) How ecological neighbourhoods influence the structure of the scavenger guild in low arctic tundra. Diversity and Distributions 18:563-574 + Hamel S., Killengreen S.T., Henden J.-A., Yoccoz N., Ims R.A. (2013) Disentangling the importance of interspecific competition, food availability, and habitat in species occupancy: recolonization of the endangered Fennoscandian arctic fox. Biological Conservation 160:114-120	effect and references added
Kristina Raab	Ch.4	161	4708	161	4708	Evolutionary consequences are mentioned in previous section already	we report the general mechanisms here. This is why we briefly touch it here. It's one of the core mechanisms.
Andrew Wade	Ch.4	161	4735	161	4746	A useful summary of the likely impacts of climate change on freshwater ecosystems can be found in Kernan et al. (Eds) 2010. Climate Change Impacts on Freshwater Ecosystems, Wiley-Blackwell, pp. 314. The book focuses on the direct impacts of climate change on freshwater ecosystems and indirect effects through changed hydrology and morphology, the interaction of eutrophication and climate change, the interaction of acid deposition and climate change, the distribution of persistent organic pollutants and mercury, and considers reference conditions, freshwater ecosystem restoration in the context of climate change, modelling catchment-scale responses and decision making. The book contains useful literature reviews and summarises likely impacts. For example the following are presented: summaries of stream temperature changes in Switzerland since 1965; the effects of a deeper thermocline consistent with A2 warming on nutrient concentrations, water temperature, oxygen content and phytoplankton in Lake Valkae-Kotinen, Finland, and field experiments looking at warming in lakes and mesocosms.	this section has been expanded
Mark Sneath	Ch.4	162	4736			"Very generally, climatic extremes were found to add explaining the spatial distribution of forest trees in addition to climate means in Central Europe (Zimmermann et al. 2009).": not very clear	text re-phrased
Kristina Raab	Ch.4	162	4755	162	4755	I wonder whether hypoxia should be mentioned here. To me these are extreme events, but the community might see it differently.	hypoxia is treated under eutrophication in the pollution chapter
Kristina Raab	Ch.4	164	4796	164	4796	Maybe some information can be found in this overview of North Atlantic gelatinous zooplankton: Licandro et al Earth Syst. Sci. Data, 7, 173–191, 2015 doi:10.5194/essd-7-173-2015	we already have three references
Mette Skern-Mauritzen	Ch.4	164	4797	164	4833	Add more literature - see comments above	section is restructured, expanded and then condensed
Kristina Raab	Ch.4	164	4803	164	4803	Please insert after Greene et al 'Some studies do however compare combinations of likely explanatory variables/factors, like temperature and trophic dynamics across space and time (Raab et al 2013)' doi: 10.3354/meps10408	Raab et al. 2013 is cited
Amor Torre-Marín	Ch.4	166	4882			Confidence term? If so it should go between brackets. If not alternative wording should be used.	adjusted
Germany	Ch.4	167	4933	167	4933	Please use 'projection' instead of 'prediction' when talking about models.	adjusted
Mark Rounsevell	Ch.4	169	4983			Cut-down and contextual and descriptive text, focusing more on the drivers	text is revised and shortened
Germany	Ch.4	169	4984	171	5043	Those paragraphs are discussing negative as well as positive impacts of alien invasive species. While there are certainly negative as well as positive impacts, the text doesn't explain well how they are related but simply lists them. E.g. Line 4997-4999 lists food production and carbon sequestration, aesthetic values etc. as positive benefits. However, there is no discussion on whether the same effect couldn't be reached using native species, and which previous state the invasion was compared to - probably not to intact ecosystems. The study that is mainly cited to support those statements (Katsanevakis et al. 2014) just lists positive and negative effects found somewhere in the literature, but lacks a critical discussion and evaluation of the findings. Certainly, some characteristics of the ecosystem may experience a positive change / increase e.g. line 5037 lists higher carbon sequestration as positive effect of many invaders, but that's only one characteristic, and does not mean the overall effect of the species being present is positive. Line 5036 lists research opportunities as benefit - while this might be indeed beneficial to researchers, it does not imply the species presence is beneficial to humans in general. --> I suggest a complete revision of subchapter 4.8.1 and subchapters 4.8.1.1 -4.8.1.3 When positive effects of invasive species are listed, they need to be illustrated, put into context, and it needs to be critically evaluated whether single positive aspects such as a higher aesthetic value can really tell us anything about the impacts of the species on the ecosystem and overall benefits for humans. Furthermore, there needs to be a clear differentiation between effects on biodiversity and effects on NCP. Similarly, figures 4.72 and 4.73 are misleading without a proper explanation of the context.	expanded and discussed now.
Hanno Seebens	Ch.4	169	4985	169	5011	Biotic homogenisation (or loss of beta-diversity) should also be mentioned in the list of negative effects of alien species, not only the change in alpha-diversity. The loss of heterogeneity among regions is often neglected as most people and studies focus on regional scales thereby ignoring global developments like the biotic homogenisation.	Now added
Amor Torre-Marín	Ch.4	169	4999	169	5000	Confidence term? If so it should go between brackets. If not alternative wording should be used.	reworded
PESC-4: Frederic Lemaitre	Ch.4	170	5023	170	5024	Line 5023 to 5024: A well documented example of IAS in freshwater environments would be the spread of the Bd fungal disease strongly affecting European amphibian and salamander populations following its introduction from South America. See Bosch J, Martinez-Solano I, Garcia-Paris M. (2001) Evidence of a chytrid fungus infection involved in the decline of the common midwife toad (Alytes obstetricans) in protected areas of central Spain. Biological Conservation 97 : 331–337 + as well as Fisher MC, Stajich J, Farrer RA. Emergence of the chytrid fungus Batrachochytrium dendrobatidis and global amphibian declines (2012) in Evolution of Virulence in Eukaryotic Microbes. Eds Heitman J, Sibley D and Howlett B + also Martel A, Blooi M, Adriaenssens C, Van Rooij P, Beukema W, Fisher MC, Farrer RA, Schmidt BR, Tobler U, Goka K, Lips KR, Muletz C, Zamudio K, Bosch J, Lötters S, Wombwell E, Garner TWJ, Cunningham AA, Spitzen-van der Sluijs A, Salvidio S, Ducatelle R, Nishikawa K, Nguyen TT, Kolby JE, Van Bocxlaer I, Bossuyt F, Pasmans F (2014). Recent introduction of a chytrid fungus endangers Western Palearctic salamanders. Science Vol. 346 no. 6209 pp. 630-631 DOI: 10.1126/science.1258268	one reference added
Kristina Raab	Ch.4	171	5042	171	5042	title should say NCP not ES	adjusted
Hanno Seebens	Ch.4	172	5063	172	5063	The figure 4.74 should show the cumulative number of alien established species, rather than the rates. This would be more intuitive and easier to communicate (I can do the new plot as I did the initial one as well). I also contacted CLA (Niklaus E. Zimmermann) and the Lead authors Avelina Helm, Piero Genovesi and Andre Mader.	now adjusted and included
Amor Torre-Marín	Ch.4	174	5145			Confidence term? If so it should go between brackets. If not alternative wording should be used.	adjusted
Germany	Ch.4	180	5269	180	5272	Please simplify or/ and re-structure Figure 4.78.	Done
Germany	Ch.4	181	5276	184	5340	Section 4.9: a) According to the heading of section 4.9, the section is only on direct drivers. If so, why is there no such section on indirect drivers? b) Although the heading of section 4.9 focusses on direct drivers, the text of the section also addresses indirect drivers. Furthermore, it sometimes also addresses just 'drivers'. Up to this point in the chapter it had been clearly distinguished between direct and indirect drivers. These aspects are confusing. Please clarify or reformulate.	We have added a new section 4.9.3 Synthesis of Indirect drivers.

PESC-4: Kristina Raab	Ch.4	181	5289	184	5340	Habitat fragmentation is mentioned only in the context of land use change, but not in relation to infrastructure development (highways, roads etc) - the latter is very important and definitely so in some regions. On page 181 section 4.9 Synthesis of Drivers, fragmentation is mentioned. It's also an indirect driver because once a road is there, it allows for additional developments, settlements etc. in addition to causing fragmentation. So this ought to be mentioned in the relevant section as well. See Ibsch, P. et al. A global map of roadless areas and their conservation status, Science, Vol. 354, Issue 6318, 16 December 2016.	this section has been largely re-written
Mark Sneath	Ch.4	181	5291			It might also be interesting to point out in this paragraph that landscape fragmentation can also slow down the invasion by alien species.	this is too specific given the text space we have
Kristina Raab	Ch.4	181	5293	181	5293	Box includes indirect drivers this doesn't fit with section title (direct drivers). Although I am in favour of restructuring the section to include indirect drivers, see earlier comments above.	both indirect and direct drivers are now included in 4.9; the box has both, indirect and direct drivers
Germany	Ch.4	182	5295	182	5295	Box 4.8: Please use 'projected' instead of 'predicted' when talking about scenarios.	done
Mark Rounsevell	Ch.4	183	4315			Are you sure that this doesn't just reflect that there is more literature on climate change? I'd be very surprised if climate change was so important in the past.	right, adjusted
Ilija Gasan Osojnik Črničec	Ch.4	183	5315			"Invasive species" is already defined as species that is not native to a specific location, therefore the use of "alien" is not necessary in this context.	this term has been used throughout, and will not be changed here.
Mark Rounsevell	Ch.4	183	5321			Need to cross-check against the latest version of the UoAs	done
Marie Stenseke	Ch.4	183	5321	184		In both figures, the term exploitation should be replaced by Natural Resources Extraction, in line with the definitions and settings for the chapter in 4.2.2	done
Ilija Gasan Osojnik Črničec	Ch.4	184	5327			What does "future" mean, e.g. which future time period?	this is defined in the methods part and used throughout the whole document
Gunay Erpul	Ch.4	184	5327	184	5334	Soil biodiversity is vulnerable to many human disturbances, including land use and climate change, nitrogen enrichment, soil contamination, invasive species and the sealing of soil.	to specific for the synthesis
EU: Markus Erhard (EEA)	Ch.4	184	5334		5335	Some of the trends in figure 4.80 are rather surprising and not in accordance with the evidence held at the EEA (in general see EEA 2016. Mapping and assessing the condition of Europe's ecosystems. Progress and challenges). For example, for cultivated areas the weak decrease for land use change should rather be neutral or a weak increase (see e.g. Land take indicator https://www.eea.europa.eu/data-and-maps/indicators/land-take-2/assessment-1) and the slight decrease for exploitation should rather be neutral or slight increase. Another example is temperate & boreal grasslands where slight decreases should be slight increases (due to agriculture and land abandonment depending on location in Europe).	these trends were only placeholders, as indicated in the box. Now replaced by the outcome of the delphi process. And yes, CA & TBG is increasing, not decreasing.
Jean-Paul Hettelingh	Ch.4	184	5336			While Figure 4.8 is illustrative for relationships between drivers and "biodiversity" it tends to hide the kinds of impacts and their propagation to NCP. What are the endpoints for each of the 12 receptors? And how are these lined to Aichi targets which are so prominent in SPM 1? It is recommended to review whether Biodiversity and NCM targets should not be explicitly addressed in the IPBES conceptual framework. This may help to structure the logic of the linkages between the chapters of the ECA assessment!	Answering this question is not the goal of chapter 4
Mark Rounsevell	Ch.4	184	5336			Whilst I was a bit surprised to see such high levels of driver change and impact for climate change (above). I'm also surprised to see not much more impact of climate change for the future. Cold grassland for example is no different between past and future, but high latitudes will have much higher levels of warming than elsewhere in the future. Isn't the climate change problem likely to increase in the future?	these were by no means final results... Now, that the Delphi process has been finalized, the mentioned difference is clearly visible
Amor Torre-Marín	Ch.4	185	5341			Thomas: I suggest we keep the refs in the text, this will facilitate the inclusion of these in the ref list. The comments are just for internal purpose, so that we know which are new refs.	OK. This section on Inter-regional flows has been moved to a new section 4.2.5.
Mark Rounsevell	Ch.4	185	5354			"...are softened...": Not sure what this means. Use another verb?	Changed.
Mark Rounsevell	Ch.4	185	5368			"...external cost...": Does this mean that externalities are not part of the cost model?	Yes. Neither producer or consumer pay.
Mark Rounsevell	Ch.4	185	5379	185	5380	"... the producing countries...": Is it also not the responsibility of consuming countries to ensure that environmental regulations are properly implemented in the producing countries?	True, but international law and sovereignty principles give limited jurisdiction on production methods in other countries
Mark Rounsevell	Ch.4	185	5380			"...global trade institutions...": Perhaps be more specific here? Presumably this is reference to the WTO? It would be good to clearly outline what the failures are here in terms of global trade policy, and/or what could be done to alleviate the problem	WTO is only one of a multitude of multilateral and bilateral trade agreements. The arguments have been developed.
Jean-Paul Hettelingh	Ch.4	187	5290			The list of references needs to be verified against references made (e.g. Bobbink 2010 is missing...)	Done
The Netherlands: Astrid Hilgers	Ch.4	187	5290	230	7624	The list of references needs to be verified against references made (e.g. Bobbink 2010 is missing)	Done
Oliver Lindecke	Ch.4	203	6243	6244	203	Horváth et al. seems not to be cited in the main text. However, the effect of polarized light pollution should be acknowledged in the paragraphs about light pollution.	See above, we included: "Unnatural polarized light sources, e.g. from building materials, can also trigger maladaptive behaviors in polarization-sensitive taxa and alter ecological interactions (Horváth, Kriska, Malik, & Robertson, 2009).