

2nd Review Phase of IPBES Deliverable 3c) Fast-track methodological assessment on scenarios and models Chapter 5 ‘Ecosystem Services’

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Ram Pandit

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Lenin Babu Kamepalli

UK government

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Nkue Nouwezem Daniel Jude

Yann Clough

Marina Rosales Benites de Franco

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
1	5	General				<p>If I may make a general comment: This chapter makes a very good summary of existing models, their strengths and weaknesses in a very interesting way. I applaud efforts of the authors, this chapter is definitely going to add a huge value to this important IPBES document.</p> <p>However, one aspect looks missing. Economic valuation has not been discussed in this chapter. Many of the models discussed in this chapter have embedded in them economics. For example, InVEST produces outputs both in physical and monetary terms. Valuation approaches in most of the models are now outdated. There are some new and interesting economic valuation methods being developed which deserve attention.</p>	Mahbulul Alam	This chapter mentions but does not focus on economic valuation models
2	5	General				In chapter 5, we need to better note the need for basic science establishing linkages between drivers and BES responses. We can model that, but we need to carve out space to ensure we pursue the fundamental understanding and mechanism of the connections and relationships. Ditto socio-economic	Jason Link	We have focussed chapter on model assessment and discussion. Drivers

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						responses to changes in BES.		moved to chapter 3, discussion of missing links between biodiversity & WS as well as need for disaggregated and better understood links to HWB
3	5	General				The chapter is generally well written and covers the aspects expected. Some terminological issues arise, addressed seriatim below.	Peter Bridgewater	thanks – now(?) chapter substantially revised
4	5	General				Key findings somewhat mixed up with those of other chapters, but is a thought provoking discussion. Suggest greater emphasis on some of the solutions identified would be more useful in the key findings. The key recommendations appear not so well targeted at the audience for this document. Some might be better located in Chapter 7?	Shane Orchard	Much of work on capacity building was moved to chpt 7
5	5	General				Some of the terminology and concepts appear a little loose eg in the discussion of ‘services’ vs ‘human wellbeing linkages’. Pg 505 lines 4-7 - mention of efficient use: it is also possible to argue on the contrary ie. that more traditional uses of ecosystem services can be assessed as more efficient use modes, especially when assessed across multiple services. Definition of efficiency and also well-being important. The key point of resource overexploitation for a narrow set of economically driven uses would seem appropriate here.	Shane Orchard	Check terminology.
6	5	General				Chapters: 2; 3; 4; 5; 6; 8: The issue of dealing with uncertainty in models and scenarios (identifying, managing, communicating) is considered in almost every chapter in an explicit and broader part (see 2.3.4, 2.4.3, 3.5, 4.6, 5.5, 6.5, 8.2.3) This causes overlaps in content. Moreover, chapter-specific aspects of uncertainty are difficult to identify. We propose to deal with general aspects of uncertainty only in one or two chapters. The chapter-specific aspects of uncertainty might be additionally described in other relevant chapters. You may also wish to consider analysing the language used in the IPCC when discussing uncertainty and elaborating further steps in dealing with uncertainty. The IPCC uses qualitative “levels of confidence (comprised of “levels of evidence and agreement”) and quantitative “levels of likelihood”, if possible. Please see https://www.ipcc.ch/pdf/supporting-material/uncertainty-guidance-note.pdf . Such terminology might also be helpful for IPBES.	Germany	IPBES developed own standards we have revised language to be consistent with those standards
7	5	General				Chapters 2; 3; 4; 5: Chapter 3, 4 and 5 treat general aspects (importance, types etc.) of models and scenarios. This causes redundancies and inconsistencies.	Germany	We have tried to align content across chapters

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						The given conceptualisations should be adjusted and common aspects should be placed together (e.g. in chapt 2).		2,3,4 & 5
8	5	General				The link to nature's benefits to people and human well-being has to take into account the conceptualisations of nature's values. Thus, the collaboration with experts from deliverable 3d) is crucial for the development of the models and scenarios described in chapter 5.	Germany	Section has been revised.
9	5	General				The key findings and key recommendations need to be brought out more in the text within the chapter. Go through each key finding and ensure that it is clearly and explicitly brought out in the text of the chapter.	Robert Dunford	Done
10	5	General				<p>My review of the first draft concluded that it was not "on track"; it appears that the suggestions made in that review have not been taken up in producing this second order draft. Therefore there is some urgency in getting this chapter on track.</p> <p>The big problem remains – the chapter focus is on ecosystem services, yet biodiversity option values provide a benefit and are not treated in the chapter. I note again that the 3c intro chapter refers to this chapter addressing "the consequences of changes in biodiversity and ecosystems for the benefits that people derive from nature, and that therefore contribute to good quality of life (human well-being) – including, but not limited to, ecosystem goods and services"</p> <p>There are of course lots of studies that assess loss in biodiversity option value benefits at various geographic scales. For example the change in biodiversity may be loss of species, and the consequences for loss of benefits (loss of option value) is assessed by modelling phylogenetic diversity – that is just one example out of many. None of these are treated.</p> <p>This could be an embarrassing omission for IPBES – For example, going back more than 40 years, Holden (1974) summarised an important discussion meeting where participants called for "an Ethic of Biotic Diversity in which such diversity is viewed as a value in itself and is tied in with the survival and fitness of the human race". Holden warned, "Plants and animals that may now be regarded as dispensable may one day emerge as valuable resources" and that extinction "threatens to narrow down future choices for mankind". Roush (1977) similarly argued that "diversity increases the possibility of future benefits"</p> <p>Or just go back "40 days" –Gascon et al (9 NGOs) presented a persuasive case for the importance of biodiversity option values as a benefit. And even the Vatican just recently argued for the importance of the option values of biodiversity: "The loss of forests and woodlands entails the loss of species which may constitute extremely important resources in the future, not only for food but also for curing disease and other uses. Different species contain genes which could be key resources in years ahead for meeting human needs and regulating environmental problems."</p> <p>So, how are we assessing the loss of these benefits as a consequence of</p>	Dan P Faith	<p>Benefits from biodiversity are addressed via ecosystem services. However we not that current ecosystem service models do not explicitly link to biodiversity and making these connections clear, and better understood would be useful.</p> <p>Issues of geographical scale may be taken care of by the regional scenarios.</p> <p>Some of the issues are suggestions which are appreciated and most of them have been addressed in the revised chapter.</p>

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						<p>biodiversity change? The chapter says nothing. All those various methods for modelling and scenario setting for these “consequences of changes in biodiversity .. for the benefits to people” are not covered.</p> <p>The authors say “Nature, including both biodiversity and ecosystems, provides goods and benefits to human societies. These are throughout this chapter referred to as ecosystem services (e.g., provisioning, regulating, cultural, and supporting services), that contribute to wealth (anthropogenic assets) and well-being of human societies (MA 2005).” So, if the authors are recognizing option values of biodiversity, then perhaps they are calling these ecosystem services.... Few writers do this – so the range of opinions on this would need to be made clear. Note that the recent PNAS critical concept paper (West 2015) suggests that, in an ecosystem, preserving elements that contribute to broader (e.g. global) option values can be a service. But this raises the classic local-global problem addressed by systematic conservation planning (use of complementarity etc); this would need exposition.</p> <p>It’s probably best to highlight the separation of biodiversity and ecosystem service benefits. Generally these are separate, and are so even in parts of this chapter – e.g. they say “Analyses typically forecast the impact on and trade-offs to biodiversity and ecosystem service supply” That is also why the IPBES progress report http://www.ipbes.net/images/documents/plenary/third/information/INF_6/IPBES_3_INF_6.pdf for bonn says for this chap “Recognition that different decision-making processes may require a focus on different types of material and non-material values (as defined by the IPBES Conceptual Framework) including: ecosystem goods and services (provisioning, regulating, cultural services), existence value, bequest value, and option value...” In other words, ecosystem goods and services benefits and biodiversity option value benefits are not the same. The IPBES prelim guide to values pts to both ecosystem goods and services benefits and biodiversity option value benefits as having value “This guide is about the diverse conceptualization of multiple values of nature and its benefits. It aims to pinpoint these multiple values to align the methodologies for future qualitative and quantitative assessments of values of nature and its benefits, including biodiversity and ecosystem functions and services “</p>		

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						<p>I note that the recent Science for Environment Policy (2015) Ecosystem Services and the Environment. In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol laments the continued neglect of biodiversity option values.</p> <p>Overall, I think the chapter visits the familiar already much cited literature, and fails to draw on a broader literature to strengthen the story. For example, the Chapter refers to Bateman et al but not the counter to that study, which highlights the option value issues.</p> <p>Dan Faith</p>		
11	5	General				<p>General: A lot of work has gone into this and it covers many aspects of modelling consequences of change in biodiversity and ecosystem services for nature's benefits to people. There is so much in it, that the reader can get bewildered and wonder what all this detail is for- and by page 515 we discover that it is for: it is building evidence to support the IPBES 'assessments', but it is not clear what the assessments will be used for.</p> <p>Some aims and objectives at the start of the chapter would be helpful.</p> <p>Key recommendations should be action words, and include something for policy makers. Do the findings tell them why should they be interested in human well-being, do the recommendations tell them what do you want them to do? It should be emphasised that well-being is not entirely economical. I have been able to jot down quite a few specific examples of where ecosystem modelling has been used for a range of policy uses-the point about multiple policy uses could be made more strongly, and it may be useful to list them out.</p> <p>C5.2.2 is titled: needs gaps and proposed improvements- but there is a lot of detail and it is difficult to pull out the needs, gaps and improvements. Needs seem to crop up in most of the other chapters too- perhaps a list of needs could be drawn out?</p> <p>C5.2.4 is about institutions and other drivers but- is this much detail really necessary? Could some of the paragraphs be shortened by using table to summarise the information about drivers- and how these are related to modelling consequences on human well- being, benefits, strengths or weakness of incorporating them into models, problems that need to be overcome, what aspect of well-being is impacted against the supporting evidence (references)?</p> <p>C5.3 should be titled 'the policy or decision making context determines model choice'. There is a lot of wavering between developing and fitting models for purposes of decisions, or letting the decision need determine the models to be</p>	UK Government	<p>Most of the former section 5.2 was moved to other chapters, so the comments here are no longer applicable.</p> <p>These comments have been addressed in the revised version.</p>

No	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>applied. Why are IBPES decision context separated by the IPBES assessments from the decision context in the bulk of this chapter? 5.3.1 should become 5.3.2, which leads nicely onto the models.</p> <p>5.4 Types of models- Again a lot of useful information packed together- but a table would help structure it and make it more accessible- model type, uses, strengths weaknesses, improvements and references.</p> <p>There is a large section on InVEST- which could be edited down, along with some of the other model descriptions if a table is used. Figure 5.4 and 5.8 are really useful and would have been in a section called choosing models for particular purposes. A separate section describing links to human well-being would be useful.</p> <p>S5.5 should be cross checked with other chapters for consistency in dealing with uncertainties.</p> <p>Style guide:</p> <p>Shorten sentences. There is some very strange language in places, and awkward sentences that could be simplified. Delete all however, therefore, moreover, furthermore, indeed and key. Use passive voice. Avoid mixing opinions or recommendations for IPBES in with the text describing evidence. Statements such as: doing this gives a better result than doing that should be referenced.</p>		
12	5	501	15	501	16	Maybe this is overstated. Enough to say that consideration of tradeoffs/synergies/bundles is very important and ES approach allows that.	David Cooper	This is an editorial issue
13	5	501	13	502	22	The KF perhaps need review and rewriting. Not useful to say "This chapter" (KF are not a table of contents!).	David Cooper	It is not clear what the issue is. 'The chapter refers to chapter 5'
14	5	501	21	501	32	Are these two KF unique to the models in Chapter 5? Seem rather general	David Cooper	Chapter 5 is the models chapter, so this is OK.
15	5	501	23-27			Good finding, repeated in other forms in numerous places here. Somehow you have not made the leap from having simple components for ease of use to recommending modular components. US EPA's NESCS is designed to meet objectives that precisely mirror numerous findings and needs identified in Chapter 5, and modularity is one strength. NESCS "plugs in" between a classification system for ecosystems producing ES and a classification system of economic "users" of resources, including ES, that identifies users by industrial codes used in national accounting. More detail in later comments, as NESCS is not a comprehensive assessment, specializing as it does on being a modular ES identification tool amenable to participatory use.	U.S. Government	Noted - NESCS is now mentioned. Have tried to place assessment of models and scenarios broader context of decision and policy
16	5	501	22			change 'better fits' to appropriate	UK Government	Done
17	5	501	29			Produces	UK	Done

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							Government	
18	5	501	38			change low to weak	UK Government	Done
19	5	502	11	502	22	This paragraph seems confusing, although I understand what is trying to be said. In particular, “Making progress on the connections between biodiversity and ecosystem service models would improve ecosystem models, as would improving social and abiotic factors. Because ecosystem services are produced by social and ecological factors in addition to biodiversity, so including all these aspects of would likely increase the predictive quality of ecosystem service models. “ uses ecosystem services and ecosystem to apparently mean the same – and it is unclear what “services are produced by social and ecological factors” actually could mean. If biodiversity here means species it is better to say so.	Peter Bridgewater	section removed
20	5	502	11	502	13	“Models of biodiversity and models of ecosystem services are not well connected. Ecologists increasingly understand how biodiversity produces ecological functions (Chapter 4), however most models of ecosystem services utilise land use and land cover to predict ecosystem services.” Here as being IPBES, it would be better to give a striking example which is quite instructive, for example the wave alteration at extremely big scales production role (function, service) of jellyfish in oceans (see ScienceDaily).	Eyüp Yüksel	Noted
21	5	502	4	502	9	Perhaps this point should be reflected in SPM	David Cooper	No objection
22	5	502	11	502	22	Perhaps this point should be reflected in SPM	David Cooper	No objection
23	5	502	40	502	41	Scope if this chapter? Models or scenarios or both? This point seems rather general.	David Cooper	Scope of the chapter is modelling and scenarios, but we view scenarios as a type of soft modelling rather than as input to a model.
24	5	502	27	503	7	These two recommendations could be condensed into one. Does the reference in line 37 and 38 refer to the IPBES conceptual framework e.g. expansion of the conceptual framework? If not, the text might be reworded to avoid confusion. Also, development of new frameworks should be based on new knowledge. Perhaps what is really needed is information to improve understanding of the relationship between people and nature?	Brenda McAfee	Noted, and we have clarified discussion of IPBES conceptual framework and linked it to other frameworks.
25	5	502	4			Modelling the impact of ecological changes on human well-being is not well developed still in preliminary stages	Lenin Babu Kamepalli	Done
26	5	502	1			delete now	UK Government	Done

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							nt	
27	5	502	8			change diversity of to many	UK Government	Done
28	5	502	18			delete because	UK Government	Done
29	5	502	19			delete of	UK Government	Done
30	5	502	40			delete we recommend	UK Government	Done
31	5	502	41			Scenarios	UK Government	Done
32	5	502	4			Some successful models or tools that link ecosystem services to human well-being should be described even they are rare. Or some ideas to make this possible should be shown. Otherwise, it would be virtually difficult for the authors of the IPBES assessment to make assessment.	Tohru Nakashizuka	This comment is not clear
33	5	502	11	502	13	It is very much true. This direction should be muched also in Chapter 4.	Tohru Nakashizuka	Noted
34	5	502	4	502	9	Studies of human well-being is rapidly evolving. The well-being is partly shaped by values and value system an individual or a society hold. I think the study of different values of ecosystem and biodiversity based on different worldviews are crucially lacking. Same ecosystem may provide different types of values depending on social context, affecting well-being.	Ram Pandit	This chapter is not focussed on human wellbeing, but we point out the need to better understand and model how changes in nature, anthropogenic assets and institutions impact the well being of different people.
35	5	502	35	502	38	It is unclear what the 'new frameworks' refer to here? Is it just to signal areas for improvement or else. One thing that is relevant here is the work done in 3d 'values and valuation methods'. Key recommendations of 3d are highly relevant to link nature and people. IPBES should make use of the expertise of that group in setting scenarios and modelling them, particularly where questions of values and well-being are relevant.	Ram Pandit	Edited/clarified in new draft
36	5	503	19	503	27	When working with cross-scaling, sometimes not only scaling up but also scaling down methods could be likely.	Gunay Erpul	Noted, the recommend does not rule out scaling down
37	5	503	9	503	17	I suspect to really make this work ILK and Other values will not be "included"	Peter	We have substantially

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						in a model or scenario, but be the subject of separate models. Models and scenarios are extensions of existing world views, and ILK often comes from, or represents a different world view.	Bridgewater	expanded our discussions of ILK, models, scenarios and bridging knowledge systems
38	5	503	29	503	34	Isn't better to use all available information from both local and regional models, rather than recommend that expert groups ignore regional models because they are still developing.	Paula A Harrison	Agreed, but challenge would be reliance of under-developed models.
39	5	503	32	503	34	This is very ambitious and may hold up progress in developing regional assessments. Our experience in the UK is that it is not possible, at least in the short term, to integrate local (better) data into a national level 'system': see for example the relationship between National Accounts for Scotland and the UK national accounts, and the relationship between sub-national ecosystems accounts and national level ones. More detailed (better) local information can be used to validate and improve the national level systems, but can rarely be integrated because of the different sources and sometimes the different methods and definitions used.	UK Government	Chapter is trying to provide a guide to tradeoffs and options in use of multiple models. Tried to clarify this in chapter.
40	5	503	7		12	develop what?	UK Government	Revised
41	5	503	12			using models by IPBES- what about policy people in countries?	UK Government	chapter addresses both needs of IPBES and ecosystem service assessments in general
42	5	503	9	503	10	The recommendation that IPBES promotes developing new ways to include multiple values and indigenous and local knowledge systems in models and scenarios, is crucial to integrate scientific and local knowledge that leads to be more effective in planning, manage and make decisions.	Marina Rosales Benites de Franco	Noted
43	5	503	29	503	35	I strongly agree that regional assessments of ecosystem services (IPBES 2b) link and analyses connections among multiple cross-scale ecosystem service assessments that use better developed models of local ecosystem service dynamics. This assessment should	Marina Rosales Benites de Franco	Noted
44	5	504	31	504	31	Ecosystems are part of biodiversity – this sentence perpetuates the continuing linguistic mess around biodiversity and ecosystem services.	Peter Bridgewater	Corrected
45	5	504	30	505	16	There is no mention here of the novel ecosystem concept which has increasing traction, with of course some contention too. However it should receive at least a few words of acknowledgement.	Peter Bridgewater	Done
46	5.2	504	15	504	15	For the sake of clarity: the “conceptual framework” should only be used when the IPBES Conceptual Framework is meant.	Germany	Noted. This is the case here.
47	5.2.1	504	32	504	32	When nature's goods and benefits to people are referred to as ecosystem services throughout this chapter, inconsistencies with the title of the chapter and	Germany	We clarify that we are using ecosystem

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						with the terms in the IPBES Conceptual framework could result (see also the wording in the key findings page 501 – 502).		services is a broad sense at the start of chapter - it is too awkward to use broad term and most models use term ecosystem services
48	5	504	15	504	30	This wording does not reflect properly the conceptual framework of the IPBES since this is about Good quality of life and not only human well being, there is the need therefore to incorporate in addition the living-well in balance and harmony with Mother Earth. The whole section must be adjusted.	Diego Pacheco	We explain how we have used the IPBES conceptual framework to organize an assessment of existing research following the structure we were asked to follow by IPBES.
49	5	504	16			linkages (I believe this is a conceptual, not a grammatical point of concern. The word “linkages” in this title is entirely redundant to “ecosystem services,” because “services” means “increases human well-being,” unless it is specifically qualified otherwise [as in “intermediate” ES, which only indirectly support the final ES that affect human well-being]. The “transmission of services” aspect that the word “linkages” is intended to satisfy is absolutely implicit in the other words in the phrase.)	U.S. Government	section has been revised, but IPBES conceptualization doesn't include intermediate and final ecosystem services.
50	5	504	33			Nowadays supporting series are often (in Europe) called maintenance services and combined with Regulating services e.g. http://publications.jrc.ec.europa.eu/repository/bitstream/JRC94889/lbna27143enn.pdf and in the EU Mapping and Assessment of Ecosystem Services which is being undertaken by all Member States http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/pdf/2ndMAESWorkingPaper.pdf	UK Government	Noted
51	5	504	37	504	40	If we take our observations at the global level we may miss the local peculiarities. More the said “scientific” data in our developing countries does not reflect the realities of the field most of the time, due to some biases linked the data collector. If we consider human development index based on such data we won't appreciate human well-being at its real value	Nkue Nouwezem Daniel Jude	Comment unclear, but we discuss some of these issues in data and knowledge needs section
52	5	504	40	505	1	This is a general statement that can't be appropriate for many areas in developing countries, where some societies are still primitive and live from wild ecosystems. In these areas ecosystem simplification reduces vital elements for human well-being	Nkue Nouwezem Daniel Jude	This statement is appropriate for >>>99% of world's population
54	5	505	12	505	12	Insert ‘into the longer-term’ after ‘well-being’. It might be helpful to draw out some argumentation about the relationship between wellbeing and sustainability...i.e. sustainability extended into the future. This is important as	Gary Kass	We do not address this bigger issue as it is outside of scope of our

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						we could be looking to improve wellbeing now but actually trade off short-term wellbeing against longer-term sustainability.		chapter.
55	5	505	4			“Moreover, wild.....simplified ecosystems” - any evidence/ reference?	Mahbubul Alam	Unclear comment
56	5	505	21	505	24	When all chapters are considered as a whole, referring back to Chapter 1 thru 4 by these lines could be unnecessary.	Gunay Erpul	This should not be a problem since it will be a book
57	5	505	4	505	24	Difficult to read - needs editing	Paula A Harrison	Edited
58	5	505	7	505	8	The opinion “However, while scientists have 7 unravelled outlines of how ecosystem services contribute to human well-being” cannot be satisfactory/sufficient alone. The indispensable role of interruptions of ecosystem services by industrial actions, land use, urban areas dynamics, their corresponding list in terms of impact density is also explained, stressed, and classified by not scientist, but area managers, protected area managers, Ministries of nature conservation, etc.	Eyüp Yüksel	Main point is we have some but partial scientific knowledge of ecosystem services hope this is clear in revised chapter
59	5	505	8	505	13	“...there how these multiple is a great need to assess the links between ecosystem services and human well-being using scenarios and models in order to be able to develop and implement policies that can help ensure the sustained flow of benefits from biodiversity to human society, and thereby contribute to human well-being . In addition, there is a great need to assess how social and ecological changes increase or decrease the supply, use and demand for ecosystem services various socio-ecological context.” Here, water pollution epidemic diseases models have already been modeled by UNEP etc. Source of non-resilient bird (wildlife bird migratory species and chickens habitats and mutual interactions, interruption of such mutual beneficiary interactions through Crimean Congo Hemorrhagic Fever Disease) ecosystems and bird species habitats which are worse in impacting human health can be easily modeled, and should be exemplified as soon as possible without delaying! Otherwise many misunderstood, so for “hygienic” reasons destroys farming chickens in developing countries to eradicate this, but did failed due to getting rid of useful farming village chickens which are fed on harmful-virus-carrying tick (acarid) while providing no need for pesticides (against bees and pollination!). Therefore IPBES must prepare, made convenient models of phages, viruses, bacteria, bacterio-phages, mold, yeast, indoor air pollution (air conditioners in homes, hospitals, clinics, surgery rooms, etc.) in relation to visible by the naked-eye large organisms and events of animals, and human beings.	Eyüp Yüksel	For this comment and the next 2, It is not clear what the reviewer wants done. It seems like the reviewer want to contribute towards the recommendations from this chapter??
60	5	505	1	505	4	Also holiday villages, suburb areas, secondary holiday houses, and even biggest centrum (downtown) of cities provides important ecosystem services for water retention for people, and municipalities, wildlife habitats for birds, butterflies, reptiles, foxes, and so on. The most striking is the mechanical push forward service of big cities for the tired (exhausted) big migratory bird populations	Eyüp Yüksel	Noted

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						during extended migration routes, such as İstanbul, formerly Venice, etc. These big cities emits heat to the atmosphere up to migration route altitude of exhausted bird colonies. This heat layer in turn make birds become		
61	5	505	4	4	505	Health staff, professionals, hospital amnagers should be trained on the health benefit providing ecosytem services of natural habitats biodiversity at each scale species, habitat, biome, ecosyestem, gene. Tehy can better illuminate the public on the beneficiary sides of ecosystems, ecosystem services, biodiversity, and wilderness.	Eyüp Yüksel	Noted
62	5	505	18	505	24	This chapter is not about modelling connections between ecosystem services and human weill being. There is a huge misinterpretation of the conceptual framework. There is the need to talk about the connections between ecosystem functions and the living-well in balance and harmony with Mother Earth.	Diego Pacheco	We are following chapter outline we were given by IPBES
63	5	505	8	505	9	Sentence does not make sense. Maybe delete “how these multiple”?	Thomas Brooks	Section revised
64	5	505	4	505	5	Change the phrase to “Moreover, wild ecosystems may provide more of some services, such as disease regulation, than simplified ecosystems”	Cécile Leclere	Edited
65	5	505	8 – 9			there how these multiple is a great need to assess	Lenin Babu Kamepalli	Edited
66	5	505	13			ecosystem services in various socio-ecological context	Lenin Babu Kamepalli	Edited
67	5	505	4	505	5	What is the evidence for this statement?	UK Government	Edited
68	5	505	7		12	does not make sense	UK Government	Edited
69	5	505	14		16	Very IPBES focused, also useful for policy makers in countries	UK Government	Noted
70	5	505	18		24	Repeats what was said already, and adds a bit more about C3 and C4- do we really need this repetition?	UK Government	We’ve aligned chapters better and moved text
71	5	505	14		23	delete all 'key'	UK Government	text gone
72	5	505	4	505	5	These wild ecosystem also produce vital medication (traditional drugs)	Nkue Nouwezem Daniel Jude	Noted. It is only an example that is provided.
73	5	505	12	505	13	Looking at the spatial distribution of species and more to diverse trends of climate it is preferable to assess these changes at a local level. It is more	Nkue Nouwezem	Noted

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						expensive but provide accurate data and facilitate modelisation at different scale. Global views doesn't always reflect the real facts.	Daniel Jude	
74	5	506	1			Figure 5.1: -some unconventional terms were used in this figure -in top box "Living in harmony with nature" vs "Living-well in balance.....". What's the difference? -Two ramp bars "Changing over time" and "Integrating..." were used to describe the figure, but the these bars are inappropriate given the content in the figure	Mahbul Alam	We cannot change the IPBES conceptual framework.
75	5	506				Figure 5.1 and Figure SPM.1, cover similar topics, but are very different visually and in text. Suggest aligning.	Derek Tittensor	Noted, we cannot change Fig. 5.1
76	5	506	1	506	1	I believe the importance of this Figure should be enhanced, because it explains the aim of this Chapter. At the same time, the letter is not very clear.	María Isabel Delgado	How can this be done? we cannot change Fig. 5.1
77	5	506	Fig. 5.1			Given this level of generalization, the "changing over time" arrow at the bottom, and the arrow from Good quality of life to institutions and governance, how is there not an arrow from Good quality of life to Anthropogenic assets? I would direct attention to the fact that Anthropogenic assets is the only box with no arrow going into it, which gives it an inexplicable abiogenic quality greatly challenged by the "changing over time" premise. All Anthropogenic assets, including the change in stocks over time, are the result of savings (surfeit beyond absolute needs) or draw down of previous stocks from previous production cycles, each fueled by nature's benefits or the combination of nature's benefits and Anthropogenic assets built in previous years or generations. I understand the caution in not having bi-directional arrows throughout the Figure, but I present the case that between these two top boxes an exception is warranted. I suggest that a downward facing solid arrow is appropriate to add, leaving in place the dotted upward facing arrow.	U.S. Government	we cannot change Fig. 5.1
78	5	507	40	508		A caution that use of the words "production" and "provision" on line 41, page 507, and lines 2 and 15 on page 508 represents either a confusion about what the production of an ecosystem service is in contrast to the use or valuation of that service, or a conscientious (and dangerous, per the argument here for Figure SPM.1 and 3.1.5 on page S9) rejection of the "final" ecosystem services perspective. To be a final ecosystem service, an ecosystem must generate something that a human then values. The production, transmission, and appreciation are all essential elements of an ES. But the production of the ecosystem product and the production of value for that product are different processes. For the practitioner who parses function use and value within the final ecosystem services perspective, there is no question that one must as carefully as possible partition the inputs to human well-being that are human-based (and therefore already in microeconomic analysis and national accounting) from inputs into human well-being that are based in the structures functions and	U.S. Government	Disagree with comment. We are adopted a broader approach to ES following IPBES conceptual framework, hopefully clarified by discussion of multiple approaches & figure 5.2- we also include EPA NCESCS framework in section on valuation & accounting frameworks

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>processes of nature as these would yield benefits without human action or intervention. It is from the latter that <i>ecosystem</i> products that when used or valued in any way by humans become ecosystem services – whether the product be a wild mushroom, bird song, soil formation, genetic diversity, or a beautiful unspoiled beachscape. These un-marketed, unpriced services and provisions arising from natural processes are the very things the ecosystem services concept was designed to capture, the term itself linking for the eco-blind their fundamental dependence on complex ecologies that deeply undergird the market and most human attention.</p> <p>While the line has yet to be cleanly defined in academic publication, the final ecosystem services perspective pushes practitioners to determine whether a service or input occurs naturally (without human input, e.g., processes of decay and soil formation, sunlight, rain, most of what you would call supporting and regulating services), or whether there is measurable human input in the <i>production</i> of a good. The latter is an economic, and never an ecosystem function. Humans may restrict the scope or quality of a natural service (for example, by converting the land on which it occurs, or introducing chemical pollutants to its processes), but “nature’s benefits” come from nature. Managed systems may make it harder to distinguish the difference, but nature “naturally” processes soil (an ecosystem service), whether a farmer puts chemical fertilizer into the soil (a commercial process) or not. Humans may cap, pipe, preserve, or pollute a natural spring, but a natural spring comes from the ground – the spring water (in all of its attributes) is an ecosystem service. The moment a human applies anything that transports or harvests that water beyond its natural boundaries, the ecosystem service has transferred into the economy. Man may convert a wetland to a parking lot, or pollute that wetland, or hunt fauna on that wetland, but the spring peepers that breed on whatever remains of that wetland are an ecosystem service, as are their cries in the spring night. The concept of a socio-ecological production function is not incorrect so long as one clearly understands that what is being produced is that portion of human well-being that is ecosystem-services based. It is not the ecosystem services that are produced by any social capital or complex of things (as in the cited line numbers that I here dispute).</p> <p>Humans do not make (the season) spring, or spring water, or spring peepers. Even if humans restored a wetland, and re-seeded it with peepers, the peepers’ survival would be an ecosystem service, i.e., based on the natural processes occurring in the space from which the parking lot was removed.</p> <p>One may extend this class of argument that is rooted in the final ecosystem services perspective, and infer the larger point that crops <i>cannot</i> be ecosystem services. Why not, when a number of major publications and even some ES classification systems say they are? Because the hand of man is necessary for a “crop” to exist. Still, <i>many of the biophysical inputs</i> that help a seed become a harvestable edible plant within a managed ecosystem <i>are</i> ecosystem services.</p>		

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>Calling crops ecosystem services ultimately undermines the fundamental purpose of the ecosystem services concept – to get mankind to realize that the entire human economy is a weak subset, strongly dependent on underlying natural systems that we are now capable of seriously disrupting on very large scales. To identify which elements are natural and which are man-made, or to fumble in attempting to extricate the two for some crop, is an exercise which highlights the fundamental purpose of the ecosystem services concept. Simply substituting the word “value” for “production, in p507 line 41, and p508 line 2 solves the problem, while preserving the strengths of the Social-Ecological System (SES) approach. (Replacing “provision” with “processing or delivering” in p508 L15, and adding “economic” between “final” and “users” in the line before also leaves a sentence that does no violence to the final ecosystem services perspective.) Whether these changes would entirely preserve the intended meaning is a separate question. SES is useful for a <i>whole</i> system approach, engaging the range of elements in the <i>production of human well-being</i>, for which of course natural and human elements are necessary. But <i>production of ecosystem services</i> is ecological. (To be painfully specific for anyone new to this line of argument, this last short sentence may be greatly lengthened: The production of ecosystem end-products that are candidates to be ecosystem services, and only fully become ecosystem services when they are used or appreciated by humans [thus fulfilling the “service” part of the phrase] is necessarily an ecological process, whether the space for that ecological process to occur is created in a managed environment or not.)</p> <p>Some of the cited authors confuse which type of production is being referred to, and thus imply that man can make ecosystem services, when in fact man only infers value from natural things, or creates value in commercial things or in social interactions. This confusing of the production of value for ES with the production of ES has spilled over into this summary analysis. If man could produce any ecosystem service, it could not be an <i>ecosystem</i> service, because that produced by man is already <i>economic</i>. Note this perspective is consistent with the Constanza et al., 2014 figure used on p509 here in your Figure 5.2., which incidentally does not even argue from a final ecosystem services perspective.</p> <p>Greater familiarity with Boyd and Banzhaf, 2007, or the US EPA’s FECS-CS or NESCS ecosystem services classification systems, each designed to avoid double-counting of benefits and porous classification, might assist against confusing the object of “production.”</p>		
79	5	507	25	507	25	It is not only people, but also wildlife and all living creatures which benefit from ecosystem services (Contributes and Benefits).	Mahmood Yekeh Yazdandoost	Noted
80	5	507	40	507	43	This paragraph seems be a non sequitur?	Peter Bridgewater	Edited

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
							er	
81	5	507	17	509	8	Missing from this section is an appreciation that ecosystem services exists in the absence of people – supporting services in general are independent of people, regulating services have greater human involvement, provisioning still more and cultural are totally human dependant. I miss an explanation along these lines in this section.	Peter Bridgewater	Not according to IPBES conceptual framework
82	5	507				5.2.2 pg 507 para 1 – tidy up grammar here.	Shane Orchard	Section has been dropped from this chapter.
83	5	507	17	507	17	This is also wrong, wince the conceptual framework is not only about ecosystem services and human well being, but also about living-well in balance and harmony with Mother Earth, and about ecosystem functions, Mother Earth and systems of life. DELETE THE WHOLE CHAPTER OR WORK AGAIN USING A MORE OPEN APPROACH REALTED TO THOSE CONCEPTS.	Diego Pacheco	Not a very useful comment. We have followed chapter outline we were given by IPBES. Irregardless, this section has been dropped from this chapter.
84	5	507	25	507	26	It is not so straightforward that ecosystems = natural capital. For many authors natural capital is a broader term than ecosystem services and includes for example subs soil assets and abiotic flows. (see for example the definition given by the MAES group in their first report in 2013)	Cécile Leclere	Section has been dropped from this chapter.
85	5	507	26	507	27	In SEEA-EEA, ecosystem services are not equivalent to ecosystem assets ! Assets are considered as a stock whereas services are considered as flows. See the definition part of the SEEA-EEA document (page 162 for ecosystem assets and p 164-165 for ecosystem services)	Cécile Leclere	Section has been dropped from this chapter.
86	5	507	30	507	30	Rephrase in order not to use the “consume” word -> “benefits from nature can only arise when complementary anthropogenic assets...”	Cécile Leclere	Section has been dropped from this chapter.
87	5	507	29	507	29	To note that usually recreation services require some infrastructure in terms of roads, car parks etc. in order to for people to benefit from them.	UK Government	Section has been dropped from this chapter.
88	5	507	37	508	15	This whole section seems just to focus on the role of produced assets , human capital in the form of knowledge, skills and abilities, and social capital: it ignores labour inputs that (for example) work the machinery or simply pick the crops. A better representation of how anthropogenic inputs contribute to the delivery of services – and how services then deliver benefits (the two terms are conflated in chapter 5 and ought to be distinguished) - is given in the SEEA-EEA (2014).	UK Government	Section has been dropped from this chapter.
89	5	507	34		35	delete	UK Government	Section has been dropped from this chapter.
90	5	507	31		33	change to For example, considering timber as a provisioning service, machines and transport systems are necessary bring the timber resources to final users or	UK Government	Section has been dropped from this

№	Chap ter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						producers in the intermediate sectors for further processing	nt	chapter.
91	5	507	41			delete In this regard, one should think of	UK Governme nt	Section has been dropped from this chapter.
92	5	507	42			knowledge should be thought of	UK Governme nt	Section has been dropped from this chapter.
93	5	507		512		Not always clear how these drivers are important considerations for modelling or how they could or could not be incorporated- what are the benefits and difficulties of incorporating them?	UK Governme nt	Section has been dropped from this chapter.
94	5	507	23	507	23	Check the sentence for clarity – missing ‘of’	Ram Pandit	Section has been dropped from this chapter.
95	5	507	40	507	41	‘knowledge, values, skills, and abilities. Values people place on a particular ecosystem service may contribute towards its production as well as use.	Ram Pandit	Section has been dropped from this chapter.
96	5	508	33	37	508	“...advances in the development of such integrated framework can be found in the Social-Ecological System (SES) approach (see e.g. Berkes et al. 2003, Ostrom 2009, and Reyers et al. 2013), where four core subsystems are usually characterised for analysing them: (i) resource systems; (ii) resource units; (iii) governance systems; and (iv) users (Ostrom 2009).” However majority of the public, in particular the poor does not aware of this! So cannot seek for its rights. The dominant economic system s globalization, and it does not give permission protection of ecosystem services in favour of the public of the world fairly. This is directly related to world’s present severely unfair distribution of income due to financial capital of the world which manages the world over the nations, governments, irrespective of some efforts aimed to conserve ecosystem services, and biodiversity by the UN bodies, EEA, OECD, etc. distribution. So we must find other, more in-depth, root problems solutions.	Eyüp Yüksel	Section has been dropped from this chapter.
97	5	508	20	508	20	Delete word ‘technology’.	UK Governme nt	Section has been dropped from this chapter.
98	5	508	25	508	28	This sentence is a bit garbled but also perhaps misses the point. For me, the social dynamic goes far wider than technological change and institutional settings, to include demographic variables, leisure time habits etc. Whether it is realistic to expect modelling to cover all this is another matter ...	UK Governme nt	Section has been dropped from this chapter.
99	5	508	11			change to that make access to an ecological service by the people possible	UK Governme nt	Section has been dropped from this chapter.
100	5	508	32		33	change to The modelling should capture non-linear feedbacks, trade-offs, and drivers associated with services provision	UK Governme nt	Section has been dropped from this chapter.
101	5	508	25	508	37	Social/built/human/natural factors–collectively genrate value/values to	Ram	Section has been

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						individual and society which affect human well-being. Does it need explicit mention in this paragraph?	Pandit	dropped from this chapter.
102	5	509	Fig. 5.2	509		Figure 1 or Figure 5.2, confusing. I think in the Chapter 5 there is reference only to Figure 5.2 (page 508, line 11)	Gunay Erpul	Section has been dropped from this chapter.
103	5	509	5.2			The important contribution of cultural capital is missing here, which bring ILK to the table. Cultural is not simply a sub-section of social, it is on its own.	Peter Bridgewater	Section has been dropped from this chapter.
104	5	509				5.2.3 Fig 5.2 - caption needs matching with graphics. Possibly a greater emphasis on both understanding and accounting for Natural Capital needed in this section, where considerations for modelling ES are presented ie. modelling of both stocks and flows is the foundation, then considering spatio-temporal aspects of each follows.	Shane Orchard	Section has been dropped from this chapter.
105	5	509			512	To “5.2.4 Institutions and other drivers of ecosystem services and human well-9 being”, “Unfair Revenue Distribution between nations and inside nations” should be absolutely inserted as the subdivision: “Sociopolitical drivers” does not contain this! The completely, severely distorted revenue distribution is too important compared to indigenous people, and “Aboriginal peoples (Peterson 2000).”	Eyüp Yüksel	Section has been dropped from this chapter.
106	5	509	1	509	3	This graph also reflects the western view and not all knowledge systems. Natural capital is a work of the green western economy. This chapter is very unbalanced. Need to delete this graph.	Diego Pacheco	Section has been dropped from this chapter. Figure replaced with an number of frameworks. We are covering what has been done.
107	5	509	9	510	28	Also, this section only looks partially to one part of the conceptual framework and does not analyze the relationship between ecosystem functions and the living-well in balance with Mother Earth. The first alternative is to delete the section and the second one to rework the entire section.	Diego Pacheco	Section has been dropped and moved to chapter 3. Our chapter only part of framework. It follows outline of what we were asked to address by IPBES
108	5	509	Figure 5.2 caption			“...suggestions for diverse frameworks welcome.” From US EPA’s National Ecosystem Services Classification System (NESCO Report due for publication autumn of 2015), in the draft for the NESCO Report Executive Summary, Figure ES-1. Conceptual Framework Including Flows of Final Ecosystem Services (FFES) as Inputs to Human Systems:	U.S. Government	This figure is now included and briefly discussed in the chapter

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>The diagram is divided into two horizontal sections. The top section, labeled 'Ecosystem Services Demand-Side', has a light blue background and contains a flow from left to right: 'Physical Capital and Labor' (in a blue box) leads to 'Intermediate Economic Production Function' (in a blue circle), which leads to 'Final Economic Production Function' (in a blue circle), which finally leads to 'Household Utility Function' (in a blue circle). The flows are labeled 'Capital and labor services', 'Intermediate Economic Goods & Services /Products', and 'Final Economic Goods & Services /Products' respectively. The bottom section, labeled 'Ecosystem Services Supply-Side', has a light green background and contains a flow from left to right: 'Natural Capital' (in a green box) leads to 'Ecological Production Function' (in a green circle), which leads to 'Ecological End-Products' (in a green box). A central green box labeled 'Flows of Final Ecosystem Services' is connected to 'Ecological End-Products' and 'Final Economic Production Function' by double-headed arrows. Vertical arrows also connect 'Ecological End-Products' to 'Intermediate Economic Production Function' and 'Final Economic Production Function' to 'Household Utility Function'.</p>		
109	5	509	1	509	1	As noted above, neither of these completely captures the links between the natural assets and anthropogenic inputs. They're helpful to the development of models in that they go wider than the SEEA-EEA to include other forms of capital, but they need more clarity over the terms and the relationships between the entities shown.	UK Government	Section has been dropped from this chapter.
110	5.2.4	510	38	512	28	This description of drivers corresponds more to the focus given in chap. 3 than to chapt. 5.	Germany	Section has been dropped from this chapter.
111	5	510	34	502	2	Useful KF, but bold text perhaps not the most useful. Consider combining this one with next KF.	David Cooper	Section has been dropped from this chapter.
112	5	510	24	510	26	A distinction must be done between resources degradation and resources exploitation. While addressing resource exploitation you have given example of resources degradation	Nkue Nouwezem Daniel Jude	Section has been dropped from this chapter.
113	5	510	41	510	42	In developing countries, precisely on the central African countries, Urbanization rate is function of population growth (size and affluence. Both have the same impact on the ecosystem services) With the town expansion (arising of slums, industrialization of the sub rural) ecosystem services are reduced	Nkue Nouwezem Daniel Jude	Section has been dropped from this chapter.

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
114	5	510	1	510	2	..and wealth, international trade, etc), direct natural drivers (e.g., earthquakes, volcanic eruptions, etc), as well as indirect drivers of change (institutions and governance systems, societal level of inequalities, corruption, cultural values and practices, policies, technology, etc).	Marina Rosales Benites de Franco	Section has been dropped from this chapter.
115	5	510	20	510	21	2007). Fragmented legal systems can lead to gaps and conflicts (Techera & Klein, 2011, Pomeroy et al. 2010) and centralist bias rules, while governance of large scale ecosystems requires identification of the heterogeneous, multi-scale and interlinked nature of these systems (Fidelman et al. 2012).	Marina Rosales Benites de Franco	Section has been dropped from this chapter.
116	5	511	16	511	16	I realise it can be editorial but <i>Aboriginal</i> is only capitalised in the case of Australian Aboriginals.	Peter Bridgewater	Section has been dropped from this chapter.
117	5	511	33	512	2	Of course there are many negative aspects of climate change on ecosystem services but there will also likely be positive ones? Can this not somehow be alluded too?	Peter Bridgewater	Section has been dropped from this chapter.
118	5	511	33	511	43	About climate variability and change be careful about the word used here. In particular considering extrem events, even if climate variability is expected to increase in the future, there is not yet clear and undoubtedly evidence on relation between specific extrem events and climate change. So it is better to use sentences like “it is likely that climate change will increase the number of negative events such as super-storms, droughts”	Nicolas Viovy	Section has been dropped from this chapter.
119	5	511	37	511	38	Don't forget that increased atmospheric concentration of carbon dioxide has also increased the productivity of some systems, thus enhancing service (IPCC WG2 Chapter 4)	UK Government	Section has been dropped from this chapter.
120	5	511	11	511	11	Whenever there is war social destruction occur	Nkue Nouwezem Daniel Jude	Section has been dropped from this chapter.
121	5	512	7	512	11	Land-use change could result in increase in carbon storage or decrease in carbon storage and increase in carbon release? What about timber and food production? Next sentence opposes this sentence.	Mahmood Yekeh Yazdandoost	Section has been dropped from this chapter.
122	5	512	37	512	41	Do these lines try to say there is a need for “process-based models” rather than stochastic models? By nature, this is the way it should be to explain ecosystem services and functions, and so, it could be better to put a little more emphasis on “process-based models”.	Gunay Erpul	Section has been dropped from this chapter.
123	5	512	15	512	15	The word huge is inappropriate here. But in general this paragraph is more balanced than the climate change one alluded to in the comment above.	Peter Bridgewater	Section has been dropped from this chapter.
124	5	512	21	512	28	Perhaps a note that “natural” disturbances can be amplified/distorted by climate change, invasives, land use change etc etc?	Peter Bridgewater	Section has been dropped from this chapter.
125	5	512	4	512	11	Is reforestation Should not been added as a 5 th land conversion that affect demand and supply of ES ?	Nicolas Viovy	Section has been dropped from this

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						It seems that there is inconsistency in presentation of impact of LU on ES. Only positive effect of LUC on ES is presented for carbon storage, food production but a negative effect on species habitat. If both aspects are presented one should also present negative effect of LUC for instance on carbon sequestration in case of deforestation.		chapter.
126	5	512	5	512	5	Insert rural industrialization	Nkue Nouwezem Daniel Jude	Section has been dropped from this chapter.
127	5	513				5.2.6 – key points for chapter.	Shane Orchard	Noted
128	5	513	21			Cross-reference to chapter 2	Paula A Harrison	Done
129	5.3	513	21	517	16	Title and content of section 5.3 are associated more with the objective of chap. 3 than chapt. 5.	Germany	Revised to fit better with chapter 5
130	5	513			32	Social capital aspects are important here too particularly networks of connectedness, and issues of trust, engagement and agency etc. are also important here. (these are bigger than just “socio-cultural characteristics of the beneficiaries” or “governance and institutional settings”). The other capitals are also worth considering in terms of their implications in terms of coping/adapting to lack of/changes in ecosystem services.	Robert Dunford	we briefly discuss but relate to IPBES framework also see chapter 3
131	5	513	1-7			These sentences clearly state that “...modelling the linkages between ecosystem services and human well-being may be key to achieving international and national IPBES and CBD targets...”. The US EPA’s NESCS, and its antecedent partner FECS-CS, have done <i>exactly</i> this, but are not comprehensive ES assessment tools, because they have done <i>exactly</i> this. They achieve this through interdisciplinary collaboration throughout their development, and by intentionally <i>not</i> attempting to conduct a full ES assessment, focusing rather on getting as comprehensive and precise as possible the identification of ES and of flows of final ES into the human sphere. Each system is intended to serve a modular function within a larger suite of tools and resources that would serve an ES assessment, including prediction dynamics. This satisfies the desire expressed in 515, lines 7-14, and in lines 19-21 on page 532 (page 536 in a separate comment). Both FECS-CS and NESCS attempt to identify every ES (or flow of ES) that may occur in a scenario or application. This can run to the dozens.	U.S. Government	We’ve added NESCS to chapter
132	5	513	7		14	cut into smaller sentences!	UK Government	Done
133	5	513	15		18	References to the IPBES framework get confusing, repeats line 3-6 p 509, differs from comment about scales and interactions p 512, line 32-24, and other references to 3 components of models under IPBES framework. Is the list here indicating that models need further development, or the conceptual framework?	UK Government	Section has been removed. We better connect to IPBES framework in text

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
134	5	513	26			change is to into	UK Government	section removed
135	5	513	32	513	37	‘Values at stake’ – what values of biodiversity and ES are at stake in a given decision context. These values at stake should also be explicitly mentioned here in the text in line of table 5.1.	Ram Pandit	text has been removed following larger revisions
136	5	514	1			Table 5.1: Don’t include two tables in the report in different chapters with very similar headings, but different content. This is very confusing. I would recommend removing this detail from chapter 5 and ensuring it is integrated into chapter 2 where it can be cited from chapter 5	Paula A Harrison	aligned better with chapter 2
137	5	515	25	515	26	ecosystem functions and benefits is used in 1 25 but ecosystem goods and services in 1 26 – consistent usage would be preferable.	Peter Bridgewater	revised
138	5	515	34	515	35	The Aichi targets are global, probably don’t fit here, the rest works well.	Peter Bridgewater	moved to chapter 3+4
139	5	515	16		18	At last, we have the aims of the IPBES assessments- informing the uses of models in the assessments should be one of the aims of the chapter?	UK Government	revised, this assessment is for IPBES assessments & broader community
140	5	516	1	516	3	A process-based scaling up”of ecosystem services from regional and subregional assessments to global assessment could be a concept here.	Gunay Erpul	yes; added to discussion
141	5	516	5	516	6	What are “IPBES decision contexts”??	David Cooper	explained chapter 2; linked to figure 5.2
142	5	517				The model types in section 5.4.1 first paragraph appear to roughly correspond to those defined in Chapter 4: proxy-based models (correlative models in Chapter 4), and biophysical simulations (process-based models in Chapter 4; in fact described as ‘process-based models’ in 5.4.1.2). Suggest harmonizing concepts and language.	Derek Tittensor	yes; now they are aligned - and we have much more discussion
143	5	517	on			It is suggested that most ecosystem service models fall into two categories (proxy-based and process-based), but then four categories are described (the additional ones being probabilistic models and social-ecological scenarios). Please refine for consistency.	Derek Tittensor	done
144	5	517		14		Cross-reference with Chapter 4	Robert Dunford	done
145	5	517	30	517	34	This is a key distinction. Turner et al. 2012 BioScience used “potential ecosystem services” to describe the former (“supply side”) and “realized ecosystem services” (“demand side”) to describe the latter, adding a third class of “essential ecosystem services” to incorporate measures of reliance, poverty, and equity – the delivery of the same quantity of a given ecosystem service to different people can have completely different implications for lives and livelihoods. It would be worth adding this third approach here.	Thomas Brooks	section revised. Many different approaches used to conceptualize ES & people we do not discuss them all. Similar TEEB framework added to alternative conceptual

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
								frameworks.
146	5	517	25	518	5	In this chapter, ecosystem service models are typed as “process-based” or “proxy-based.” But the term “proxy” might be better used to type the response variables (i.e., does the model predict a final service or a “proxy” for the service such as a quality variable) than computational type, since even a process-based model can estimate a proxy variable rather than a service. Why not use “empirical” as the alternative to “proces-based,” both here and in Chapter 4? (Note, in Chapter 4 these are called “correlative.”)	U.S. Government	clarified and explained; typology now consistent with chapter 4
147	5	518	2			Figure 5.3: ARIES is not a system dynamics model, but MIMES is. Please double check.	Mahbulul Alam	correct; clarified
148	5	518	17			The term “ecological production function” is defined differently elsewhere in literature (e.g. Johnsson et al 2014). Please double check.	Mahbulul Alam	Text edited
149	5	518	Fig.3 of line 2			Is there any meaning of outer dash dot circle apart from encircling?	Gunay Erpul	figure revised
150	5	518		15		European work such as the GREENFRAME approach (Kopperoinen et al., 2014) extends the Burkhardt approaches by including local knowledge and additional datasets. It is worth mentioning here. Its also worth stressing that, even within the context in which they are designed, these approaches are only strong where there is a lengthy iterative stakeholder process. Just making the values by themselves can lead to dubious results. As such, though pragmatic, and less complex than other approaches they can still be quite time consuming.	Robert Dunford	We cite Burkhardt because it is review paper, rather than individual examples of matrix models.
151	5	518	5	519	22	Another approach is to predict (e.g., Larsen et al. 2012 PLoS ONE) or measure (e.g., Peh et al. 2013 Ecosystem Services) ecosystem service provision from particular sites. Documentation of sites as being of particular importance for biodiversity (e.g., Eken et al. 2004 BioScience, Ricketts et al. 2005 PNAS, Butchart et al. 2012 PLoS ONE), in comparison to counterfactual sites elsewhere, allows inference regarding the connections between biodiversity and ecosystem services.	Thomas Brooks	These papers are now cited
152	5	518	Fig 5.3			Proxy models still take account of the biological component of the system it is just that a particular land cover (or species) may be substituted for an ecosystem type, although for some (e.g. agro-ecosystems) these may at the coarse scale, overlap	UK Government	We have tried to explain this point in text, and not they may not capture changes outside of data used to produce correlations.
153	5	519	24			Section 5.4.1.2: There are also approaches where statistical emulators or meta-models of process-based models have been developed to enable better coupling of models across different sectors/disciplines (e.g. integration of meta-models for agriculture, forestry, species, hydrology, coasts and urban systems in the CLIMSAVE Integrated Assessment Platform; Harrison et al. (2013). Combining qualitative and quantitative understanding for exploring cross-	Paula A Harrison	we have more discussion on meta-models

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						sectoral climate change impacts, adaptation and vulnerability in Europe. Regional Environmental Change. 13: 761-780; Harrison et al. (2015). Assessing cross-sectoral climate change impacts, vulnerability and adaptation: An Introduction to the CLIMSAVE project. Climatic Change, 128: 153-167, DOI 10.1007/s10584-015-1324-3; Dunford et al. (2015). Ecosystem service provision in a changing Europe: adapting to the impacts of combined climate and socio-economic change. Landscape Ecology, 30: 443-461, DOI 10.1007/s10980-014-0148-2).		
154	5	519			521	To “5.4.1.2 Process-based models” section, “the load and impact of widespread wars over the world” should be added, and should be analyzed very carefully, by in-depth analyzing capacity.	Eyüp Yüksel	section shortened
155	5	519	18	519	22	This critique of Costanza et al. 1997 Nature is rather facile; the original paper is very clear on the caveats and limitations of the approach, and a number of subsequent refinements (e.g., Turner et al. 2012 BioScience) address some of them.	Thomas Brooks	Clarified in general discussion of correlation and process models
156	5	519	19	519	22	CLIMSAVE IAP was an integrated assessment model that used a proxy approach to assess vulnerability of ecosystem services to climate change. See R. Dunford, P.A. Harrison, J. Jäger, M.D.A. Rounsevell and R. Tinch (2015). Exploring climate change vulnerability across sectors and scenarios through indicators of impacts and coping capacity. Climatic Change, 128:339-354, DOI 10.1007/s10584-014-1162-8. Some of the IAM models are more process based. CLIMSAVE IAP is being further developed in the EU IMPRESSOINS project and the health sector is being added to enhance assessment of human well-being.	UK Government	We do not review all models of ES. This model is not included
157	5	520	36			Ensure consistency and avoid repetition by cross-referencing information on scenarios from other chapters	Paula A Harrison	Cross-references added
158	5	520	12	520	12	Another advantage of process based models that can be indicated is “a priori” a better ability of extrapolation outside of the domain where they have been calibrated (because of the genericity of the processes considered) than empirical or statistical models for which ability to extrapolation is very uncertain.	Nicolas Viovy	We have now added section on process models
159	5	520		6		Process-based methods not forcibly fine scale – see IMAGE or GLOBIO ...	Robert Dunford	Clarified
160	5	521	40	521	43	Need more specific information on why these ecosystem service models were selected and not others, i.e. was a literature review undertaken to identify the “major” models where “major” refers to highest number of references, citations, applications in case studies, or something else. Alternatively, reword as examples of different ecosystem services models as done in chapter 4 for biodiversity-related models.	Paula A Harrison	Clarified
161	5.4.2	521	39	522	5	In the introduction to this chapter it is stated that the ‘major models (and modeling approaches)’ are described. It seems to me, however, that you then not present a comprehensive list of available models. For marine ecosystems you just include Ecopath with Ecosim but there is also Atlantis, which is an ecosystem services model (as far as I can judge as a non ecologist). My	Ralf Doering	That is correct we state that, and we now mention Atlantis.

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						assumption is that you cannot provide a full list of models here but then it should be stated. However, later in ch. 6.3.1 Atlantis is mentioned as a marine ecosystem model.		
162	5	521				In my opinion, “5.4.2 Description of major ecosystem services models” cannot be so much important in protecting ecosystem services unless they are to be implemented by the strong resistant policy makers accept.	Eyüp Yüksel	Comment is not clear.
163	5	521		42	43	I can understand the need to limit the number of models mentioned but in doing so you are missing out on some work that has directly addressed some of the key issues you note as being absent (cross-sectoral interactions, response to multiple drivers etc.). Our recent research in the CLIMSAVE project provides an integrated assessment model that projects both ecosystem processes and ecosystem services (such as food, water and timber provision, biodiversity vulnerability for arable and forest-based species, flooding and variables related to landscape aesthetics/experience) at a European Scale in response to both socio-economic and climatic drivers. Rather than producing and combining multiple independent layers of ES provision, the CLIMSAVE model produces ecosystem service maps that actually respond to interactions between sectors (i.e. land use responds to e.g. water stress from urban, industrial and agricultural demand as well as direct climatic influences). See Dunford, R.W., Smith, A.C., Harrison, P.A. and Hanganu, D. (2015) Ecosystem service provision in a changing Europe: adapting to the impacts of combined climate and socio-economic change. <i>Landscape Ecology</i> , 30(3): 443-461.)	Robert Dunford	Now mentioned.
164	5	521	39	528	41	Section 5.4.2 is very unbalanced at the moment, with excessive detail dedicated to some tools. This should be balanced out, and approximately the same amount of space devoted to each. The justification of “more emphasis on modelling frameworks that have a community of practice around them, have available documentation, and are open-access” does not hold water – TESSA, for example, has all three of these.	Thomas Brooks	TESSA is different type of model from EwE etc. Sections not reorganized.
165	5	521	39			What is a 'major' ecosystem model?	UK Government	This is now clarified
166	5	522				Table 5.2: -TESSA is not a model, it is a step by step guide to assess ecosystem services by “non-specialists” -Corporate ES Review is not a model -SEEA-EEA is not a model, it aims to be a statistical standards consistent with SNA -Green GDP/GPI, please double check	Mahbul Alam	Section reorganized - these are models in an static assessment way
167	5	522		525		It is a little odd that Ecopath with Ecosim is presented in this chapter as an example of an ecosystem services model (as well as being in Chapter 4), whereas other heavily-developed approaches (e.g. Atlantis) are not. Is this just a set of examples? The language tends to suggest not (‘major ecosystem services models’). Can be addressed by either including all models through a more	Derek Tittensor	EwE has been widely used to model ecosystem services, but not Atlantis. Atlantis is now mentioned

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment																														
						intensive literature search, or through indicating that those shown are just examples and that additional approaches are out there.																																
						<table border="1"> <thead> <tr> <th>Model</th> <th></th> <th>Ease of Use</th> <th>Use in participatory process</th> <th>References</th> </tr> </thead> <tbody> <tr> <td>Participatory GIS Models</td> <td>Regional, watershed, landscape, local</td> <td>Medium</td> <td>Yes</td> <td></td> </tr> <tr> <td>Community-based participatory mapping</td> <td></td> <td>Easy</td> <td>Yes</td> <td>CBD. Community based monitoring.</td> </tr> <tr> <td>Collective action framework</td> <td>National and regional</td> <td>Easy</td> <td>Yes</td> <td>Conceptual and methodological framework. UNEP/CBD/CO P/12/INF/7 Page 2</td> </tr> <tr> <td>System of life</td> <td>National, regional, watershed, landscape, local</td> <td></td> <td>Yes</td> <td>Pacheco, Diego. 2014</td> </tr> <tr> <td>Plans of life</td> <td>Landscape, local</td> <td>Easy</td> <td>Yes</td> <td></td> </tr> </tbody> </table>	Model		Ease of Use	Use in participatory process	References	Participatory GIS Models	Regional, watershed, landscape, local	Medium	Yes		Community-based participatory mapping		Easy	Yes	CBD. Community based monitoring.	Collective action framework	National and regional	Easy	Yes	Conceptual and methodological framework. UNEP/CBD/CO P/12/INF/7 Page 2	System of life	National, regional, watershed, landscape, local		Yes	Pacheco, Diego. 2014	Plans of life	Landscape, local	Easy	Yes		Diego Pacheco	A reference would have been helpful here. We have added a figure from a new review paper on participatory modelling approaches for ES. We have added to discussions of ILK + modelling, but despite a lot of effort searching there are few models in this area that bridge multiple knowledge systems
Model		Ease of Use	Use in participatory process	References																																		
Participatory GIS Models	Regional, watershed, landscape, local	Medium	Yes																																			
Community-based participatory mapping		Easy	Yes	CBD. Community based monitoring.																																		
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System of life	National, regional, watershed, landscape, local		Yes	Pacheco, Diego. 2014																																		
Plans of life	Landscape, local	Easy	Yes																																			
169	5	522	1	522	5	<p>Corporate ESR, SEEA-EEA and Green GDP/GDI are NOT ecosystem services models. Corporate ESR is a guidance to conduct a diagnosis of interactions between business activities and ecosystem's functioning. Results are qualitative and subjective. SEEA-EEA is an accounting framework for organising information and data on ecosystems and their services. Green GDP/GDI are indicators that complement the traditional GDP.</p> <p>They can be mentioned somewhere else in the summary since they are interesting approaches for policy makers but they should not appear in the Table 5.1, it is really confusing.</p> <p>Should they though my remark stay in this table, they have to appear in a different colour since those approaches are completely different from all the other models mentioned in the table.</p>	Cécile Leclere	Tables have been reorganized																														

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						LUTO is not present in the rest of the chapter (no description)...		
170	5	522	1	522	4	Table 5.2 needs to be linked to text to be useful.	David Cooper	Now revised table 2 linked to CHpt 2 + chpt 5 text
171	5	522	Table 5.2.			“major models and modelling approaches” here omits approaches that expressly follow the final ecosystem services framework (with the exception of SEEA-EEA, whose needs compel it into that framework, but the final ES framework is but one of many drivers of the SEEA-EEA modelling set). As with Figures 5.6-5.8, only systems that attempt comprehensive ES assessment are included? If one were to follow objectives and “frontiers” defined within chapter 5 and conclude that a modular tool driven by the final ES framework were relevant, the US EPA’s NESCS would have “Flexible” under the Scale <i>and</i> under the Ecosystem Services columns, and Easy (or at worst Medium) under Ease of Use. (NESCS would not in its current form under Scale extend to Global.) I believe NESCS is participatory, but this would involve careful discussion of your term (perhaps inapplicable to a tool that does not do comprehensive ES assessments). Aside from not being a comprehensive assessment tool (which developers hail as a strength), the key “weakness” is that the first NESCS report is scheduled for publication autumn of 2015. The US EPA’s FECS would have the same row values in this Table, but has an EPA report published 2013. Either tool might benefit from direct citation of Boyd and Banzhaf, 2007 as a second reference.	U.S. Government	Don’t understand this comment. This section has been revised.
172	5	522				very useful summary	UK Government	thanks
173	5	523		524		InVEST’s description is disproportionately large compared to other models discussed here	Mahbubul Alam	We have purposefully emphasized most widespread modelling groups InVest & EwE followed by ARIES.
174	5	523		529		too detailed	UK Government	This has been revised
175	5	523	39		43	lists policy uses of inVEST- useful- many policy uses, could also be listed out for other models to make the point that models can serve a multiple policy decisions- not just one.	UK Government	revised and moved.
176	5	524	13	526	15	Modelling “frameworks” are contrasted with “approaches,” but the respective terms are not satisfactorily defined.	U.S. Government	revised
177	5	525	2	525	2	The comparison between ARIES and INVEST is interesting but the authors should mention whether there is a quality – speed trade-off, rather than just mentioning the number of hours the two models took to be implemented on that case study.	Yann Clough	would be great to know but hasn’t been assessed

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
178	5.4.2	526	3	526	6	Within this sentence a discount rate of 11% is mentioned. Normal would be long term real interest rates (at the moment appr. 3%). This paragraph is a description of what was done by Daw et al. 2015. However, such a high discount rate would need an explanation (in fisheries we add a risk premium as fishing is a risky business (high uncertainties as well)). I would leave it out to avoid questions about it.	Ralf Doering	removed - section compressed
179	5	527	39			SEEA-EEA is still in experimental stage and has not been adopted yet as a statistical standard by UNSD. I believe it is important to mention this point. Also I believe these frameworks aim at national scale accounting and not for regional scale accounting, although some pilot projects are experimenting EEA at a regional scale.	Mahbubul Alam	noted; section has been revised
180	5	527	24	527	24	The term ecosystem health seems suddenly to arise here – it is not without controversy and if to be used perhaps should be anchored in a definition..	Peter Bridgewater	removed
181	5	527	19	527	34	I don't understand why these four approaches are relegated to this short section on "Other Ecosystem Service Toolkits". All four are broadly comparable to the three approaches covered in the previous section. I'd recommend merging these two sections, and balancing out coverage of the nine tools accordingly.	Thomas Brooks	Focus of chapter on forecasting models - these are more assessment tools, but we have revised chapter organization
182	5	527	17			O'Farrell et al 2012 missing from references	Brenda McAfee	fixed
183	5	527	19	527	34	It would be useful at the end of the paragraph to include a brief discussion about the utility of these toolkits for the work of the IPBES.	Brenda McAfee	yes, but hard to do because regional assessments have just started and isn't clear to us what approaches they will take
184	5	527	36	529	6	I think it would be worth positioning the SEEA-EEA (and it's true that further work is in hand and that the system may well be rapidly changing) as a framework in which to analyse and understand the relationship between ecosystem assets, services and economic actors, flows and assets. Rather than as simply a system from which aggregate indicators may be derived. In this sense the SEEA-EEA could be used as the coherent framework within which detailed modelling and scenario development can take place. Note that economic valuation is included within the framework but is not the whole story. Note also that spatial disaggregation is envisaged, probably more in the <1km resolution category although not necessarily.	UK Government	We have expanded our economic section
185	5	527	19	527	34	For Europe there are other toolkits e.g. ESTIMAP: a suite of models for a spatially explicit assessment of three ecosystem services (recreation, pollination and coastal protection) at continental scale. The main objective of the models is to support EU policies with information on ecosystem services.	UK Government	We are not conducting a review, and do not include all models tools or toolboxes. We added

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						http://publications.jrc.ec.europa.eu/repository/handle/JRC87585 . This is being used in several case studies in the EU OpenNESS project.		mention to ESTIMAP.
186	5	529	3	529	4	Include a reference or source for this finding. Is it just based on the examples in Table 5.2 or the wider literature?	Paula A Harrison	Based on our review of literature in chapter. Section is revised
187	5	529	1	529	1	<p>5.4.3 Description of major ecosystem functions alternative models</p> <p>5.4.3.1 System of life-based models. This type of models are oriented to find out the balances and best optimal equilibrium between natura and peoples, including social, economic and environmental variables shaped by the cultural contexts. These models used to address the relationship between nature’s benefits to peoples and good quality of life using a more holistic and integrated approach. Pacheco, Diego. 2014. Techniques combine geographic system analysis with deliberative process, taking together assessment and decision policy making. The views of indigenous and local peoples are essential in order to validate the results of the models.</p> <p>Aims to value the relationships and dynamics, either positive or negative, established among peoples and nature regarding the regeneration or reproduction of the systems of life of Mother Earth for Living-well. Holistic valuation follows a rights-based approach, taking into account that Living-well in balance and harmony with Mother Earth (relational and cosmocentric values) is based on the complementarity of the rights of Mother Earth (intrinsic values) and the rights of peoples to their holistic development and eradication of poverty (instrumental values) (Bolivia 2010, Bolivia 2012, Pacheco, 2014a). This method will be more accurately applied when rights of indigenous peoples and local communities and principles or rights of Mother Earth have been included as intrinsic part of the national legislation or public policy frameworks. In this regard, the holistic valuation of systems of life can be developed at different levels (national, subnational, and local) assessing to what extent there is in a given jurisdiction a positive relationship and interactions between the conservation of environmental functions, development of sustainable production systems, and peoples’ access to basic needs and services for poverty eradication, inherently entwined as systems of life in Mother Earth.</p> <p>This approach is developed using participatory planning and intercultural dialogue techniques, among others, in the context of deliberative multi-actor processes that help to evaluate the extent to which there are systems of life settled in practice in a given jurisdictional territory. An example of a holistic-based valuation is the “Systems of Life of Mother Earth” approach being developed in Bolivia, which includes the identification and characterization of systems of life, the establishment of complementary agreements with Mother Earth, and actions for the harmonization of systems of life of Mother Earth</p>	Diego Pacheco	We have added more focus and review on participatory approaches to modelling. Could not find Pacheco 2014 on other references without full citation.

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>(Pacheco, 2014a, b).</p> <p>5.3.3.2 Community-Based Monitoring models (take examples of the Convention of Biological Diversity).</p> <p>5.4.3.3 Collective action framework model. The goal of this model is to assess the contribution of collective action and local resource users, including indigenous and rural communities, to the conservation of biodiversity. After discussing the proposal's conceptual rationale and theoretical underpinnings, is presented a methodological proposal that consists of three modules: (1) A geospatial modeling module to estimate the rate, extent, direction, spatial pattern, and the area of terrestrial ecosystems that is protected by indigenous and local communities; (2) An institutional analysis module which includes elements to be used with the geospatial module and a field-based protocol for measuring specific characteristics of institutional arrangements related to the protection of biodiversity in a sample of measurement areas, and (3) An ecological assessment module that includes field-based protocols and sampling to validate the geospatial model, to understand how collective action and institutional arrangements influence the conservation of biological diversity and resources (UNEP/CBD/COP/12/INF/7).</p>		
188	5	529	10	530	4	<p>How is the size of “communities of practice” being measured here, to allow claims like “Only two ecosystem service frameworks have substantial communities of practice”? If such claims are to be made, it is essential that they be supported by data or references documenting the relative size of the “communities of practice” in question.</p>	Thomas Brooks	<p>We reference literature on Invest & EwW, as well as Bagstad et al But no one has specifically compared communities of practice.</p>
189	5	529	7	529	8	<p>There is a lack in the legend: what is the color code white/grey?</p> <p>Green GDP, SEEA-EEA, corporate ES review should enter a specific category as they're not really ES models but more generic frameworks.</p> <p>Details on the assessment procedure should be given somewhere (discussions within the IPBES expert group / information in the documentation of the models, etc)</p>	Cécile Leclere	revised
190	5	529	Figure 5.4			<p>While corporations indeed may be multinational, I pose that there is a <i>general</i> natural progression in spatial size and scope from Corporation to Landscape/Watershed, to Nation, to Large Region, to Global. Moving the Corporate column one place left would maintain this general logic. Depending on the size of the nation and the meaning of “large region,” a large region may be smaller than a nation (arid Western China, arid American West). The most</p>	U.S. Government	tried to clarify - have divided table into multiple tables

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						appropriate order of the those two columns within the general progression is a decision for an IPBES team, one made easier if the term Large Region is defined specifically between Landscape/Watershed and Global.		
191	5	529	Fig 5.4			There are a large number of other landscape/watershed to national scale models which are being developed, at least for Europe but with potential for application elsewhere.	UK Government	yes - but we can't mention all these specific models
192	5	529				Very useful figure	UK Government	thanks - we've revised
193	5	530				In addition to Fig. 5.5, suggest having a table or figure indicating the transparency of the models (e.g. is code publically available? Is model published in the peer-reviewed literature?) It would fit very nicely in section 5.6.2.	Derek Tittensor	We have emphasized this point now
187	5	530	1	530	4	NatCap accounting as well as LUTO are not defined in the rest of the text There is a lack in the legend: what means the bold writing? Green GDP, SEEA-EEA, corporate ES review should enter a supplementary color code as they're not really ES models but more generic frameworks Details on the assessment procedure should be given somewhere (discussions within the IPBES expert group / information in the documentation of the models, etc)	Cécile Leclere	Reorganized and revised
188	5	530	14	530	15	Given that "Modelling the impact of ecological changes on human 14 well-being is not well developed." It would be helpful to have a section on what has been achieved by the different types of models, so that gaps can be more explicitly identified e.g. food supply is much better covered than health.	UK Government	Added
189	5	530	11	530	15	The discussion on valuation needs to be enhanced and linked to the work on 3d (value and valuation).	Ram Pandit	Enhanced - we didn't have access to that report
190	5	531	Fig. 5.7 of line 7			Better to have this as a table instead of figure.	Gunay Erpul	New tables
191	5	531				Fig. 5.6 is very hard to interpret. Might it be better presented as a matrix/table, with 'supply', 'demand' etc presented as columns and check-marks applied when included in a model?	Derek Tittensor	Revised
192	5	531	5	531	5	In the graph include in participatory adaptive the following methods: System of life; collective action framework model; plans of life.	Diego Pacheco	Without a reference this is hard to respond to
193	5	531	1	531	4	Corporate ES review does not permit in itself to make some monetary valuation. Moreover, in a sense, the demand side is analyzed through the 3rd step of the methodology where 3rd party (= other stakeholders beyond the company)	Cécile Leclere	figures removed

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						relationships with ES are analyzed. NatCap as well as LUTO are not defined in the rest of the text. To me SEEA-EEA and Green GDP cannot fit within this figure. Details on the assessment procedure should be given somewhere (discussions within the IPBES expert group / information in the documentation of the models, etc)		
194	5	531	5	531	7	NatCap as well as LUTO are not defined in the rest of the text. There is a lack in the legend: what means the bold writing? Details on the assessment procedure should be given somewhere (discussions within the IPBES expert group / information in the documentation of the models, etc)	Cécile Leclere	cut
195	5	531	9	531	12	More should be explained about the development procedure of this decision tree. The reason why the decision tree is qualified as preliminary should be explained: is there further work on this tree already planned within the IPBES? Who should use this tree? To me SEEA-EEA and Green GDP should be kept out of this figure. NatCap as well as LUTO are not defined in the rest of the text.	Cécile Leclere	tree is revised
196	5	531	10	535	20	Modelling “frameworks” are contrasted with “approaches,” but the respective terms are not satisfactorily defined.	U.S. Government	revised
197	5	531	2	530	2	Modelling “frameworks” are contrasted with “approaches,” but the respective terms are not satisfactorily defined.	U.S. Government	revised
198	5	531	Figures 5.6., and 5.8	532		If one were to include analytical frameworks that meet specific objectives from the “Synthesis and Research Frontiers” on page 536, but that are not comprehensive ES assessment tools, then the EPA’s FECS-CS and NESCS would be placed with NESCS above FECS-CS as high as possible in the intersection of all circles except Valuation in this Figure, i.e. in the full overlap space within the same color as only ARIES and EwE, but above ARIES. Thus a question for the authors is: are the objectives on page 536 more important, or is restricting the figure (and related tables and figures) to include only comprehensive ES assessment tools more important? Here the answer may hinge on whether one finds traction in the argument for the employment of modular tools within a larger ES assessment effort (to point again, the argument for a modular approach is supported directly at least by lines 7-14 on page 515).	U.S. Government	Figures have been replaced.

Nº	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
						<p>If the IPBES chapter author team were to decide that tools within a larger ES assessment effort did indicate unique modelling, then FECS-CS and (separately) NESCS would fit between the INVEST and IMAGE LUTO boxes, linking from Supply and Demand up and to the left, but skirting the “Quantification and Valuation” boxes. FECS-CS is designed to assist in quantification, and NESCS is designed to identify ES flows that will be affected by policy, thus also supporting identification necessary for dynamic modelling (for a possible arrow from the Supply and Demand box up and to the right).</p> <p><u>Chapter 7, p.702-703, Key findings:</u></p> <p>A similar argument would encourage caution in not excluding the US EPA ecosystem services classification models in work to fulfill key recommendations in Chapter 7, pp702-3.</p>		
199	5	532	Fig. 5.8 of line 3			Better to have a simple expression how this figure works.	Gunay Erpul	We use a simpler figure now
200	5	532	15	532	16	This is partially because understanding of human well-being is poor (changeeful!!!),	Gunay Erpul	unclear
201	5	532	15	532	16	“understanding of human well-being is poor” - this seems an odd statement since ipbes has included it in much of its work, as did the MA – perhaps a little more explication would help here?	Peter Bridgewater	Expanded discussion and added citations.
202	5	532				Useful decision tree- it give the idea of all the considerations in choosing models	UK Government	thanks we have revised
203	5	532	12	532	17	This discussion on human well-being needs to be linked to the values people have on ES, which may vary based on socio-economic and cultural contexts. Modelling ecological change on changes on values of ES link needs to be discussed.	Ram Pandit	We mention this as an area that needs further work, but has been partially addressed using scenarios and other soft systems modelling approaches
204	5	532	24	532	28	How changes in ES changes values generated from Ecosystem are impacted? In my view research in this area is lacking, which will help to make informed decision. In the text between these lines – this issue of change in ES and its effect on values among different parties affected by the change needs to be highlighted.	Ram Pandit	now mentioned in gaps + future research
205	5	533				Section 5.4.4 missing some key links.	Jason Link	noted
206	5	533	25	533	25	The link to other knowledges needs to be sensitive.	Peter Bridgewater	We cite and mention this multiple times & mention multiple

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
								knowledge systems approach
207	5	533		534		Chapter 4 also has a section on communicating uncertainty. Make sure that they are harmonized but not simply repeating the same information.	Derek Tittensor	done
208	5	533				Instead of 5.5 Methods for assessing, and communicating, uncertainty “ a series of relevant IPBES ACTION PLANS have to be prepared, and negotiated. “	Eyüp Yüksel	revised and mostly moved to chapter 7
209	5	533	1	533	18	Details on initiative(s) that seek to gather and standardize data (GEO, etc) could be mentioned here.	Cécile Leclere	revised and mostly moved to chapter 7
210	5	534	25	534	33	I don't know how far the adaptation of these diverse models globally is feasible. Presently I don't see the existence of that capacity. Hope another model for bringing route to capacity also develop.	Mahmood Yekeh Yazdandoost	revised and mostly moved to chapter 7
211	5	534				To “5.6.1 Training and networking “ instructive IPBES “ecosystem services description and ACTIONS” television must be added to this training programme at the world level. In addition, all the municipalities, and the administration of small villages of the world have to be included to the network.	Eyüp Yüksel	revised and mostly moved to chapter 7
212	5	535	19	535	19	Please define and categorize people, and where the financial support comes from?	Mahmood Yekeh Yazdandoost	Don't understand comment. Section is rewritten
213	5	535	22			Local knowledge is missing?	UK Government	have expanded discussion of ILK
214	5	535	32			check against uncertainties in C3 and 4	UK Government	we have aligned language
215	5	536	21	536	22	Could be better to make this first in array.	Gunay Erpul	ok
216	5	536	all of 5.7			There are 8 bullets here. The US EPA's NESCS tool is developed and the first EPA Report pending publication, autumn 2015. NESCS was specifically designed to, or objectively meets the criteria in bullets, 1, 3, 4, and 6 (by its modularity), and for bullet 5, NESCS has done the linking, but looks outside itself for quantification that should be properly specified by the precise identification of potential flows of final ES. Almost the exact same may be said for US EPA's FECS-CS. Omission of NESCS, FECS-CS, and the final ecosystem services framework from “major models” and the major tables and figures in chapter 5 may be an oversight that overlooks contributions to the debate, to the suite of operational tools, and to the ES field as members of IPBES within the field seek to redress long-term analytical and policy problems.	U.S. Government	It is hard to include unpublished work! But in response to these comments we now include.
217	5	536	41		42	add demonstration that models work, approximation to reality, efficiencies and benefits, uses in policy making- no good modelling stuff if no one uses the results!	UK Government	agreed and clarified in expanded future research + knowledge

№	Chapter	From page	From line	Till page	Till line	Comment	Reviewer Full Name	What was done with the comment
								gaps sections
218	5	536	16	536	42	Gaps in research: marginal change in ecosystem service values as a result of change in one of the component of the ecosystem; research gaps in cultural and spiritual values of biodiversity and ecosystem services. Research on effect of upscaling or down sizing the values generated by an ecosystem to a larger or smaller context (human population, spatial area, political jurisdiction etc).	Ram Pandit	We mention these issues in sections on gaps/future research
219	5	571	17			Besides, psycho-social aspects also play a vital role in nature conservation.	PS Bhatnagar	noted