Comment form for 1ˢᵗ Review Phase of Chapter 3 'Drivers' of Deliverable 3c) Fast-track methodological assessment on scenarios and models

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Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
1	General Comments					Thank you for the opportunity to review this chapter. My main suggestion is to take a step back and think about the goals of the chapter and the structure, before expanding on the current draft. I understand that the authors had a very short amount of time from producing this, and it would have been difficult to produce more than an extended outline in such a short period. However, I feel that the current structure of the chapter makes it hard to come up with a better understanding of the options available for building scenarios and models of drivers of changes. This applies even to the expert reader.	Piero Visconti (PV)	This section is restructured and rewritten in the new draft.

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						To be more explicit, I will refer to the description of this chapter in chapter 1, which I think makes sense and should be followed carefully "*Chapter 3 addresses challenges associated with "building scenarios and models of indirect and direct drivers of change in biodiversity and ecosystems". It **explores approaches to modelling plausible, or alternative, trajectories of indirect drivers** through socioeconomic scenarios and **lessons learnt from previous development and application of such scenarios in assessments at global, regional and subregional scales**. It then **reviews methods for modelling expected consequences of socioeconomic scenarios for direct drivers of change** in biodiversity and ecosystems across terrestrial, freshwater and marine systems. This chapter **also considers potential for better coupling modelling of indirect and direct drivers of change**, with potential feedback effects of changes in biodiversity and ecosystems on socioeconomic futures, **through integrated assessment models (IAMs)**.*" I must say that the current organization of the chapter, and its contents, doesn't really reflect this. Below are some high-level comments that elaborate on this, with some recommendation to make this more accessible and useful. None of this is meant to be a criticism to the authors, on the contrary, I hope the authors will take these as recommendations to improve the enormous efforts they have done already.

Main comments
- I was expecting a review of methods to build scenarios relevant for environmental decision-making and a review of methods to feed scenario assumptions into IAMs or chains of models through input/output links. However, this is not done in a coherent, and structured fashion, and there is no high-level description of what scenarios are, what indirect and direct drivers are, and types of data and models are used for each type of driver.
- There is no section that provides generalization on the pros and cons of different methods and tools to construct scenarios and to model indirect and direct drivers of change. I was expecting this to be there, given the scope of deliverable 3c.
- The numerous specific example applications of models and tools are not supported by sufficient background information on integrated assessment modelling and other modelling frameworks used for indirect and direct drivers modelling. This background information should be the core of this chapter.
- As a consequence, many of the specific examples give a lot of | | |

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						information for granted, that would leave those non-familiar with the specific issues and methods used a bit puzzled. - I would suggest moving the specific examples can be boxes, figures, etc., but should not be used to describe the methods. The methods should be described in a more general way in the main text, before being addressed in a more detailed way through examples. - Direct/indirect, exogenous/endogenous, ex-ante/ex-post, all of these and many other terms are described through examples, rather than through definitions. Maybe a glossary would help? - Some of the topics mentioned here are also discussed into other chapters, sometimes in more detail, even though they should belong to this chapter. For instance, IAMs have a specific box in chapter 6, but they should be described thoroughly here (although currently they don't). Similarly, the policy-cycle is discussed in chapter 2. OSMOSE is discussed here, but belongs to chapter 4 as it is really a model of ecological responses. There are other examples like this. A bit of overlap and repetition is probably unavoidable, because some of these topics are truly relevant to multiple chapters, but at least is worth cross-referencing chapters, and perhaps move things across them to ensure these paragraphs are included where they belong the most. In summary, I would recommend re-thinking a bit the overall structure of this chapter, bearing in mind the conceptual framework of IPBES and the objectives of this chapter as set out in chapter 1 of deliverable 3c. I think that providing a very good introduction to scenarios and integrated assessment models in the first two sections of this chapter would help the reader understanding the reminder of the chapter which should review the different methods and tools, perhaps through examples in boxes. This could then be concluded with pros and cons of different methods, and possibly some recommendations for the building of regional and global scenarios for IPBES.		
2	Summary					I suggest not to summarize the content of each section, since these are often technical and the summarize may appear impenetrable to the non-expert. Perhaps is worth just describing what each section is about, similarly with the ending paragraph of the summary of section 3.3 "This chapter explores the interactions.." by the way, it should be this section..	Piero Visconti (PV)	This section has been completely restructured and rewritten in the new draft.
3	3.2.1					I think you need to divde this into sub-paragraph like you do with indirect drivers, and discuss for each of them how they operate to affect direct drivers and what class of models are available to model each.	Piero Visconti (PV)	Indirect and direct drivers are clearly separated in the new

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								draft.
4	3.2.3					A proper introduction to the concept of scenarios is needed. Also, you are missing here a section on the development of scenario planning for warfare and business planning, I am referring to the work of Herman Kahn, Peter Schwarz and Paul Schoemaker. We wouldn't even global change scenarios if it wasn't for the work of this people.	Piero Visconti (PV)	An introduction to the concept of scenarios is in the previous chapter.
5	3.2.5					I think the whole chapter should describe the state of the art. I suggest removing this very short section which doesn't really add much	Piero Visconti (PV)	Removed as a separate section.
6	3.3.1					This section was hard to follow. It's worth giving a high-level description of participatory approaches, within a broader section on how to build scenarios. I would put all the examples into boxes.	Piero Visconti (PV)	This section has been completely restructured and rewritten in the new draft.
7	3.3.2					I think this should be greatly expanded and brought up front after a larger section on scenario building. IAMs and their core components, general and partial equilibrium models, should really be the protagonists of a chapter on indirect and indirect drivers of chances	Piero Visconti (PV)	This section is restructured and rewritten in the new draft.
8	3.3.2.3.2					You have a mix of description of general/partial equilibrium model and land-use change models here. I would keep them in separate sections.	Piero Visconti (PV)	This section is restructured and rewritten in the new draft.
9	3.3.2.3.4					This is exemplary of what I meant of describing drivers by examples. This is a problem throughout section 3.3.2.3. You get straight into a specific example of water hiacint, whereas I would have expected an high-level description of the problem of invasive species (e.g. how many species are affected by invasives according to IUCN, how many species were driven to extinction, what ecosystem services are lost due to invasives). Then I would describe what data and models are available to model the extent and impact of various invasives today and in the future.	Piero Visconti (PV)	This section has been completely restructured and rewritten in the new draft.
10	3.3.2.3.5					Similarly here, I was expecting a general description of the workings of GCMs instead you get straight into talking about the one produced by IIASA. I don't mind the fact that only one was picked as example, but I think it would be best to give a general overview of how they work, and how they are integrated into IAMs in the context of scenariso and other classes of earth system models to model all byophisical changes of the earth system.	Piero Visconti (PV)	This section has been completely restructured and rewritten in the new draft.
11	3.3.3					This is still very incomplete, also Maxent and Marxan certainlty do not model drivers of changes..	Piero Visconti (PV)	This table has been completely restructured and rewritten in the new draft.
12	3.4.1					As I said, this is also in chapter 2. Worth cross-checking and cross-	Piero	Policy cycle section

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						referencing	Visconti (PV)	has been greatly simplified in new draft to avoid redundancies.
13	3.4.2.2					Only back-casting should be consdiered here. Otimal allocation of resources, for instances on protected area expansion, doesn't fit into scenarios modelling, there is no creation of storyline from going to the present to the desirable future, just a map of priority areas for protection. I regard spatial conservation prioritization and other disciplines that use optimization methods that do not create storylines/pathways as very distinct from scenario-building.	Piero Visconti (PV)	Optimization models have been removed.
14	3.5					This is incorrectly labelled as 2.5, but it should be 3.5. this applies to all subparagraph.	Piero Visconti (PV)	Noted
15	3.5.1					There is A bit more on IAM here, as I said, I think you need to have a proper description of what these are, how they work, how one feed scenario assumptions into them, and how they return quantitative data on indirect and direct drivers of change.	Piero Visconti (PV)	This section is restructured and rewritten in the new draft.
16	3.5.2					I found this section hard to follow and I am not sure how useful it is	Piero Visconti (PV)	This section has been completely restructured and rewritten in the new draft.
17		3	6	3	Last line	You introduce too many terms for the same things: Exogenous and endogenous, direct and indirect, proximate and underlying drivers. I think consistency will improve understanding of the concept.	Benis Egoh (BNE)	Terminology has been simplified in the new draft.
18		3	Paragraph 3	3	Paragraph 3	The first 3 sentences repaet each other and could be combined into one. It could also be deleted because it says there are direct are indirect drivers which is already said in the previous paragraph and said again in the next paragrapgh.	Benis Egoh (BNE)	Noted, restructured
19		4	Paragraph 3			"....and economic growth amongst others directly influnce...". I suggest changing the word direct from this sentence as it can be confusing given that the subject is indirect drivers.	Benis Egoh (BNE)	Changed
20		4	Paragraph 4	4		So what is the situation in Dominican republic?	Benis Egoh (BNE)	Clarified
21		7		8		I think it is a great idea to have the diagramatic representation from Nel et al., 2007. However, based on the many examples given in page 7, is it not possible to have a more generic diagram (not only applicable to fisheries) that sumaries the steps from all the examples into one?	Benis Egoh (BNE)	This section is restructured and rewritten in the new draft.
22		8		9		So we have this example of components of ERA and the performance report. What about the step before this? How do we identify stakeholders/ What types of stakeholders are needed to adequately	Benis Egoh (BNE)	Stakeholder participation is mentioned in the

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						contribute to this process. How do we overcome challenges of working with a multi-disciplinary team? I think we need some discussion on the dynamics of stakeholders' identification and facilitation.		methodology section while a box on the Delphi Method provides one example of a technique to overcome group dynamic biases. Further elaboration upon stakeholder identification is simply not feasible given the space constraints.
23		10		11		3.3.2.1 if possible give examples of some models for easy understanding.	Benis Egoh (BNE)	This section has been completely restructured and rewritten in the new draft.
24		11		25		This section has a mix of system, process and driver. It is also not clear if the drivers discussed are those affecting the system in relation to biodiversity or ecosystem services or both. Although this section is on examples it will be good to have some consistency. For example the section on climate change gives crop production as example but crop production is also an agent of change.	Benis Egoh (BNE)	This section has been completely restructured and rewritten in the new draft.
25		15		16		In determining the drivers, it is important to consider the system since the extent of degradation is defined based on the system. For example, bush encroahcment in grasslands could be seen as a threat in grasslands but is not in other biomes. At least some discussion on how degradation is system specific and can be defined depending on what is being degraded (e.g. biodiversity or ecosystem services). Degradation is therefore context specific.	Benis Egoh (BNE)	This section is restructured and rewritten in the new draft.
26		18		19		There is a mix of biophysical models and economic models. Maybe a table with the different types of models, data requirement and types of output may be more useful. At present the too much of a mix of everything.	Benis Egoh (BNE)	Some tables have been introduced with the relative uncertainties of specific drivers and their use in modelling applications. Economic models are no longer listed due to the sheer number available to choose from and questionable utility of including such a list. In the end the authors

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								decided against including a table dedicated to various types of models due to space constraints as well as difficulty in establishing the criteria for inclusion in such a table.
27		20		22		I think this section on use of resources is unecessarily long.	Benis Egoh (BNE)	This section has been completely restructured and rewritten in the new draft.
28		10		25		The use of models and the outcputs are as good as the data. Maybe a section on data (e.g. types of data required by models, availability) mayb be useful. The expertise required in using these models is also an important discussion. Countries with limited data and limited expertise could not be able to use these models. What is the alternative? We must think of a stepwise approach from sinple to complex modelling.	Benis Egoh (BNE)	The authors decided that a section on data was beyond the scope of this chapter.
29		1	Section 3.1			Examples of indirect drivers would be useful here.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
30		1	Section 3.2	Para 1		What you say about the usefulness of participatory approaches is all true but a caveat is needed - sometimes drivers and their relationships are poorly known, indirect or uncertain or non-linear. In this case they will not be well captured in participatory approaches, because people are not necessarily aware of them, or of the unexpeced dynamics that may happen. This is when/why scientific research + modelling are needed. Participatory approaches are excellent for capturing perceived linkages, not (necessarily) real ones.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft. The limitations of participatory approaches will be covered in 3.3.1.2
31		1	Section 3.2	Para 2		Slightly odd selection of typologies here - not really explaining the issues.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft. These methods and tools are elaborated upon in their respective sections.
32		2	Section 3.2	Para 3		I think it would be worth talking about the trade-off between simple and complex models here	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.

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33		1-2	Section 3.2			I am very surprised that the executive summary (in fact the whole report) has nothing substantive on issues of uncertainty, how to deal with it in modelling and what types may afflict models of drivers and scenarios.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft. More emphasis is placed on uncertainty. Further, uncertainty is covered at length in other chapters.
34		2-3	Section 3.4			I don't think the key messages in the Executive Summary come out very clearly from the material in the main body of the chapter. They are sensible messages but they are not well evidenced in the material at the moment - sections need to be added that deal with these, or the edited chapter needs to have these themes woven through each section.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
35		3	Section 3.4	Para 1, mess age 2		Agreed the list of drivers must be comprehensive enough, but not too comprehensive - a balance is needed between identifying key drivers and over-complexity	E.J. Milner-Gulland (EJMG)	Noted
36		3	Section 3.2	Para 3		This is a strange definition of indicators - does this need more explanation? Do you think the issue of how to select and use proxies, indicators, metrics needs its own section? It is a fundamental and difficult issue.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
37		4	Section 3.2	Para 2		This last paragraph of the section is quite weak.	E.J. Milner-Gulland (EJMG)	Paragraph moved, substance elaborated upon in respective sessions.
38		4	Section 3.2.1	Para 1		This is a very specific model mentioned here. You need more than just cohort modelling; you also need to model changes in actual interactions between people and their environment.	E.J. Milner-Gulland (EJMG)	To some extent cohort effects can influence lifestyle changes but we will add additional sections on societal/cultural indirect drivers.
39		5	Section 3.2.2			The content of this section seems out of place here? Don't we need an explanation of direct drivers, similar to the explanation of indirect drivers in 3.2.1?	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
40		5	Section 3.2.3	Para 1		Scenario approaches are good for addressing some types of uncertainty but not others. The whole chapter needs a section on different types of uncertainty and how to address them.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft. More

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								emphasis is placed on uncertainty. Further, uncertainty is covered at length in other chapters.
41		6	Section 3.2.3	Para 2		It might be worth mentioning the Delphi method here?	E.J. Milner-Gulland (EJMG)	Included under expert-based methods in the new draft.
42		6	Section 3.3			I think the Methods and Tools section should not dive straight in to a section on participatory methods, without an overview of the overall types of methods needed, and why (actually there is quite a good section on this in the first part of what is currently the Discussion).	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
43		6	Section 3.3			You need to have a section somewhere on how to identify drivers (direct & indirect), and how to quantify their interactions both with each other and with nature, before talking about how to develop scenarios for the future? This should probably be section 3.2, but at the moment that section doesn't really go into enough detail on this.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
44		6-10	Section 3.3.1			This section seems to be more about scenarios and less about understanding drivers. It is also just a collection of examples, which is fine, but a bit more general text on the issues and how to address them would be useful first. Otherwise it is hard for the reader to see how the specific detailed examples fit within the broader field.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
45		10	Section 3.3.2			I don't really see how this content moves on from the previous section - it seems rather similar.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
46		10	Section 3.3.2.1	Para 1		What about other elements than just the economy? e.g. the ecosystem vs single species, or social sub-divisions.	E.J. Milner-Gulland (EJMG)	Scale is addressed in the new draft.
47		10-11	Section 3.3.2.1			This section doesn't really explain the typology well or why it matters - can you have a table that explains the different extremes of your typologies and when one or other end is more or less appropriate?	E.J. Milner-Gulland (EJMG)	New section 3.3.3?
48		11-25	Section 3.3.2.3			The structure is unclear in this section - there is not enough background material to help readers understand why particular examples have been drawn out for further exploration.	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
49		11-13	Section 3.3.2.3.			You don't explain what you mean by Toy model. Or what ecopath is (and ecopath is far from a toy model, it's quite a complex modelling	E.J. Milner-	This section is restructured and

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			1			framework). I think actually you are using the term incorrectly. A toy model just means an oversimplified model that enables you to explore the very simplest relationships in preparation for making a more realistic model that could actually be used to draw inferences.	Gulland (EJMG)	rewritten in the new draft.
50		14	Box 3.1			This is a good example of a simple ecological model that maps the extent of biodiversity and threats (drivers) but not modelling the interactions. But surely this should be introduced earlier on in the section as an example of simple threat mapping approach? Then you can move on to more complex models that include social elements, interactions and dynamics (e.g. the one covered in pages 11-13). Why are some examples in Boxes and some in the main text?	E.J. Milner-Gulland (EJMG)	This section has been completely restructured and rewritten in the new draft.
51		15	Section 3.3.2.3. 2			An excellent clear section - I think this is the content and style that the other sections should be aiming for.	E.J. Milner-Gulland (EJMG)	Noted
52		16	Section 3.3.2.3. 3	Line 6		Is there any evidence that it is true that degradation is mostly in drylands? Maybe it's just where the research focus has been?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
53		16	Section 3.3.2.3. 3	Line 14		I'm not sure this is true either - DSSs are used to support decisions, not to describe degradation.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
54		16	Section 3.3.2.3. 4			The section moved very quickly on to the specific example of water hyacinth - why not start this section by broadly characterising invasives, and their roles as the direct and indirect drivers?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
55		17		Box 3.2		This is currently a pointless box.	E.J. Milner-Gulland (EJMG)	Noted
56		17	Section 3.3.2.3. 4			Why is this section just about plants, what about animal invasives?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
57		18	Section 3.3.2.3. 5			This section rather jumps straight into the subject without a general overview. "Climate" needs a bit more disaggregation into direct and indirect drivers as well in this first section.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
58		11-25	Section 3.3.2.3			The different drivers listed and discussed in this section are not well linked to each other, and each section is different in its scope and	E.J. Milner-	This section is restructured and

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						contents - a bit more consistency would help.	Gulland (EJMG)	rewritten in the new draft.
59		18	Section 3.3.2.3.5	Lines 29-41		In this section overall, we're supposed to be talking about modelling methods but this example seems just to talk about results?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
60		18-19	Section 3.3.2.3.5			What about other models than GLOBIOM? Don't we need an overview rather than just one model being discussed?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
61		19	Section 3.3.2.3.6	Para 1, Line 10		"Stressor" has not been defined before, so it is hard to say if this is true. Need to write this section using the language of drivers as per the rest of the chapter. Influential in what sense?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
62		20	Section 3.3.2.3.6	Para 2, line 10		You need to qualify and explain this statement - what types of models might be needed, and which types do we have examples on, which are missing?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
63		20	Section 3.3.2.3.7	Para 1, line 27		Surely we here need to start this section with an explanation of the issue (as per other sections), what the direct and indirect drivers are in this case, and then talk about what types of modelling approaches are needed, before going straight into an example (which doesn't have any details or a reference)?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
64		20	Section 3.3.2.3.7	Para 2, line 31		What is the "companion modelling" approach?	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
65		21	Section 3.3.2.3.7			Fig 3.8 doesn't seem specific to exploitation - move to a more general section?	E.J. Milner-Gulland (EJMG)	Moved to methods
66		21-22	Section 3.3.2.3.7			I think you can't just talk about one particular method in this section - there are so many other approaches to modelling exploitation, they need to be acknowledged.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
67		22	Section 3.3.2.3.8			how is "use of resources" different to exploitation? Can these two sections be merged?	E.J. Milner-Gulland (EJMG)	They are merged in the new draft.
68		23	Section 3.3.2.3.	Line 4-6		Although the model is clearly very valuable, it presents perceived relationships only. It does not summarise actual evidence on the	E.J. Milner-	This section is restructured and

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
			8			relationship between drivers and outcomes. So I feel this statement is not really true.	Gulland (EJMG)	rewritten in the new draft.
69		24	Section 3.3.2.3. 8	Lines 3-5		This is not really a summary of the preceding section, because scenarios were not included in the preceding text - in the sense of looking forward and predicting trajectories.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
70		24-25 (and whole report)	Section 3.3.2.3. 8	Box 3.3		Again, this seems like rather an arbitrary example to pick, unless there is explanation of why it's been chosen. It's a good example but I think generally, throughout the report, it is necessary to explain why specific examples have been picked and what they particularly illustrate, e.g. this one seems to be illustrating the potential of bottom-up models from first principles (e.g. physiology)	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
71		24-25 (and whole report)	Section 3.3.2.3. 8	Box 3.3		This is a bit of an advertisement for one particular model - there is a need for balance and assessment of what different model types bring, not just specific models (this is generally true of the chapter as a whole).	E.J. Milner-Gulland (EJMG)	The approach to describing direct drivers and providing case studies has been revised in the new draft.
72		24-25	Section 3.3.2.3. 8	Box 3.3		There are issues with highly complex linked models, particularly propagation of uncertainty, which ought to be acknowledged.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
73		26	Section 3.3.3	Table 3.2		This table is quite a partial summary, and some of the models have not been explained in the text (e.g. in the marine habitats row). The terrestrial habitats row is preferable to me in style to the other rows, because it looks at general classes of model rather than specific examples of particular models.

On the other hand, this row exemplifies a main issue with this table as a whole, ie it's a bit arbitrary which boxes are ticked. in this case pretty much all of them. That is I think because the columns are not particularly helpful categories. Perhaps instead of domains you would do better to have typologies of model types, because most of the models you include in the table could in principle cover most of the domains. | E.J. Milner-Gulland (EJMG) | Table has been removed |
| 74 | | 26 | Section 3.3.3 | Table 3.2 | | I am not sure what you mean by "domain"? Why are there no BES domains in the table? What do you mean by "natural disaster"? Where in the text do you explain and categorise these domains? | E.J. Milner-Gulland (EJMG) | Table has been removed |
| 75 | | 27-29 | Section 3.4.1 | | | This section is good but I don't see how it fits in this chapter. | E.J. Milner-Gulland | This section is restructured and rewritten in the new |

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(EJMG)	draft.
76		29-32	Section 3.4.2			3.4.2 is an excellent section - very clear and gives the general principles in the main text, with pertinent examples in boxes. I think it should be moved up, though, to before the sections in which you are giving examples of specific modelling approaches and different drivers, so that the reader has a clear understanding of what the framework is before getting into the detail. There should also be a similar section which characterises the range of approaches for modelling direct & indirect drivers and their interactions, and their impacts on systems..	E.J. Milner-Gulland (EJMG)	Moved up, similar sections added
77		33	Section 3.4.3	Table 3.3		This is a useful table.	E.J. Milner-Gulland (EJMG)	Noted
78		33-35	Section 3.5.1			A very good section - but I would have liked it up at the front of the report as the introduction!	E.J. Milner-Gulland (EJMG)	This section is moved in the new draft.
79		35-36	Section 3.5.2			This section also seems to need to be early on in the report? Before the examples.	E.J. Milner-Gulland (EJMG)	This section is moved in the new draft.
80		35	Section 3.5.2			It would be good to go into a bit of detail about TCCCA - why each element is important, some examples from IPBES-relevant studies on how these principles can be put into practice etc.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
81		35	Section 3.5.2	Lines 21-22		explain why? This remark is a bit cryptic	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
82		35.36	Section 3.5.2			This section is OK but I would like much more reflection on the BES-specific issues, rather than a focus on climate change. We need to understand how previous experience of modelling drivers and scenarios feeds through into best practice for BES modelling specifically. It's OK to use CC as an example, as it's relevant, but not just to talk about CC.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
83		33-36	Section 3.5			Overall, there is some good stuff in the Discussion but it is completely unrelated to what has gone before! We need this material but also a proper Discussion of the chapter as a whole.	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
84		36	Section 3.5.2	Line 17		It isn't useful to end on this sentence - we need to know how these processes can serve as useful role models to IPBES!	E.J. Milner-Gulland (EJMG)	This section is restructured and rewritten in the new draft.
85						Thank you for the opportunity to review the 3rd chapter ("Building scenarios and modesl of [indirect and direct] drivers of change in biodiversity and ecosystems") of the IPBES deliverable 3(c) "Policy Support tools and methodologies for scenario analysis and modelling of biodiversity and ecosystem services". This current manuscript seems to represent a primitive rough draft of what is intended to be completed as a final deliverable, and due to that my review only deals with the broad framing of the work (although, there is a significant amount of work in sentence structure, word usage, etc. to be done before this is polished off). Because of this I do not have detailed line by line commenting available. The purpose of this chapter is laid out in the Executive summary (which I assume is taken to be 3.1 although is not labeled as such), although as a summary I found the text to be extremely difficult to follow. As it fits into the overall deliverable it seems this chapter is intended to explore approaches to modelling plausible, or alternative, trajectories of indirect drivers through socioeconomic scenarios, and review methods for modelling expected consequences of socioeconomic scenarios for direct drivers of change in biodiversity and ecosystems across terrestrial, freshwater, and marine systems, and also consider the potential for better coupling modelling of indirect and direct drivers of change through integrated assessment models. It supposedly caps things off with policy cycles over the top of all of these issues. Given the amount of material to cover this chapter has a lot to handle, and unfortunately it suffers signficantly from trying to do it all. Instead of a clear and concise treatment of 1) What a direct driver is (and what is being 'driven' 2) what an indirect driver is, what a scenario is, etc. one is quickly lost in a sea of words describing 'this research project did this, and this other person did that' and the reader is unfortunately left to skim back and forth and back and forth across the pages trying to figure out what the context of each sentence and paragraph is (at least I was... this chapter took me an extremely long time to read and re-read, and I'm still not entirely sure I understand what the reader is intended to take away from it all). Due to the way case studies are integrated into the main tex there were also multiple times I felt like I was reading an advertisement for a particular type of scenario building exercise. I do not want to sound overly harsh, or unhelpful, but I have reviewed so many manuscripts in my career and I have never had such a difficult time working my way through one as with this. I started trying to build out an outline to suggest	Lucas Joppa (LJ)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						how the chapter could be constructed, but I felt like the amount of work needed was extreme. I do agree with much of what the authors write, including the 'key messages from the chapter'. Yet, from actually reading the chapter I'm not sure how they arrived at those three key messages. For me, that summarizes my problems with this draft. The executive summary sets out an agenda and closes with three key messages. A minimum amount of work could turn the summary into an engaging text that hits the key main points. I would urge the authors to explicitly work backwards from that summary though. For each point/included case study, etc. in the extended text think hard about what in the executive summary it i relevant to, and why, and be explicit about that in the framing of the chapter and content of the paragraphs. Perhaps I'm not the best person to review this, but I am at least indicative of someone well-informed in this field who struggled significantly the follow the flow and logic of the overall chapter. I'm sure with some targeted hard work the authors can reform the content to provide something polished enough for publication as a component of the overall deliverable. However, I find the current draft well off the mark of something even ready for in-depth review. All of this said, my opinion is one of very many, and I would recommend the authors get extensive fresh set of eyes on this as they work their way through the upcoming iterations assistance.		
86						General comments: Using the instruction provided to reviewers, the intention at this time is to: "...obtain early feedback on whether, in the opinion of expert reviewers, the chapters of the report are heading in the right overall direction.". Using the description provided in Chapter 1, Section 1.3, an expectation is created that Chapter 3 provide a concise overview of scenario and model methodologies appropriate to biodiversity and ecosystem sevices (BES). In particular, Chapter 1, Section 1.3 primes the reader to anticipate the following: *"Chapter 3 addresses challenges associated with "building scenarios and models of indirect and direct drivers of change in biodiversity and ecosystems". It explores approaches to modelling plausible, or alternative, trajectories of indirect drivers through socioeconomic scenarios and lessons learnt from previous development and application of such scenarios in assessments at global, regional and 25 subregional scales. It then reviews methods for modelling expected consequences of socioeconomic scenarios for direct drivers of change in biodiversity and ecosystems across terrestrial, freshwater and marine systems. This chapter also considers potential for better coupling modelling of indirect and direct drivers of change, with*	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						potential feedback effects of changes in biodiversity and ecosystems on socioeconomic futures, through integrated assessment models (IAMs)." Respecting that this is an initial draft with several gaps, Chapter 3 would benefit greatly from each sub-section wrapping up with lessons learned from the examples given, and how these lessons could be used to advantage for the work of IPBES. The whole of section 3.3.2.3 is overly detailed and lacks the "punchline" relevance or "take-home messages" for IPBES. Sections 3.3.2.3.1, 3.3.2.3.3, 3.3.2.3.7, and 3.3.2.3.8 (with the exception of the box highlighting the OSMOSE example) are completely devoid of any references within the text. Overall, the Chapter captures the necessary and relevant elements pertaining to challenges however the flow or progression of the Chapter would benefit from significant tightening up of the narratives and examples to intentionally bring out the aspect of the challenges impeding progress in respect of BES scenario and modelling of IDs and DDs, and specifically draw out lessons learned to conclude with meaningful recommendations. The structure could benefit by providing examples of assessing indirect drivers, as noted for direct drivers. It may also be useful to include a section on the elements of building scenarios of direct and indirect drivers of change in biodiversity and ecosystem, and touch on issues of uncertainty/unpredictability due to other drivers, such as climate change. Finally, the Chapter could consider presenting a section on the communication of scenarios and outcomes of models (and elements of uncertainty) to ensure policy relevance, and that the intended messages are clear and accessible to a wide audience.		
87		3		4		While the definitions provided may be accurate, I found myself confused and having to re-read the presentation of this section – it really could be simplified as it sets the foundation for the chapter, and the reader is not expected to be an expert in this field. I would suggest simplifying the language and avoid confounding the definition by the simultaneous use of exogenous, endogenous, direct, proximate, and indirect in examples of defining and contrasting each other.	Monika G MacDevett e (MGD) & Janak Pathak (JP)	The authors have decided to remove references to endogeneity and exogeneity due to the primary audience of this deliverable. An overview of 'controlability' at various scales is however covered in other chapters.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
								Other concepts introduced for the first time in this chapter will be clearly defined.
88		6	Section 3.2.5	6		The UK did not undertake a "national GEO". It commissioned a national ecosystem assessment (which was awarded to WCMC, separately from UNEP). The UK national ecosystem assessment is not a "GEO" product.	Monika G MacDevette (MGD) & Janak Pathak (JP)	"by" changed to "in"
89		6	End of Section 3.2.3			Participatory approaches for scenario development may be influenced by political interest or influenced by local political institutes, and may pose a barrier to objective contributions of participants, and create difficulties in getting consensus on the outcomes.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
90		6		6		What happened to Section 3.2.4?	Monika G MacDevette (MGD) & Janak Pathak (JP)	Revised
91		6	Section 3.3	7		In some cases, participatory approaches may not able to involve key actors in the identification of drivers of change. It would be useful to draw in examples of the potential for gender bias.	Monika G MacDevette (MGD) & Janak Pathak (JP)	Noted and revised
92		10	Section 3.3.2	11		Accounting direct and indirect drivers for scenario development is complex and interrelated, involving interaction between drivers within and between direct and indirect drivers. This section may consider providing an example of the interaction between two drivers, and how models and scenarios rank drivers based on the degree of influence and of uncertainty.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
93		11		11		What happened to Section 3.3.2.2?	Monika G MacDevette (MGD) & Janak Pathak (JP)	Revised
94		17		17		The description of the positive socioeconomic benefits of WIPs in the context of South Africa's WfW programme neglects to mention the profound positive impact on riparian ecosystems and water flow – which was an initial priority of the project. The way it is currently described in this paragraph presents a picture of promoting the perpetuation of these	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						invasives for the sake of job creation.		
95		19	3.3.2.3.6	20	24	The Heading "Pollution" is much wider than the contents in this section, which only gives brief examples of individual chemical pollutants. Microplastics affect marine ecosystems and biodiversity in a profound manner. The authors may wish to re-name this Heading to more reflect the ability to model (specific) chemical pollutants.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
96		20	3.3.2.3.7	22	14	References please.	Monika G MacDevette (MGD) & Janak Pathak (JP)	References added
97		22	5	22	6	Not sure what mythology is being referred to in this example.	Monika G MacDevette (MGD) & Janak Pathak (JP)	methodology
98		23	16	23	20	This paragraph makes reference to *"...recommendations which will support the following management planning process..."*, yet none are given. It appears to be a cut and paste from some report – if so, please re-state with relavance to the section and topic at hand. This entire section needs appropriate references.	Monika G MacDevette (MGD) & Janak Pathak (JP)	Elaborated in new draft.
99		24	7	24	11	This entire paragraph seems out of context within this section.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
100		32	Section 3.4.3	33		This section needs interpretation. As it currently stands, there is only Table 3.3 on its own.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
101		34	29	24	30	Reference to *"For a comprehensive look at integrated assessment modes, see Section 3.3.2.4.3."* This section, 3.3.2.4, does not exist.	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.
102		36	9	36	11	This sentence is a direct repeat of the sentence on page 34m lines 9 – 11. *"The TCCCA principles stand for transparency, completeness, consistency, comparability and accuracy with the final aim to allow a technical 10 assessment of FMRL by an independent reviewer panel organized by the UNFCCC."* Most of what is contained on page 36 can	Monika G MacDevette (MGD) & Janak Pathak (JP)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						be eliminated as it is largely redundant.		
103		General				The text is very technical and jargon-laden, so much so that large parts of it will be inaccessible to all but the most expert readers. This in spite of the fact that Chapter 1 suggests that this report should be understandable for a non-technical audience.	Tim Newbold (TN)	This section is restructured and rewritten in the new draft.
104		General				Much of this chapter is not about Drivers. There is a lot here about participatory methods of scenario development, some examples of processes from East Africa and the Mediterranean etc. I suspect that most of that needs to be removed and a more heavy focus retained on the drivers and how they link into the scenarios and models. That might entail turning the chapter around to some extent	UNEP-WCMC	This section is restructured and rewritten in the new draft.
105		General				I was expecting some kind of classification of drivers to be introduced and then followed through this chapter, with examples of their use in scenario and model approaches (and case examples). There are at least 2 classification schemes of threats and their drivers (Salafsky et al. 2008 and Balmford et al. 2008). There may be more. This would seem to be a place to start the chapter.	UNEP-WCMC	Salafsky et al. 2008, Balmford et al. 2008, and Halpern et al. 2008 to be included in DD overview
106		General				There are large tracts of text with no references, making it impossible to assess where much of the information has come from. There are also sections which are almost all lists of example applications, rather than the underlying import of the particular idea. It needs less specifics and more generalities.	Tim Newbold (TN)	This section is restructured and rewritten in the new draft.
107		General				The models are often introduced with little preamble. This makes it difficult to assess at what scale the model is operating. Since this report is intended to have global scope, it would be nice at the beginning of the section on each driver to state whether there are global models, and then to introduce the models that do exist with a clear statement about the spatial scope of these models.	Tim Newbold (TN)	This section is restructured and rewritten in the new draft.
108		General				The authors represent one IAM (GLOBIOM) and 1 land-use model (from Verburg), but how about the other major IAMs? Also- what about scientists modelling other drivers of change? For example the IMAGE, GCAM, AIM, MESSAGE folks. Plus people doing other types of direct pressure modelling, e.g. invasive species, direct harvesting, pollutants... This would greatly strengthen the chapter	UNEP-WCMC	This section is restructured and rewritten in the new draft.
109		Section 3.2				I was expecting a conceptual model here. But I did not see one	UNEP-WCMC	This section is restructured and rewritten in the new draft.
110		Policy relevan				Was not really sure if this should be in this chapter at all. Might be better placed in another chapter perhaps?	UNEP-WCMC	This section is restructured and

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
		ce 3.4						rewritten in the new draft.
111		Discuss ion 2.5				Again – I wondered if a lot of this was not too far off subject and hence better removed from this chapter and perhaps used elsewhere?	UNEP-WCMC	This section is restructured and rewritten in the new draft.
112		1	1st para	1		'unsustainble use' – including harvesting of animals? This would be worth mentioning explicitly since it is the major driver in the oceans	UNEP-WCMC	This section is restructured and rewritten in the new draft.
113		1	1st para	1		'The underlying or indirect...' – it would be useful to include examples here.	Tim Newbold (TN)	This section is restructured and rewritten in the new draft.
114		1	Last para	1		Including structural equation models as their own category seems odd as they are a very specific class of statistical modelling approach. Do you mean mechanistic models?	UNEP-WCMC	This section is restructured and rewritten in the new draft.
115		2	1st para	2		No evidence given for this assertion. Is it true e.g. for climate models? Probably not. Also mechanistic models are 'data driven' in terms of their inputs. Suggest deleting, replace with the idea that using multiple model types is generally a good thing.	UNEP-WCMC	deleted
116		3	3rd para			Endogenous and exogenous drivers need to be defined.	UNEP-WCMC	The authors have decided to remove references to endogeneity and exogeneity due to the primary audience of this deliverable. An overview of 'controlability' at various scales is however covered in other chapters.
117		3	Last para	3		'Major direct drivers…'Only true on land. Overexploitation is the major driver in the oceans.	UNEP-WCMC	Noted, overexploitation falls within the rubric of natural resource use
118		4	3.2.1 1st para			Does demographic change include lifestyle changes – might be worth including anyway as likely important in the future.	UNEP-WCMC	Added entire section on sociocultural drivers with emphasis on consumption (dietary)

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
119		5	Fig. 3.1			Figure does not appear to be referenced anywhere in the text. I also find it could be a little more explicit e.g. all arrows labelled.	UNEP-WCMC	Figure replaced
120		5	Section 3.2.3			Needs something on the limitations / problems with using scenarios. As an aside, section 3.2.4 appears to be missing.	UNEP-WCMC	It is not clear that more general issues relating to scenario should be addressed here or in the chapter in which scenarios are introduced.
121		6	Section 3.2.5			Acronyms not defined earlier int he chapter.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
122		6	3.3.1			'Invaluable' seems too strong a word. What is the evidence for this?	UNEP-WCMC	Changed to "widely used"
123		11				Vector Autoregressive Models again seems very specific for what is actually a broad class of models.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
124		15	Para 1			Important to distinguish between land cover and land use; the latter is more important for biodiversity.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
125		15	22			Integrated Assessment Models should perhaps be mentioned here; they are one of the more consistent methods for predicting land use at a global scale.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
126		15	34			Again, maintain distinction between land use and land cover.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
127		19	10			Most sources (including global biodiversity outlook and references therein) suggest that land use has the biggest impact on biodiversity (exploitation in the marine realm)	UNEP-WCMC	This section is restructured and rewritten in the new draft.
128		24	Box			Chapter is on modelling drivers? The box would better belong in the chapter dealing with modelling impacts on biodiversity/ecosystems.	UNEP-WCMC	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
129		26	Table 3.3.3			Nowhere does the table say that the models listed are examples, but they are only a very few of the many models available.	UNEP-WCMC	This table has been removed
130		29	26-27			This would better belong in the previous paragraph, because this is business as usual.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
131		35	34			'where review procedures are more biting than academic peer review.' Really? Where is the evidence for this? This whole paragraph seems very loosely worded and speculative without any references to support the numerous assertions.	UNEP-WCMC	This section is restructured and rewritten in the new draft.
132		Overall				The executive summary fairly clearly covers the key issues and is very useful. The main text doesn't seem to match this in content or structure, which is a pity. Important concepts like quantitative vs. Qualitative approaches, Structural equations vs driver processes, dterministic vs. Stochastic models are introduced, but it's not easy for readers to find reference to these in the text. I suggest a restructuring of the main text sections roughly as follows: 3.1. Exec summary 3.2 Defns and conceptual framework 3.2.1 Direct vs. Indirect drivers (also discuss the need to deal with interactions between them) 3.3 Constructing scenarios (intro is current 3.2.3, 3.2.5) 3.3.1 Participatory methods (in this you need to tackle both direct and indirect drivers, as well as interactions) 3.3.2 Modeling methods (in this you need to tackle both direct and indirect drivers, as well as interactions) 3.3.3 Quantifying direct drivers: examples In this section and table 3.2 you mix drivers and application domains. I don't think this works or is user-friendly; choose one or the other. I'd suggest drivers and then work with, for e.g. exploitation, in each of terrestrial, marine and freshwater environments. 3.3.4 Quantifying indirect drivers: examples (the chapter really needs this addition) 3.4 Linking multiple models (current section 2.5.1) 3.5 Making scearios and models policy relevant .... (I can't advise much on the struture of this section) 3.6. Good practice in building scenarios and models of change in biodiversity and ecosystems.	W. Foden (WF)	The chapter has bee restructured and rewritten in the new draft.
133		11				Application domains: don't forget freshwater ecosystems.	W. Foden	This section is

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(WF)	restructured and rewritten in the new draft.
134		11				Drivers: don't forget elevated CO2	W. Foden (WF)	This section is restructured and rewritten in the new draft.
135		116				Invasive species section: can assume readers know what they are, so perhaps a short definition in first paragraph, example in box, but the long explanation on pg 17 is unnecessary. Pollution: same – readers know what it is. Readers just need to know the scope of your definition of it in this chapter.	W. Foden (WF)	This section is restructured and rewritten in the new draft.
136		20,22				Exploitation (section pg 20) and use of resources (section pg 22): the same thing? If not then it's not clear how.	W. Foden (WF)	These sections are merged in the new draft.
137		1; overall				Chapter Focus: Is it meant to focus purely on modeling DRIVERS (i.e. on mechanistic modeling approaches)? Or is the focus on building models of IMPACTS of the drivers i.e. the change in biodiversity and ecosystems? It's not clear from the title. If the former, I assume that another chapter tackles modeling impacts of the drivers? If not, it seems an odd distinction, and it would make sense to include scenario modeling by e.g. correlative species distribution modeling here too.	W. Foden (WF)	Focus should be purely on modeling drivers and not the impacts of direct drivers.
138						The structure and goals of the chapter remain unclear. Is the purpose of the chapter to be a)a thorough review of existing developments and applications, b) a practical synthesis of scenarios and models available to be used in forthcoming IPBES assessments or c) a best practice guideline for building scenarios and driver models for individual contex-dependent cases? This should be clarified from the start with a structure that supports it. Depending on the chosen path, the chapter may need major changes in content, and /or the comments that follow may not be of so much relevance. Much of the content is built upon what appears to be a random choice of case studies of diverse nature and scale, making difficult any conceptualization or recommendation. If a thorough review is not conducted, examples should be chosen to cover a diversity of cases or alternatives, and summarised in e.g. tables according to their properties and applications. Alternatively, individual examples can be used in e.g. boxes, to illustrate concepts, or complexities. I would rather have the chapter starting with scenarios, first linking to the	Mar Cabeza (MC)	This chapter has been completely restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						concepts explained in ch 1 (e.g. as described in column 1 in Table 3.3 in this chapter), with types of scenario/purpose, moving sections 3.4.2. and 3.4.3 to the beginning and expanding them to include a more thorough review of approaches to build scenarios for such different goals, covering also a range of spatial and temporal scales. Once such review and synthesis are done, summarizing the state of the art, the role of participatory methods and local knowledge can follow, but not as a series of case studies, but instead a description of concepts, pros and cons, uncertainties and best practice guidelines. A box, with one of the examples, can illustrate the process and/or variationsof it.

Section 3.3.2 goes directly into modelling direct-indirect driver interactions. Perhaps it would be simpler to start with the selection of major direct drivers, and a synthesis of whether a)different drivers have typically been modelled differently and b) whether this is necessary given their different nature, and c)whether indirect drivers are common to (and are included thus in the modelling of) all major drivers or , d)which direct drivers are modelled jointly and are interdependent or have synergistic effects,etc. The overview of available methods (3.3.2.1) is now very brief and technical and would benefit from further structuring and clarification of terms. Part of the contents included in the discussion, (e.g. regarding the IAMs and coupling of models) could come here. Section 3.3.2.2 is lacking, did the authors plan to exand on the overview of methods here?

Section 3.3.2.3 (illustrative examples) is extensive but does not contribute much to the understanding of concepts or to linking "domains", given that the subsections are rather heterogenous in scope and structure. If such illustrations are to be included, please consider first an introduction for each subsection similar to that of "Habitat modification", followed by one or a few examples, if necessary, following a common structure, with reference to e.g. model type, scale, objective, drivers modeled etc. Separate clearly the part of the example that relates to "modelling drivers" from both the scenario or goal optimizing part, and/or the biodiversity/service impact part

I would like to see a critical assessment of gaps and biases is scenario and driver modelling towards the end, in relation to where are the great advances, what applications are lagging behind (models of particular drivers, scnarios for particular regions, scales, policy options, integration or coupling of models for different drivers or accross different scales), uncertainties. | | |
| 139 | | | | | | My comments are more general, while there are a few grammatical | Ellen | This section is |

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						errors, my overreaching feeling is that this chapter jumps around quite a bit and could be better organized. Graphics need to be of higher resolution and less complicated. The Summary table of drivers/tools (Table 3.3) is not very accurate in its assumptions, as for just about most of these, the domains could be inputs into the model, such as Marxan. Also Maxent is a habitat modeling software, quite different from the decision making models in the rest of the table. Perhaps instead of the domains, various strengths of these models should be summarized.	Hines (EH)	restructured and rewritten in the new draft.
140	3	2	13	2	16	This part summarize key and common problem we are facing in implementing environmental policies but no information is given in the body (section 3.3) that talk about method and tools whether or not the exampled model are selected because they have been proved to have some merit to address or minimize such problems	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
141	3	2	14	2	14	Here the pragraph start with " This chapter", i think it should be "This section"	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
142	3	3	14	3	22	My speciality is not modeling but as an environmntal policy anlysist, this pargarph is quite important in that it diffrentiate between indogenious and exogenious drivers. This concept have prgmatic implication for policy making and implemnting as well as evaluation and feedback. I couldnt find any presentation of about models and tools that utlize these classification in the section 3.3. If valid, it should be cosnidered	Abrar Juhar Mohamme d (AJM)	The authors have decided to remove references to endogeneity and exogeneity due to the primary audience of this deliverable. An overview of 'controlability' at various scales is however covered in other chapters.
143	3	3	32	3	32	I think it is better to give reference for the information about 80% of deforestation is caused by agriculture conversion.	Abrar Juhar Mohamme d (AJM)	added
144	3	4	5	4	10	This paragraph seem to me a bit isolated and disjointed. May be better to create one section (section 3.2.1. Drivers) and discuss about indirect and direct drivers (section 3.2.1.1 and 3.2.1.2). Then put the pargracph under section 3.2.2 (the current 3.2.3 section)	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
145	3	5	2	5	2	To keep similar flow, it is better if this section also start by defining and providing examples of direct driver than the current structure that directly discuss about modeling.	Abrar Juhar Mohamme d (AJM)	This section has been completely restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
146	3	5	5	5	5	Figure 3.1 seems to have been misplaced.	Abrar Juhar Mohamme d (AJM)	This figure is moved in the new draft.
147	3	6	13	6	13	There is no section 3.2.4	Abrar Juhar Mohamme d (AJM)	Noted
148	3	6	28	6	29	I think between section 3.3. and 3.3.1, it is better to give brief intrdiocution about the section and most importantly criterias used to select example models used in the section. This should also consider previous comments (comment no 1,3)	Abrar Juhar Mohamme d (AJM)	This section has been completely restructured and rewritten in the new draft.
149	3	6	29	10	12	This section is quite important but it lucks thorough anlysis of some concepts, epscially "stakeholders". The defintion of stakeholder in a specific scenario development process can be influenced by in addition to the purpose of the scenario, diverse socio-economic, political and cultural factors. Without going in detail, it is better to clarify some key points that should considered in selecting stakeholders	Abrar Juhar Mohamme d (AJM)	Covered in new draft under participatory methods
150	3	7	32	7	32	Please check usage of period	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
151	3	10	10	10	12	The proposed triagualtion method which is data triangualtion, is just one way. There are also other types such as Methodological triangulation or investigator triangulation which can have advantage over data triangulation depending on the context. It is better to give the broader way (talk about the need for triangulation using different techniques) and provide data triangulation (asking many elderly Bedouin) as one of this techniques	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
152	3	11	14	11	14	There is no table 2.2 in this chapter. If it is refering to table from other chapter, it is okay. Please check it	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
153	3	11	16	11	16	One possible place to discuss criterias used for selcting the example models	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
154	3	11	17	11	17	To keep similar flow with other sub section in this section such as 3.3.2.3.2, 3.3.2.3.3 etc and for ease of reading, it is better to give basic intriduction about the concept marine habitat modifcation	Abrar Juhar Mohamme d (AJM)	Noted and revised.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
155	3	16	7	16	8	I think, not only biphysical and sociao economic but also politcial and cultural factors are vital in explaing land use conversion.	Abrar Juhar Mohamme d (AJM)	Noted and revised.
156	3	18	18	18	18	Similar to comment no 14	Abrar Juhar Mohamme d (AJM)	Noted and revised.
157	3	27	1	29	12	Many mistake in the usage of period after citation. Please check	Abrar Juhar Mohamme d (AJM)	Noted and revised.
158	3	33	5	33	6	Mistake in numbering section and subsection. It should 3.5 and 3.5.1.	Abrar Juhar Mohamme d (AJM)	Noted and revised.
159	3	33	5	36	18	It is not clear for me why this section is named deisucssion. I couldnt figure out which part of the previous sections (section 3.1-3.4) being discussed in this section	Abrar Juhar Mohamme d (AJM)	This section is restructured and rewritten in the new draft.
160	3	1.41	1.41			Section 3.2 "Participatory methods and tools constitute important channels to collectively define complex problems related to the governance of particular biodiversity and ecosystem services. This social and environmental approach has been widely accepted as an innovative and sound framework for analysing the indirect and direct drivers as well as defining collective, well-grounded solutions and local development planning pathways" I will suggest Participatory methods and tools constitute important channels to collectively define complex problems related to the governance of particular biodiversity and ecosystem services. This social and environmental approach has been widely accepted as an innovative and sound framework for analysing the indirect and direct drivers as well as defining common, well-grounded solutions and development planning pathways at all development levels (eg in the fisheries sectors has been proposed for global programs on governance, although the real ownership has along to be evaluated).	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
161	3	2.41	2.41			Section 3.4 Basic principles for good modelling practice may include provisions for transparency, completeness, consistency, comparability and accuracy, including the possibility of technical assessment by independent reviewers. I will suggest Basic principles for good modelling practice may include provisions for relevancy, transparency, completeness, consistency, comparability, accuracy and accountability, including the possibility of technical assessment by independent	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						reviewers.		
162	3	4.41	4.41			3.2.1 Indirect Drivers Culture in the form of the values, norms, and beliefs of a group of people can act as an indirect driver of ecosystem change by affecting environmentally relevant attitudes and behaviors. I will suggest Culture in the form of the bad or low managed values, norms, and beliefs of a group of people can act as an indirect driver of ecosystem change by affecting environmentally relevant attitudes and behaviors. (eg culture and even traditional one is recognized as a value in the biodiversity conservation and wise use).	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
163	3	4.41	4,41			In addition to interacting with socioeconomic and demographic drivers, technological innovation can lead to the adoption of cleaner and more sustainable energy production as well as indirectly contribute to environmental degradation through electronic waste and increased demand for the raw materials used in new technologies. In addition to affecting the aforementioned indirect drivers, governmental policies (or the lack thereof) can impact the environment in myriad ways. Ill-informed and weak governance frequently leads to mismanagement of the commons as well as the adoption of environmentally unfriendly policies. I will suggest to reformulate the two sentences very similar in their construction.	Gianluca Ragusa (GR)	This section has been completely rewritten and restructured in the new draft.
164	3	6.41	6.41			(Ph. C: We should develop a bit more the overall and overall types of scenarios and their objectives here?) comments I agree with Ph. There are several examples of marine, inland, wetland participatory sustainable /and sometimes equitable management of the natural (including fisheries) resources.	Gianluca Ragusa (GR)	This section has been completely rewritten and restructured in the new draft.
165	3					"In the coastal area of Kenya, researchers and different stakeholders (fishery communities, policy makers, private hotel owners, etc.) have joined efforts to produce a collective diagnostic of drivers that negatively affect their well-being as well as to define common and well-grounded management schemes for fishery activities. First, the mental approach (network system) combined with a constructive and active stakeholder dialogue in which different participatory tools (opinions-voting, plenary, carousel) are used to identify and draw the interrelationship between indirect and direct drivers and in turn, the changes (positive and negative aspects) of their well-being and trade-offs of each fishery governance scheme are scrutinized. I will suggest In the coastal area of Kenya (as well at sub-regional level in the Western Indian Ocean), researchers and different stakeholders (fishery communities, policy makers, private hotel owners, donors, etc.) have joined efforts to produce a collective diagnostic of drivers that negatively affect their well-being as well as to define common and well-grounded management schemes for integrated coastal zone management, biodiversity and fishery activities. First, the	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						mental approach (network system) combined with a constructive and active stakeholder dialogue in which different participatory tools (opinions-voting, plenary, carousel) are used to identify and draw the interrelationship between indirect and direct drivers and in turn, the changes (positive and negative aspects) of their well-being and trade-offs of each fishery governance scheme are scrutinized (the Indian Ocean Commission has implemented and his implementing several programs funded by different donors (primarily Regional EU Delegation in Mauritius) for participatory ICZM, sustainable fisheries and biodiversity as well as participatory small island development).		
166	3	7.41	7.41			Stakeholder participation is critical when identifying drivers of change and their importance for an ecosystem approach to fisheries (EAF) aimed at reconciling exploitation and conservation of marine biodiversity. I will suggest Stakeholder participation is critical when identifying drivers of change and their importance for an ecosystem approach to fisheries (EAF) aimed at reconciling sustainable exploitation of the resources and conservation of marine biodiversity.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
167	3	9.41	9.41			The work of a wide range of stakeholders including scientific fisheries, conservation institutions, the fishing industry, and NGOs has been essential to identifying indirect and direct drivers of change in biodiversity and ecosystems. I will suggest The work of a wide range of stakeholders including scientific institutions, fisheries administrations (at regional, national and local level), conservation institutions, the fishing industry and the small-scale fisheries, civil society and NGOs has been essential to identifying indirect and direct drivers of change in biodiversity and ecosystems.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
168						To face the arising complex issues (overfishing, unsuitable governmental schemes, etc.), the Participatory Modelling of Wellbeing Trade-offs in Coastal Kenya (P-mowtick) were set and run with a multiple range of stakeholders to efficiently account for the depletion of the value of the coral reef fishery ecosystem services. In fact, overfishing, unsustainable, and weak governmental management schemes that negatively affect the well-being of local fishery communities and existing trade-offs among stakeholders were not really understood. Therefore, there was a need to investigate such interrelationships through participatory and easily comprehensible networking and ecological modelling approaches. I will suggest To face the arising complex issues (overfishing, unsuitable governmental schemes, etc.), the Participatory Modelling of Wellbeing Trade-offs in Coastal Kenya (P-mowtick) were set and run with a multiple range of stakeholders to efficiently account for the depletion of the value of the coral reef fishery ecosystem services. In fact, overfishing, unsustainable, and weak governmental management schemes (due to	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						human resources, capacity and financial means constraints) negatively affect the well-being of local fishery communities and existing trade-offs among stakeholders were not really understood. Therefore, there was a need to investigate such interrelationships through participatory and easily comprehensible networking and ecological modelling approaches.		
169	3	17.41	17.41	10		Senegaliamellifera(black thorn) and Dichrostachyscinerea(sickle bush) I will suggest to separate the scientific names	Gianluca Ragusa (GR)	
170						In this case, all relevant stakeholders (communities of Mombassa, researchers, policy-makers, etc.) went through a process starting from the design of a mental model up to a socio-ecological model (Toy model). First, the mental modelling approach provides the basic information regarding the indirect and direct factors, the degree of their interconnections, and the importance of their effects on the fishery ecosystem services. The second step will consist of investigating the most important links between factors (indirect to direct ones) and then drawing upon this insight to reveal their impacts on the well-being of local communities and fisheries' ecosystem service. Comment : I believe communities of Mombasa.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
171	3	27.41	28.41	8	30	From "A policy cycle serves as a heuristic or framework to facilitate effective decision-making by taking into,,,". Kindly revise the full stops, references, etc.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
172	3	29.41	29.41	5		throughout the process.(Mickwitz 2003; Huitema et al. 2011). See above	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
173	3	31.41	31.41	5	10	Box 3.5: Evolution of model-based scenario assumptions: From SRES to RCPs to SSPs. See above.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
174						According to the Aichi Biodiversity Target 11 adopted by the Convention on Biological Diversity, the protected area network should be expanded to at least 17% of the terrestrial world by 2020. There is considerable risk of ineffective outcomes due to land-use change and uncoordinated actions between countries. I will suggest According to the Aichi Biodiversity Target 11 adopted by the Convention on Biological Diversity, the protected area network should be expanded to at least 17% of the terrestrial world by 2020. There is considerable risk of ineffective outcomes due to land-use change and uncoordinated actions between countries and regions.	Gianluca Ragusa (GR)	This section has been completely reworked in the new draft.
175						General comment for EAF and fisheries and participation. I suggest to consult the biblio attached.	Gianluca Ragusa	This section has been completely reworked in

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(GR)	the new draft.
176	Executive summary	1	Line 3 of Section 3.1			"Unsustainable natural resources use" is too normative as compared to other direct drivers (land-use change, ..); I suggest to rather use "harvesting pressures" or "fishing pressures". This appears several times within the chapter.	Luc Doyen (LD)	Changed to "natural resource use"
177	Executive summary	1	Line 10 (last) of Section 3.1			Add "and services" to … "ecosystem functions."	Luc Doyen (LD)	This section has been completely reworked in the new draft.
178	Executive summary	1	Line 12 of Section 3.2		Section 3.2 Line 13	..whether the underlying phenomenon can be represented by structural equations and mechanistic dynamics or driver processes are captured by statistical or correlative approaches ... I suggest this because mechanistic models can be also data driven and calibrated and thus the initial sentence could be a little bit confusing.	Luc Doyen (LD)	This section has been completely reworked in the new draft.
179	Executive summary	1	Line 14 of Section 3.2			I suggest to add "spatially explicit or not" after stochastic nature as an important typology	Luc Doyen (LD)	This section has been completely reworked in the new draft.
180	Executive summary	1	Line 14 of Section 3.2			I suggest to add after ".. specific sector." "and whether the decisions and strategies of involved agents are based on rationality (optimality) or rely on more inertial and myopic behaviors as in agent-based modeling."	Luc Doyen (LD)	This section has been completely reworked in the new draft.
181	3.2 definitions and conceptual framework	3	Line 28			Same remark Nr 1: "Unsustainable natural resources use" is too normative as compared to other direct drivers; I suggest to rather use "harvesting pressures" or "fishing pressures"	Luc Doyen (LD)	This section has been completely reworked in the new draft.
182	Section 3.2	4	Subsection 3.2.1			Starting with direct drivers instead of ID could make sense. It seems to me that the impact and role of direct drivers on biodiversity are generally more intuitive and obvious.	Luc Doyen (LD)	Due to the flow of the chapters within this deliverable, it makes more sense to begin with IDs.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
183	Section 3.2	4	Second paragraph in Subsection 3.2.1			The paragraph related to public policies starting with "In addition, ..." sounds rather pessimistic regarding the role of these public policies. I suggest to start with a more positive sentence claiming that public policies can positively affect the dynamics of biodiversity and ecosystem services as exemplified by European policies for fisheries since important fish stocks are on the road to recovery from overfishing. (Ref : Fernandes and Cook 2013, Reversal of Fish Stock Decline in the Northeast Atlantic, Current Biology Volume 23, Issue 15, p1432–1437, 5 August 2013)	Luc Doyen (LD)	Add in new government/institutional ID section
184	Section 3.2	5	subSection 3.2.2			The whole paragraph is not convincing et needs to be elaborated as indicated in particular through examples.	Luc Doyen (LD)	This section has been completely reworked in the new draft.
185	Section 3.2	6	SubSection 3.2.3 Line 6			To inform ecological and/or economic models	Luc Doyen (LD)	This section has been completely reworked in the new draft.
186	Section 3.2	6	SubSection 3.2.5 title			Not sure to understand: the state of art of what ?	Luc Doyen (LD)	Section removed
187	Section 3.3	10	Subsection 3.3.2.1 Line 7			The opposition between systems dynamic models and optimization models can be confusing because optimal control models can depend on dynamic models. I would suggest to simplify with "... we can distinguish again between simulation models and normative models including optimization models."	Luc Doyen (LD)	Changed
188	Section 3.3	10	Line 12 of Paragraph 3.3.2.1			Such as policy regulations or shocks (quotas, tax, subsidies, ..)	Luc Doyen (LD)	This section has been completely reworked in the new draft.
189	Section 3.3	15	Paragraph 3.3.2.3.2			In this subsection, I would also mention recent bio-economic models and scenarios integrating at large (national) scale in UK (Bateman et al., 2013) or France (Ay et al., 2014), biodiversity, economic models of land-use and climate impacts. Bateman et al. 2013, Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom, Science VOL 341 5 JULY 2013. Ay J.-S., Chakir R., Doyen L, Jiguet F. & Leadley P., 2014, Integrated	Luc Doyen (LD)	This section has been completely reworked in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						models, scenarios and dynamics of climate, land use and common birds, Climatic Change http://link.springer.com/article/10.1007%2Fs10584-014-1202-4		
190	Section 3.3	19	Paragraph 3.3.2.3.6 Line 1			Fisrt sentence of the paragraph is too vague. I would suggest Pollution is a major stressor affecting biodiversity	Luc Doyen (LD)	This section has been completely reworked in the new draft.
191	Section 3.4	27	Subsection 3.4.1	29		It seems to me that this paragraph dedicated to policy cycle should mention the so-called management strategy evaluation (MSE) for fisheries because the adaptive methods and prospects of MSE are really closed to those described in the paragraph. See for instance Sainsbury, K.J., Punt, A.E. and Smith, A.D.M. 2000. Design of operational management strategies for achieving fishery ecosystem objectives. ICES Journal of Marine Science, 57: 731–741 or O. Thébaud, Smith T. Doyen L., Planque B. Lample M., Mahevas S., Quaas M., Mullon C., Vermard Y., Innes J. 2013. Building ecological-economic models and scenarios of marine resource systems: workshop report. Marine Policy Available on line	Luc Doyen (LD)	This section has been completely reworked in the new draft.
192	Section 3.4	30	Section 3.4.2			3)b) remove unsustainable in unsustainable socio-economic activities; because sustainable socio-economic activities are also drivers of change in biodiversity and ecosystem services	Luc Doyen (LD)	This section has been completely reworked in the new draft.
193	Section 3.4	32	Section 3.4.2.2 line 1			After scarce. I would add a paragraph devoted to co-viability approach and scenarios. In that respect, the use of co-viability scenarios and models at large and ecosystem scales as in Cissé et al. (2013), Gourguet et al. (2013) or Hardy et al. (2013) for fisheries and marine biodiversity or Mouysset et al. (2014) for land-use and terrestrial biodiversity is original and informative. The basic idea underpinning viability approach is to limit the bio-economic risks and vulnerabilities of a socio-ecosystem through a set of ecological and socio-economic constraints to satisfy throughout time. By doing this, the approach conveys informations in terms of both transients and asymptotics as well as sustainable management or policies. Gourguet, S., Macher C., Doyen L., Guyader, O., Thébaud, O., 2013, Bio-economic modeling for the viable management of mixed fisheries, Fisheries Research,140, 46–62. Available on line Cisse, A., Gourguet S., Doyen, L., Blanchard, F., Pereau, JC. 2013, A bio-economic model for the viable management of the coastal fishery in French Guyana, Environmental and Development Economics. Available	Luc Doyen (LD)	This section has been completely reworked in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						on line Hardy P.Y., Doyen L. Béné C., Schwartz A.M. 2013. Food security - environment conservation nexus: a case study of Solomon Islands' small-scale fisheries. Environmental Development. <u>Available on line</u> Mouysset L., Doyen L., Jiguet F., 2014, Co-viability of farmland biodiversity and agriculture, Conservation Biology. <u>Available on line</u>		
194	3	1	9	3	4	An introduction can be added before 3.2 (definitions and conceptual framework), providing the background information or structure of this chapter.	Tianbao Qin (TQ)	This section is restructured and rewritten in the new draft.
195	3	5	4	5	6	The types of direct drivers can be elaborated.	Tianbao Qin (TQ)	This section is restructured and rewritten in the new draft.
196	3	6	15	6	28	State of art is not clearly presented. Moreover, this can be part of 3.2.3 (Approaches to construct scenarios and scenario assumptions).	Tianbao Qin (TQ)	This section is restructured and rewritten in the new draft.
197	3	6	32	10	14	Only participatory approach is elaborated. But the reasons for using this apporach is not provided. Are there other approaches in this respect? Too many case studies are provided in this part.	Tianbao Qin (TQ)	Expert-based as well as other approaches added in new draft
198	3	10	16	11	18	Section 3.3.2.1 does not introduce the main types of approaches that will be explored in the following part.	Tianbao Qin (TQ)	This section has been completely reworked in the new draft.
199	3	11	20	13	10	This is a detailed description of a case about marine habitat modification. Generalisation is not made. The background and the potential options in making scenarios and models should be added in the beginning of this section.	Tianbao Qin (TQ)	This section has been completely reworked in the new draft.
200	3	15	39	15	39	A case study can be used to describe this approach.	Tianbao Qin (TQ)	This section has been completely reworked in the new draft.
201	3	15	41	16	21	A case study can be added and a systematic comparison of the possible approaches can be made.	Tianbao Qin (TQ)	This section has been completely reworked in the new draft.
202	3	17	21	18	17	Several methods are described. But the detailed analyses of the methods are missing.	Tianbao Qin (TQ)	This section is restructured and rewritten in the new draft.
203	3	27	1	33	4	Policy context is also discussed in pages 3 to 7 in chapter 2. This is repetitive to some extent. Besides, for classification of scenarios, they are	Tianbao Qin (TQ)	This section is restructured and

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						different from the classification from lines 1 to 25 in page 9 in chapter 1. If they are divided according to different criteria, this needs to be clarified.		rewritten in the new draft.
204	3	33	5	36	17	This is not the conclusion of this chapter. It is part of 3.4 (Policy relevance).	Tianbao Qin (TQ)	This section has been completely reworked in the new draft.
205	3					Generally, I find that in the whole deliverable aspects related to freswhater are not enough represented, although they provide essential ecosystem services, host an exceptional high proportion of biodiversity (given their coverage) and are under highest threat of all ecosystems.	Sonja C. Jähnig (SJ)	Freshwater eutrophication is now discussed.
206	3					I believe that Chapter 3, 4, 5 should be structured in a similar way, eg. Sections with scenarios and with models	Sonja C. Jähnig (SJ)	The chapter has been restructured and rewritten in the new draft.
207	3	2	1	2	2	Special care should be taken to use similar terms, e.g. how are the different models classified – are mechanistic-structural models the same as mechanistic models (Fig. 1.4) or structural models (page 5, section 3.2.2)	Sonja C. Jähnig (SJ)	Covered in the section on modelling
208	3.2	3				I find the introduction of endogenous and exogenous not very helpful and I am not familiar with these.	Sonja C. Jähnig (SJ)	The authors have decided to remove references to endogeneity and exogeneity due to the primary audience of this deliverable. An overview of 'controlability' at various scales is however covered in other chapters.
209	3.2.2					Not clear, probably a fragment	Sonja C. Jähnig (SJ)	This section is restructured and rewritten in the new draft.
210	3.3.2					I would suggest to include freshwater / river examples as well, e.g. in 1. Schmalz B, Kuemmerlen M, Kiesel J, Cai Q, Jähnig SC, et al. (2014) Impacts of land use changes on hydrological components and macroinvertebrate distributions in the Poyang lake area. Ecohydrology DOI: 10.1002/eco.1569. more publications regarding this topic are available e.g. by Fohrer et al. on stream flows, sediments, nutrients... and interactions	Sonja C. Jähnig (SJ)	The current amount of citations is more than sufficient.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
211	3.3.3	26				Clearly, freshwater and floodplains are missing, here, e.g. discharge, runoff, flood…	Sonja C. Jähnig (SJ)	This section has been completely reworked in the new draft.
212	3.x					I would appreciate a "way forward" / "outlook" section	Sonja C. Jähnig (SJ)	Added in new version
213	3	1	1	36	17	Provide the conceptual link to chapter 1. Chapter 1 provides a solid overview and framework on the topic and introduces all the subsequent chapters. Then chapter 3 immediately starts with its particular focus. Instead, introducing chapter 3 with a conceptual link to the overview and framework as defined in chapter 1 (e.g. reference to figure 1.6) as well as by outlining the chapter's aims and limits would help the reader setting the scene. As the equivalent, key messages at the end of the executive summary are very helpful and could be extended.	Lukas Mathys (LM)	This section has been completely reworked in the new draft.
214	3	1	1	36	17	Add a roadmap as a central theme. The chapter addresses the key elements, provides a broad scientific basis and many best practice examples. This information is relevant and helpful. In order to be a useful guide for the subsequent assessments, an illustrated roadmap is needed including key phases and elements. Ideally, critical phases and elements are highlighted and potential solutions outlined to minimize the associated risks. The three step process at the end of page 7 or the main steps at end of page 29ff might be a starting point or table 3.1 as a template. If such a procedure is outlined at the chapter's beginning all the details and working examples can afterwards be referred to.	Lukas Mathys (LM)	This section has been completely reworked in the new draft.
215	3	3	6	4	10	Crystallize and coordinate terminology. The chapter discusses many terms (e.g. direct/indirect, dependent/independent, endogenous/exogenous, static/dynamic, proximate, underlying), which is helpful for an overview on all the different approaches. In order to be an unambiguous guide, the chapter needs to focus on the key terms and thoroughly define them (e.g. in a glossary or wiki). These elements need to be in line with the overall conceptual framework and glossary of the entire document.	Lukas Mathys (LM)	Terms introduced in this chapter will be clearly defined while others will be covered in the first chapter that they are used in.
216	3	3	6	4	10	Add a figure on conceptual framework. The chapter mostly describes the framework in all its facets. Summarize the chapter's conceptual framework with a figure. Ideally the figure is a derivative from figure 1.2 and/or figure 1.3 in chapter 1. This figure also serves as a basis for an illustrated roadmap.	Lukas Mathys (LM)	added
217	3	6	28	26	1	Put methods and tools in line with framework. The section provides many helpful examples. The examples could be more effective if organized in the chapter's framework or along the roadmap (e.g. section 3.3.2.3). Additionally, clearly state what the examples stand for in	Lukas Mathys (LM)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						methodological terms; e.g. a certain property, an ideal procedure or exemplary inclusion of stakeholders.		
218	3	6	28	26	1	Elaborate on uncertainties. Much effort has been put into the discussion of all the scenario and model types as well as on how to build them. Little attention has been drawn to associated uncertainties. Quantifying uncertainties from the scenarios and models have to be addressed in the context of assessments. Maybe this topic is generally treated in another chapter as well. Still, uncertainties and how to deal with them in the scenario and model building process needs to be addressed in this chapter.	Lukas Mathys (LM)	The new draft covers uncertainties as they related to scenario and model construction. Further, uncertainty in general is covered at length in other chapters.
219	3	6	28	26	1	Elaborate on qualitative measures. Most scenarios and models are based on some form of quantitative measures. In contrast, local knowledge includes much qualitative knowledge. The chapter would benefit from further information on how to treat and transform such qualitative information into quantitative models. The examples in the chapter do provide best practices. A more detailed theoretical background would be very helpful.	Lukas Mathys (LM)	The process of using qualitative narratives to construct quantitative models will be elaborated upon in the new draft.
220	3	6	28	33	5	Elaborate on the interaction between modeler and stakeholder during scenario and model building process. As mentioned in the chapter as well, this interaction is essential for a successful transformation of information from scenarios and models to policy. Further details on best practices as well as associated potentials and risks are helpful.	Lukas Mathys (LM)	To be elaborated upon under participatory methods
221	3	1		1		Definitions of scenarios and models are changing from a chapter to another. According to the future studies literature (see for instance Mermet 2005 – étudier les ecologies futures, or Godet 1994 – from anticipation to action, or Bell 2003 Foundations of futures studies: History, purposes and knowledge (New Edition).), methods for futures studies can be classified between : - Quantitative models - stakeholders participatory methods - formal expert analysis - a combination of the three methods above The results of these methods can be : - quantitative projections / simulations - storylines / narratives / scenarios - horizon scan this comment also apply for the other sections of the chapter	Audrey Coreau (AC)	This section has been completely reworked in the new draft.
222	3	5		6		It seems that for the authors scenarios always derive from some kind of quantitative modelling. This is far from true, even for biodiversity and ecosystem services. Some futures exercises do analyse qualitatively biodiversity, and build some scenarios (for instance "biodiversité et	Audrey Coreau (AC)	The process of using qualitative narratives to construct quantitative models is elaborated

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						territoires 2030" in France). Translating qualitative date to quantitative inputs is necessary only if you build upon a quantitative model.		upon in the new draft.
223	3	6		25		There is a large difference in the size of the section about scenarios (small) and the section about models (large). The section on scenarios should explore the different categories of scenarios, there characteristic in rigor, complexity and coherence, the use of storylines/narratives, the use of time-arrows, future steps, etc. For general literature on scenarios : Shwarz, the Art of the Longview, Godet, Creating futures, De jouvenel, l'art de la conjecture, Bell (see above – comment 1)	Audrey Coreau (AC)	These sections have been completely restructured and rewritten in the new draft. Regarding scenarios, their introduction takes place in the previous chapter and therefore background material will be limited here.
224	3	7		8		I do not understand where are the scenarios about futures in the example that is proposed	Audrey Coreau (AC)	This section has been completely reworked in the new draft.
225	3	6		10		Scenarios are according to the authors only useful for indirect drivers. However, most scenarios include indirect, direct drivers and their consequences on biodiversity and ecosystem services (some on the consequences being modelled, some being assessed by experts or participatory methods). MA scenarios are a good example of complex intertwined scenarios.	Audrey Coreau (AC)	The direct drivers section will be further expanded upon to include the use of scenarios
226	3	26		26		Table 3.2. concerns only models, not scenarios. The same table could be drawn for scenarios	Audrey Coreau (AC)	This table has been removed
227	3	27		29		Section 3.4.1 is entitled "recap of policy cycle and different types of scenario approaches. But scenario approaches are not described in this section.	Audrey Coreau (AC)	This section is restructured and rewritten in the new draft.
228	3	28		28		I disagree on the fact that scientists are not influential on agenda setting and biodiversity policy. When you study history of environmental policies, you see that scientists have been very influential, directly or through NGOs. For an example in French see the really nice book of Blandin, de la protection de la nature à la gestion de la biodiversité.	Audrey Coreau (AC)	Rephrased with more moderate wording.
229	3	28		28		The model of "public understanding of science" when scientists should better communicate their result so that policy makers will make better policies is partly false. Communication is useful, but far not enough 1/ to make science count into policymaking and 2/ to make biodiversity policies more efficient. See for instance Mermet, L., Homewood K, Dodson A, Billé R, (2013). Five paradigms of collective action underlying the human dimension of	Audrey Coreau (AC)	This section has been completely reworked in the new draft.

Nr	Chapter/Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						conservation. <u>Key Topics in Conservation Biology</u>. D. McDonald and K. Willis, Wiley-Blackwell, Oxford, p42-58 Mermet L, 2011. Strategic Environmental Management Analysis: Addressing the Blind Spots of Collaborative Approaches, Working Papers n°5/2011, IDDRI, Paris, 34p.		
230	3	28	34	28	36	Public private partnerships have also negative consequences, as well as subsidization of private research. This cannot be summarized in just one sentence.	Audrey Coreau (AC)	This will be expanded upon.
231	3	28	39	28	41	Why "climate change mitigation policies" ?	Audrey Coreau (AC)	This was in reference to the citation. The sentence has now been generalized to environmental policies.
232	3	29	18	29	21	BAU scenarios are one kind of exploratory scenarios, but most exploratory scenarios are contrasted scenarios, and not BAU.	Audrey Coreau (AC)	reworded
233	3	29	22	29	28	BAU is not a scenario in the absence of explicit policies; it is a scenario without changing current policies.	Audrey Coreau (AC)	This is indicated in the text.
234	3	30	1	30	18	The main steps for building scenarios are a little too formal (scenarios exercises are often more efficient when they are flexible). However, some important steps are missing, such as 1/ the identification of what is at stake with the exercise, the problem that the exercise is supposed to help solve. 2/ formalising the scenarios and 3/ discussing the scenarios and analyse their strategic implications. See Mermet. 2005. Etudier les ecologies futures And Bell. 2003. Foundations of futures studies: History, purposes and knowledge (New Edition).	Audrey Coreau (AC)	noted
235	3	31	12	32	4	Why the literature on back-casting and normative scenarios is not mobilised in this section? See for instance Dreborg. 1996. Essence of backcasting. Futures. Robinson. 2003. Future subjuntive: backcasting as social learning	Audrey Coreau (AC)	This section is restructured and rewritten in the new draft.
236	3	34	5	35	5	The section is entitled "linking scenarios and models", but only models are discussed.	Audrey Coreau (AC)	This section is restructured and rewritten in the new draft.
237	3					All subchapters would benefit from a short introductory section, briefly explaining the objectives as well as providing some reasoning for the selection of case studies / examples /models, as in the current version the it is often unclear why particular issues are presented.	Joerg A. Priess (JAP)	This section is restructured and rewritten in the new draft.

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
238	3					Many statements and examples presented in this chapter are not sufficiently referenced. This deficit unneccesarily lowers the credibility of this chapter. Second, please avoid to cite unavailable forthcoming papers, while at the same time not fully exploring the wealth of existing literature.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
239	3					In many subchapters the thematic focus seems rather arbitrary and the degreee of detail of the examples presented varies extremely (the reasoning for these differences are not explained). Second, mostly meta-information is provided about case studies or models, while many readers might expect insights into processes and mechanisms, or the reasoning why and how drivers affect e.g. biodiversity or how scales are linked. I suggest to use less, but more elaborate examples throughout the subchapters and provide more concrete information.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
240	3					Executive summary: Throughout the summary strong statements and opinions are presented, often without providing sufficient reasoning. A more moderate and neutral wording and less opinon may be more appropriate.	Joerg A. Priess (JAP)	noted
241	3					Keeping the broad audience in mind, a box or list of accronyms should be provided, and the use of accronyms and jargon should be kept to a minimum throughout the chapter.	Joerg A. Priess (JAP)	noted
242	3					Exec Sum para 2, line 1: in many approaches scenarios drive models, not only the other way round. Please differentiate between the two. 2nd last line: "…understanding of issues." Please avoid fuzzy wording and clearly state which issues are relevant in this context. last line: Please clarify "…prevailing conditions and other key inputs."	Joerg A. Priess (JAP)	This differentiation occurs in the respective sections. Clarified.
243		1				last para: this para does not provide much concrete information. Please delete.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
244		2	2			please define "short term" and clarify what is to be predicted. The statement seems to contradict the scenario approach which is promoted as a key-method of this IPBES document. Please explain.	Joerg A. Priess (JAP)	deleted
245		2				section 3.3: too placative and broad statements, which I consider inadequate for this complex (and often controversial) policy-science context. Please use a more moderate wording, more general statements and provide the details in section 3.3	Joerg A. Priess (JAP)	This section is restructured and rewritten in the new draft.
246	3.2	3				Please provide a definition of indirect and direct drivers, as large fractions of intended readers may not be familiar with the concept.	Joerg A. Priess (JAP)	added
247	3.2	3				para 3 line 1-3: Repetitive, please merge sentences.	Joerg A. Priess	This section has been completely reworked in

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(JAP)	the new draft.
248	3.2.1	4				para 1 is jumping between topics and the degree of detail presented is not consistent. Please restructure	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
249	3.2.1	4				last line: please revise the logic of the statement.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
250	3.2.3	5				"...Scenario construction is a necessary endeavour". Scenarios are just one of several methods of futures thinking, so please use a more moderate wording.	Joerg A. Priess (JAP)	Wording moderated
251	3.3.1	6		10		Unclear, why so many partly unreferenced examples and details are presented in this subchapter. Please either provide a reasoning or use a consistent strategy throughout chapter 3.	Joerg A. Priess (JAP)	Noted
252	3.3.2.3.1	11		14		Very detailed & unclear why different from other subchapters. Please either provide a reasoning or use a consistent strategy throughout chapter 3.	Joerg A. Priess (JAP)	Noted
253	3.3.2.3.3	15				No information on coupled models is provided, which address socio-environmental feedbacks. Please provide at least one example (would also better match the discussion, which is picking up the issue).	Joerg A. Priess (JAP)	In new section on linking models.
254	3.3.2.3.3	16	13	21		Why are only rangelands addressed? DSS have been developed for all types of (mixed) terrestrial and aquatic systems. Please explain.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
255	3.3.2.3.5	18	29	41		Very detailed & unclear why different from other subchapters. Please either provide a reasoning or use a consistent strategy throughout chapter 3.	Joerg A. Priess (JAP)	Noted
256	3.3.2.3.6	19	10			"Pollution is ..." Please provide evidence.	Joerg A. Priess (JAP)	deleted
257	2.5.1	33				Well written subchapter, which would benefit from examples to make advantages and limitations explained therein more accessible. Additionally, I suggest to address the problem of (in-)consistency between scenario and model variables.	Joerg A. Priess (JAP)	Noted
258	3.5.2	35				The focus on the forest management example is unclear. Especially the last para seems much too specific and does not reflect the very generic title. Please revise and broaden the view.	Joerg A. Priess (JAP)	This section has been completely reworked in the new draft.
259	3	5				Section 3.2.3 does comment some of the barriers of using expert elicitation to construct scenarios and scenario assumptions. However, I believe further needs to be said in this respect as to know how uncertainty changes depending on the 'experts' knowledge.	Marta Pascual (MP)	In expert-based methods section of new draft
260	3	6				Section 3.2.4 missing??	Marta Pascual	Noted

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(MP)	
261	3	6				Section 3.2.5 State of the art is not clear why is it included in this Section 3.2 of definitions and frameworks. Suggest including this info at Section 3.2.3. Also, this paragraph talks about the use of the storylines in Global scale long-run assessments. The definition of what is a storyline, and the contraints of using storylines (using northern hemisphere based assumptions that might not in other contexts) should be further explained.	Marta Pascual (MP)	Section removed
262	3	6				Section 3.3.1 talks about the participatory methods and tools for developing plausible driver scenarios. However, these methods are not only used to prioritize drivers but also to determine the baselines. Nothing is being said in the whole document about how to determine baselines that would allow us to determine scenario impacts and evolution. Something on baselines should be said somewhere in the document.	Marta Pascual (MP)	This section has been completely reworked in the new draft.
263	3	6				Section 3.3.1 talks about MAS & RPG approaches as well as on how to use these participatory knowledge into coupled networks platforms in order to bring collective thoughts and insights into scenario building. This section is really interesting but miss the use of other tools such as some spatial and multi-criteria analysis (some mention in page 10 but just mentioned) that have also been used to determine public preferences and knowledge into decision-making. I suggest these should also be included together with some comments on social-networks analysis methods who can also give higly valuable insights on power-relationships between stakeholders.	Marta Pascual (MP)	Elaborated upon in the new draft
264	3	10				Agent based or agent-based (consistency with these and other words such as decision-making, etc.)	Marta Pascual (MP)	Noted
265	3	11				Table 2.2 mentioned by named as Table 3.2 in the document. Same with some figures (Figure 2.4 named but 3.4 in the document). Please check	Marta Pascual (MP)	Noted
266	3	34	4	34	13	This paragraph states that 'no single model can capture all the dynamics' and suggests coupling models. It does, however, not mention the high potential of integrated modelling (something on integrated assessment models but it is not the same). Something mentioning IM could be included here. This paragraph also mentions some troubles when performing the downscaling of the models to regional and local levels that it is a mayor issue. The downscaling issue could be included as a separate paragraph and further developed.	Marta Pascual (MP)	This section has been completely reworked in the new draft.
267	3	34	15	34	20	This paragraph highlights a very important problem when coupling models that it is the lack of consistency between concepts meanings. A	Marta Pascual	We believe that this discussion falls beyond

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						general/ shared ontology should be pursued as a potential solution to this problem. Something related to this and EUs recent efforts to develop ontologies could be included here.	(MP)	the scope of the current chapter.
268	3					Lack of line numbers (until page 15) makes review comments on this chapter rather challenging. Also, many references seem to be missing.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
269	3	1	12			First line of Section 3.1. Delete "and ecosystems" – ecosystems are part of biodiversity. This is the case throughout; I will point out places for correction where I spot them, but please address the issue throughout.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
270	3	1	17			Change "ecosystem degradation" (too specific) to the general "biodiversity loss".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
271	3	1	21			Change "biodiversity and ecosystem functions" to either just "biodiversity", or to "genetic, species, and ecosystem composition, structure, and function", or similar, consistent with the CBD and with Ch 2.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
272	3	1	25			Second line of Section 3.2. Delete "and ecosystems" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
273	3	1	32			Unclear what "genuine" means here. Clarify or delete.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
274	3	2	12			First line of Section 3.3. Delete "and ecosystems" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
275	3	3	3			The text "can only be found" is an overstatement. Maybe "can be found most efficiently" would work.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
276	3	3	7			"Biodiversity" generally, not "Ecosystems" specifically.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
277	3	3	9			Change "ecosystems and biodiversity" to simply "life".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
278	3	3	18			"biodiversity change" not specifically "ecosystem change".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
279	3	3	26			Delete "and ecosystems'" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
280	3	3	28			Delete "ecosystems and" – ecosystems are part of biodiversity.	Thomas	This section has been

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							Brooks (TB)	completely reworked in the new draft.
281	3	3	32			Change "depicting ecosystem conditions and trends as well as biodiversity" to read "depecting biodiversity conditions and trends".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
282	3	4	2			Delete "ecosystems and" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
283	3	4	9	4	10	Delete "and ecosystems" twice – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
284	3	4	10	4	11	"Chapters 2 and Chapter 4" – this is wrong, from what I can tell of the chapter structure. Should be "Chapters 4 and 5 respectively", I think.	Thomas Brooks (TB)	Noted and revised.
285	3	4	19			"biodiversity change" not "ecosystem change".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
286	3	4	25			Add "and other" to read "electronic and other waste" – it is not just an issue of electronics.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
287	3	4	34			"biodiversity change" not "ecosystem change".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
288	3	4	39	4	40	"biodiversity change" not "ecosystem change".	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
289	3	5	3			As and when this text is developed, Salafsky et al. 2008 Conserv Biol, which provides a classification of direct drivers, will be a key citation to include.	Thomas Brooks (TB)	Salafsky et al. 2008, Balmford et al. 2008, and Halpern et al. 2008 to be included in DD overview
290	3	5	6			Bottom right text in Fig 3.1, change "BD and ecosystem function" to "biodiversity" – ecosystem function is part of biodiversity.	Thomas Brooks (TB)	This will be decided upon by TSU.
291	3	5	6			Legend to Fig 3.1, delete "and ecosystems" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This will be decided upon by TSU.
292	3	6	21			What is a "National GEO"? Add citations for the UK, China, Brazil examples.	Thomas Brooks (TB)	Noted and revised.
293	3	6	25			"biodiversity change" not "ecosystem change".	Thomas	This will be decided

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							Brooks (TB)	upon by TSU.
294	3	7	19	7	26	This example paragraph (Kenya coast) needs a citation.	Thomas Brooks (TB)	Noted and revised.
295	3	9	3			Delete "and ecosystems" – ecosystems are part of biodiversity.	Thomas Brooks (TB)	This will be decided upon by TSU.
296	3	9	9	10	14	This four-paragraph example (Bedoiun) needs a citation. It could also probably be summarized in a single paragraph.	Thomas Brooks (TB)	Noted and revised.
297	3	9	10			Again, unclear what "genuine" means here. Clarify or delete.	Thomas Brooks (TB)	Noted and revised.
298	3	9	16	10	17	Spell out "IDs and DDs" as "indirect drivers" and "direct drivers". The world could happily do without the introduction of ugly initialisations like this.	Thomas Brooks (TB)	Noted and revised.
299	3	11				Section 3.3.2.2 seems to be completely missing.	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
300	3	11				Under Section 3.3.2.3, only subsections 3.3.2.3.1 and 3.3.2.3.4 seem to give "Illustrative examples". The other subsections seem to give general theoretical descriptions, and discuss generic tools. Also, in general, all these subsections are weak in exemplifying connections between indirect drivers and the specific direct driver in question.	Thomas Brooks (TB)	These sections have been completely restructured and rewritten in the new draft.
301	3	11		13		Section 3.3.2.3.1 could be greatly shortened, and focused on modeling the interaction between indirect and direct drivers (the focus of this chapter), rather than resulting impacts on ecosystem services and thence human well-being. Also, nothing here seems to address marine habitat modification (the title of this subsection) but rather harvest of marine biodiversity (i.e., fisheries).	Thomas Brooks (TB)	This section has been completely reworked in the new draft.
302	3	14				This example seems misplaced: it relates to planning a conservation response (i.e., relationship between direct drivers and biodiversity state), which I believe should be covered in Chapter 4. It doesn't discuss indirect drivers and their relationship with direct drivers – the subject of this Chapter 3 – at all.	Thomas Brooks (TB)	Removed
303	3	15	42	16	3	This definition of land degradation seems rather contorted. Is it consistent with the definition proposed in the scoping of the IPBES thematic assessment of land degradation and restoration? Needs to be consistent.	Thomas Brooks (TB)	Noted and revised.
304	3	16	3	16	4	Delete "climatic factors, which include drought and fluctuations of temperature and rainfall, as well as". Surely land degradation is a	Thomas Brooks	This section is restructured and

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						management issue?	(TB)	rewritten in the new draft.
305	3	16	26	16	32	This subsection seems to jump into the water hyacinth example too fast; and doesn't explain the linkage from indirect drivers to the direct driver in question (i.e., water hyacinth invasion).	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
306	3	17				Box 3.2 doesn't seem to be a box; it is just a paragraph of text.	Thomas Brooks (TB)	Removed
307	3	17	6			Initialisation "WIPs" unnecessary. Please spell out.	Thomas Brooks (TB)	Noted and revised.
308	3	19	10			"Pollution is probably the most influential stressor affecting biodiversity" – this is very unlikely to be correct. Nearly all analyses, e.g., Baillie et al. 2004 Global Species Assessment show ecosystem conversion as far and away the most severe indirect driver, followed by invasive species. Recommend deleting this sentence.	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
309	3	20	1	20	3	The UNEP report on "State of the Science of Endocrine Disrupting Chemicals – 2012" would be an important citation here.	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
310	3	20	8			Add "systemic pesticides (van der Sluijs et al. 2015)" before "and others" here. The paper is open access in Environ Sci Pollution Res (http://link.springer.com/article/10.1007/s11356-014-3229-5).	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
311	3	20	26	22	13	This subsection 3.3.2.3.7 has me confused. It doesn't seem to be about "Exploitation" at all (what does "Exploitation" mean in this context anyway?). In fact, it doesn't seem to be about direct drivers, but rather about MAS/RPG approaches for decision support. It looks as if it would fit better into Chapter 2, maybe as a subsection under Section 2.2.	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
312	3	24	15	25		Presumably this Box 3.3 is intended to be part of subsection 3.3.2.3.8? – providing a marine example of wild harvest to parallel the terrestrial one on pages 22–24?	Thomas Brooks (TB)	This section is restructured and rewritten in the new draft.
313	3	26				The material in Section 3.3.2.8 is so inconsistent that Section 3.3/Table 3.2 doesn't really make sense at the moment.	Thomas Brooks (TB)	This table has been removed
314	3	26				In Table 3.2, presumably "Marine habitats" should be "Marine habitat modification", and similarly "Terrestrial habitats" should be "Terrestrial habitat modification"?	Thomas Brooks (TB)	This table has been removed
315	3	27	3			Section 3.4.1 seems to generic for the middle of Chapter 3. This section	Thomas	This section is

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						might be best off moved verbatim to Chapter 2, maybe into Section 2.1.1.	Brooks (TB)	restructured and rewritten in the new draft.
316	3	29	37	29	38	Change "BD and ecosystems" to "biodiversity" (ecosystems are part of biodiversity).	Thomas Brooks (TB)	This will be decided upon by TSU.
317	3	29	40	30	1	Change "BD and ecosystems" to "biodiversity" (ecosystems are part of biodiversity).	Thomas Brooks (TB)	This will be decided upon by TSU.
318	3	30	2			Change "BD and ecosystems" to "biodiversity" (ecosystems are part of biodiversity).	Thomas Brooks (TB)	This will be decided upon by TSU.
319	3	30	4			Change "BD and ecosystems" to "biodiversity" (ecosystems are part of biodiversity).	Thomas Brooks (TB)	This will be decided upon by TSU.
320	3	32	4			This box needs a citation, presumably Pouzols et al. 2014 Nature.	Thomas Brooks (TB)	Noted.
321	3	35	7	35	11	Excessive initialisation; this kind of jargon will kill the enthusiasm of even the most avid reader. In particular, "GPG" does not need initialisation.	Thomas Brooks (TB)	Noted.
322	General Comment					While this contribution recognizes the importance of socioeconomic factors as indirect drivers of changes in biodiversity and ecosystems, it does not mention models which show how market failures, political failures, (just to mention a few such factors) drive socially undesirable changes in biodiversity and ecosystems. Correcting such failures or adopting policies to counteract them can go some way to preventing unwanted biodiversity loss and socially undesirable changes in ecosystems.	Clem Tisdell (CT)	The section on 'scenarios and models of indirect drivers' has been significantly extended and rewritten in the final version. Section 3.3.4 of the final version addresses this issue.
323	General Comment					Although the distinction between direct and indirect drivers of change in biodiversity and ecosystems is useful, more consideration could be given to the modelling of changes in indirect drivers such as projections of human population growth and efforts to increase per capita incomes. What is the connection between economic growth and changes in biodiversity and ecosystems? What types of models have been suggested? What types of empirical relationships have been observed? Is it possible to do the same type of modelling as was done by N. Stern for greenhouse gas emissions?	Clem Tisdell (CT)	The section on 'scenarios and models of indirect drivers' has been significantly extended and rewritten in the final version. Sections 3.3.1 and 3.3.2 address this issue.
324	General Comment					Maybe for some readers listing separately the main anthropological threats to terrestrial and marine environments would be useful. In	Clem Tisdell	The chapter has been restructured and

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						terrestrial areas, ecosystem conversion resulting in loss of habitats seems to be the main threat. Agriculture in particular has been implicated as being of major concern, especially given global population growth predictions and continuing demands for increased food production, especially meat. Economic growth in nations such as China, have increased pressures on the global environment.	(CT)	extended and the final version now addresses the comment.
325	General Comment					Dividing causes of changes in biodiversity and ecosystem into indirect and direct drivers is useful. However, this simplification can result in the chain of economic effects being given inadequate attention. For example, the chain of causal factors of global warming due to anthropological factors and subsequent changes in biodiversity and ecosystems can be long one. The last three steps in the chain are Greenhouse Gas Emissions →Global Warming → Changes in Biodiversity and Ecosystems. Preceding steps would involve considering what factors result in increased greenhouse gas emissions. Or to take another example, changes in natural biodiversity and ecosystems may be driven by increased demand for agricultural produce. Then one should consider what is driving the increased demand for such produce. For example, in Australia's case, a major influence has been increased demand for agricultural produce by Asian nations, particularly for beef and dairy products. What type of modelling is relevant?	Clem Tisdell (CT)	The chapter has been restructured and extended and the final draft now addresses the comment (See Sections 3.2.3.2; 3.3, 3.4)
326	General Comment					I think there is more scope for this chapter to consider broader modelling issues involving changes in biodiversity and ecosystems globally and at the national and regional levels.	Clem Tisdell (CT)	The chapter has been restructured and extended to include broader modelling issues. See also chapter 4
327	General Comment					Some concepts may need more explanation for readers. For example, on page 11, it is not clear what a 'Toy model' is. The relevance of the Table on page 26 does not seem to be explained yet.	Clem Tisdell (CT)	Both the term and table have been removed from the chapter due to significant restructuring.
328	General Comment					The last paragraph on page 35 continuing to page 36, seems too pessimistic.	Clem Tisdell (CT)	We agree with your comment, however the text reflects the findings of the chapter. (This paragraph was moved to section 3.2.3.1 of the final draft)
329	3	1	17			Human activities as they relate to the diversity of interactions with nature. This diversity-complexity creates uncertain impacts	Ronald W. Jones	Noted. Uncertainty is dealt with in several

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
							(RWJ)	parts of the final version of the chapter.
330	3	1	27			Can we use the term social-ecological rather than "social and environmental" or use SES framework here, recent literature refers ot SES indicating direct linkages and feedbacks	Ronald W. Jones (RWJ)	Sentence has been removed, as the section was re-structured.
331	3	2	18			This is the overall general limtis to a modelling approach. There are few tools available that can adequately deal with the complexity-diversity-uncertainty dynamics if these models rely on strict linear quantitative approaches. Models now require to be able to include stochastic process such as human agency, greed and indecision.	Ronald W. Jones (RWJ)	Noted
332	3	3	1			Finding these "measurable indicators" for highly complex adaptive systems may be extremely difficult or impossible (probably not so relevant) as the relevance of these indicators will change over time and as the target SES changes; the target is both moving and changing at the same time!! Scenarios are better as they wil provide a collection of probable futures	Ronald W. Jones (RWJ)	Noted
333	3	3	24			This is confusing ..I think the exogenous vs endogenous is related to place (scale) of origin of the driver re: within or outside the focal scale or system; both types of drivers can have impacts on each other especially via synergistic or positive feedback loops, not sure if is correct or relevant to linking endo/exo to the statistical terms of dependent and independent variables..	Ronald W. Jones (RWJ)	This paragraph was removed.
334	3	3	40			Delete the term "soft" as in conveys "less importance' were ironically they are some of the most important drivers n SES change dynamics, esp. the overlooked driver of demographics	Ronald W. Jones (RWJ)	Agreed
335	3	4	1			Citation missing	Ronald W. Jones (RWJ)	Citation has been fixed.
336	3	6	18			Desertification	Ronald W. Jones (RWJ)	The correct title is 'Global Deserts Outlook'
337	3	6	36			For examples, list or include so key examples such as "detailed foresight narrative scenarios	Ronald W. Jones (RWJ)	The section has been re-structured and extended and include more examples.
338	3	7	19			Do u have references for this case study?	Ronald W. Jones (RWJ)	This paragraph was removed
339	3	7	28			More important is their reasons or motivations for participating, what they expect to get out of it, who pressures the to participate (patron issues), these are difficult o model or include in standard linear	Ronald W. Jones (RWJ)	Noted

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						approaches		
340	3	8	11			But risk is a difficult variable because depending on assets-entitlement linkages risks are different for every participant; issues may be better prioritized using livelihoods framework-to specfic groups	Ronald W. Jones (RWJ)	This paragraph was removed
341	3	8	13			Right, as risk to ecosystems must also be included and not simply "financial" risks to diverse stakeholder groups ex. small vs commercial scale fishers	Ronald W. Jones (RWJ)	This paragraph was removed
342	3	10	12			This is a key poitn and more needs ot be developed in how we can build scenarios/models to include TEK. Thers is now too much reliance on reductionsist "hard science" approaches which aims to remove or downplay key dyankics of change and uncertainty; which are characteristics of the systems under study;TEK can help to better navigate these systems with more realistic and legitimate scenarios and thus management options; there is a real lack of work being done on a new generation of these pluralistic modeling approaches.	Ronald W. Jones (RWJ)	This section was removed
343	3	11	24			Reference need here, for both the study and methods/approaches	Ronald W. Jones (RWJ)	This section was removed
344	3	11	34			Reference for this model	Ronald W. Jones (RWJ)	This section was removed
345	3	12	3			Reference for figure	Ronald W. Jones (RWJ)	This section was removed
346	3	12	6			What is this not clear? ref?	Ronald W. Jones (RWJ)	This section was removed
347	3	13	2			Figure reference	Ronald W. Jones (RWJ)	This section was removed
348	3	15	3			Reference needed for this statement	Ronald W. Jones (RWJ)	References were added to the paragraph
349	3	15	11			References need here for these statements.	Ronald W. Jones (RWJ)	References were added to the paragraph
350	3	18	10			All scientific names in italics	Ronald W. Jones (RWJ)	This paragraph was removed.
351	3	20	37			There should be more discussions here and elsewhere on these types of inclusive models, in which attempts to include and model divers agent	Ronald W. Jones	This paragraph was removed. The issue

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						ideas and agendas are built, if we assume most of these environments as "SES as CAS" then this paradigm requires models and scenarios which can capture the non-linear dynamics of these relationships	(RWJ)	raised in this comment is addressed in section: 3.2.1.2
352	3	21	1			Reference for graphic needed	Ronald W. Jones (RWJ)	This figure was removed
353	3	21	10			Reference for this case study need here	Ronald W. Jones (RWJ)	This case study was removed.
354	3	22	5			Reference here..seem this whole section on agent models and Brazil case study needs more references for statements and methods	Ronald W. Jones (RWJ)	This case study was removed.
355	3	22	13			Reference for these assumptions?	Ronald W. Jones (RWJ)	This case study was removed.
356	3	22	19			Reference needed for this case study here	Ronald W. Jones (RWJ)	This case study was removed.
357	3	23	14			This last sentence is an excellent point and should be expanded upon how models or scenarios can capture these types of intangibles such as plus/less governability in a nat resource system? for example greed? how do model greed; a main driver of natural resources exploitation/use!?	Ronald W. Jones (RWJ)	This case study was removed.
358	3	24	14			This last paragraph brings out essential points on conservation, management and development, but becuse this exists in complex systems, models are inadequate to capture this; so a learning based approach with emphasis on developing forums for knowledge co-production with direct links to action is the key to solving some of these wicked or deeply embedded resource problems	Ronald W. Jones (RWJ)	Noted
359	3	24	16			References should be placed in the text not just text boxes	Ronald W. Jones (RWJ)	References were included throughout the final version of the chapter.
360	3	32	Box			ref	Ronald W. Jones (RWJ)	Reference included in the box
361	3	32	Box			I would venture it is the ineffectiveness of the "global scale" approaches and as with so many places relies on local communities and their NGO supports often it is national and international players which actually prevent biodiversity conservation as they implement global neo-liberal development schemes..this is a key message which tells us not to rely on the International level..most targets for conservation are no where near	Ronald W. Jones (RWJ)	Noted

Nr	Chapter/ Section	From page	From line	Till page	Till line	Comment	Reviewer Initials	What was done with the comment
						being met..		
362	3	32	6			Also models and spatial planning tools for developing Marine PAs re: terrestrial impacts on siting criteria.	Ronald W. Jones (RWJ)	This box was not included in the final version
363	3	33	12			No doubt, the WILL require these complex models, which dont exist and no one is having the debate whether they are actually needed..this complexity requires and adaptive learning approach rather than complicated mathematical models, few can understand or use...it will become like the Space program with the engineers in control..the complexity of SES will not be solved or managed like this..	Ronald W. Jones (RWJ)	Noted
364	3	36	17			Not sure if you can or want to add anythign on this..but I wonder as the models and scenarios get more and varied and more complex and inclusive. with deeper math, coupled with faster and more computing power, we have all this yet or planet ES biodiversity and key ecosystem structure-functions including species loss is increasing and the situation (plus climate change) is getting worse not better..how do you or IPBES explain this paradox..we are failing in our protection of the planet..so will more faster bigger and better models help..I think we are trying to solve problems with the same thinking or logic that created them in the first place and we know this does not work!! why is science is still afraid of trying new or different approaches ex. including traditional or ecological knowledge rather than always a reductionist or hard approach.	Ronald W. Jones (RWJ)	Noted. This issue is discussed more extensively in chapter 4.