INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

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INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE

IPCC WORKING GROUPS I AND III
Second Joint Session
Addis Ababa, 6-8 April 2005

ENGLISH ONLY
(28.III.2005)

2nd WGI&III/INF. 1

IPCC SPECIAL REPORT:

SAFEGUARDING THE OZONE LAYER AND THE GLOBAL CLIMATE SYSTEM: ISSUES RELATED TO HYDROFLUOROCARBONS AND PERFLUOROCARBONS

COLLATED COMMENTS FROM GOVERNMENTS AND ORGANIZATIONS ON THE DRAFT SUMMARY FOR POLICYMAKERS RECEIVED BY 29 MARCH 2005

(Prepared by the TSUs of Working Groups I and III on behalf of the Co-chairs of Working Groups I and III)

IPCC Secretariat, c/o WMO, 7bis, Avenue de la Paix, C.P. N° 2300, 1211 Geneva 2, SWITZERLAND
Phone: +41 22 730 8208/8254/8284 Fax: +41 22 730 8025/8013
E-mail: IPCC-Sec@wmo.int Website: http://www.ipcc.ch

Second Joint Session of IPCC Working Groups I and III
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IPCC/TEAP Special Report on
Safeguarding the Ozone Layer and the Global Climate System:
Issues related to Hydrofluorocarbons and Perfluorocarbons

Comments of Governments on the Summary for Policymakers (11 February 2005)

As submitted by March 29, 2005 12:00 CET

Governments that have submitted comments		
Brazil	Germany	Slovak Republic
Belgium	Madagascar	Spain
Canada	Netherlands	Switzerland
China	New Zealand	United Kingdom
Chile	Norway	USA
France	Oman	

SPM-Comment	From Page	From Line	To Page	To line	Comments
1	0	0	0	0	General comment: In our view the SPM lacks som introductory information with regard to how the halocarbons treated contribute to radiative forcing (direct and indirect) and how the CFCs and HCFCs deplete ozone. We had also expected more information with regard to non-greenhouse gas ODS substitutes and the fact that their impact on radiative forcing is small compared to HFCs. Furthermore, the interaction between climate change and ozone depletion should be better explained, e.g. with relation to the "ozone hole". The chapters of the report contain a lot of solid scientific information on this which we think the policymakers and others that only read the SPM should be presented to. As the SPM is now, there are a lot of figures on contribution of the gases to climate change and ozone depletion today and in the future, but there is in general a lack of background information to make the figures understandable. We would also suggest to include information on the value of monitoring of atmospheric concentrations of CFCs, HCFCs, HFCs and halons as well as ozone, which is emphasised in several chapters of the underlying report. In our specific comments we propose the inclusion of some relevant paragraphs from the TS and underlying chapters. We believe this will make the SPM easier to read and understand for policymakers. (Government of Norway)
2	0	0	0	0	We highly recommend to include a table giving an overview of sector and application specific findings, again (former Table SPM-2). (Government of Germany)
3	0	0	0	0	We again recommend to amend the chapter and give some findings of the report related to regional differences. This could be done by using examples, e.g. regional differences in the use of ODS substitutes (safety, cost incl. cost for converting twice, supply of substitutes and/or equipment, chances due to later ODS phase-out for low GWP alternatives, problems in using low GWP alternatives due to fast phase-out etc.). (Government of Germany)
4	0	0	0	0	The 2nd draft informed about the significance of bank recovery and destruction for the possible effects of CFCs on future radiative forcing of climate change and ozone depletion. We recommended to give even more detailed information. The new draft not even gives the very short recommendation on this issue. We thus again recommend to include a brief description of the overall findings on the benefits and problems related to recovery and destruction. We suggest to take findings/experiences from ODS use/recovery into account when assessing recovery and destruction options for HFCs/PFCs. The experience from CFCs has shown that end-of-life is an important life-stage when it comes to direct emissions. Clear recommendations for policy makers are considered as useful in this chapter. (Government of Germany)
5	0	0	0	0	The SPM has come together nicely with clear and policy-relevant but not policy-prescriptive findings and messages. Well done! (Government of New Zealand)
6	0	0	0	0	Purely typographic suggestion: please don't use upper case in the questions, this is confusing and unnecessary (Government of New Zealand)
7	0	0	0	0	This version is much improved. It think it is very helpful and the authors should be thanked. (Government of Canada)
8	0	0	0	0	There is some inconsistencies in the use of tons of Carbone or tons of CO2. We suggest below to use systematically tons of carbon,

SPM-Comment	From Page	From Line	To Page	To line	Comments
					which seems to us more familiar to decision makers, and we propose changes in this direction. However, if it is the IPCC policy to use systematically tons of CO2, we can also accept it, but we suggest in this case not to use anymore tons of carbon. (Government of France)
207	0	0	0	0	1. The report is clearly targeted and structured with concise background information on science. The technology, production, bank and emission are accurately stated. The polities and measures on reduction are comprehensively summed up. In general, it is a complete, clear, accurate and appropriate report. (Government of China)
208	0	0	0	0	2. The report elaborates on the impact of ODSs and their substitutes on climate change. As a matter of fact, the Kyoto Protocol aimed at improving global climate might also compromise the Montreal Protocol. For example, the projects under the clean development mechanism (CDM) as defined in the Kyoto Protocol to decompose and reduce HFC-23 are very likely to give incentives to the production of HCFC-22, the excessive growth of which would be difficult to controI or reduce. Therefore, it is preposed that such an elaboration and indication be made in the report. For instance, another sentence could be added after Page 3, Line 15: Also, policy decisions and technical options chosen to mitigate the climate change could have an impact on the ozone Jayer protection. (Government of China)
209	0	0	0	0	3. In order to give the decision-makers an overall picture, it is proposed to insert an additional component in the SPM that briefs on the two international environment oriented conventions including their implementations. For example, their profiles can be compared as follows: see Annex "Proposal China" (Government of China)
210	0	0	0	0	4. Considering the time difference of the signature and implementation of the above two conventions and their performance so far, it must be maintained that the Montreal Protocol remain unchanged. At the same time, the UNFCCC and its Kyoto Protocol should be revised or modified as appropriate. It is proposed as fellows: (1) A new component be added after Part 2 of the report to brief on the management required by Montreal Protocol over the ODSs re lating to the climate change and on the progress of their phase-out as well as the HFC and PCF emission ofthcir substitutes. Or: (2) In Part 3, e.g. Production, Bank and Emissions, additional information the phase-out of the ODSs that affect the climate system in accordance with the Montreal Protocol and on the HFC and PCF emission of their substitutes be inserted. (3) In Part 4.3, e.g. Polities, Measures and Instruments, the abovementioned principle should be reflected. (Government of China)
211	0	0	0	0	5. All description and projection of the report are based on large number of literature review and statistic summery mostly from developed countries. Therefore, the point views derived from incomplete data will be more suitable to decision makers of industrial countries. There are no regulatory obligation to restrict the emission of ODSs and their substitute production either under the Montreal Protocol or the UNFCCC and the Kyoto Protocol in developing countries. The uncertainty, as it has rnentioned, will be inevitably significant and a comprehensive analysis is impossible due to lack of associated information.

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					(Government of China)
212	0	0	0	0	The UK thanks the IPCC WG I and III teams and their authors for preparing a very useful report. Many of the suggestions are to improve communication to a policy audience as the SPM reads as a summary for scientists i.e. the meaning is unclear to non-technical people, although no doubt very precise for the technical reader. But it is appreciated that it is a highly condensed summary. (Government of UK)
213	0	0	0	0	There are several instances where acronyms are introduced without indicating their meaning. There are also instances where their meaning is given repeatedly (and then not used). (Government of UK)
9	2	5	2	6	If the words "… to prepare a balanced scientific, …" are the exact terms of the request of the UNFCCC, put them in brackets, if not, mention the exact mandate of the UNFCCC. (Government of Switzerland)
10	2	7	2	7	the accronym IPCC is first introduced here and should be explained (as it is not well known among "Montreal" policy makers, and to retain balance with TEAP) (Government of Netherlands)
214	2	13	0	0	Replace "Some ODS" with "These". (Government of UK)
12	2	15	2	0	The present tense seems more appropriate in this part of the introduction: "….ozone layer can influence climate change." (Government of Madagascar)
11	2	15	2	15	Add at the end of the sentence "...to protect the ozone layer could influence climate change" the following: "and vice versa." (Government of Germany)
215	2	15	0	0	change to "...protect the ozone layer could thus influence climate change and vice versa." (Government of UK)
14	2	16	0	0	Figure SPM-1. In general Figure SPM-1 gives a good overview of the main flows and interconnections. Some details in the figure should however be considered by experts to ensure that it actually represents the main message that should be communicated to policy makers: a) Should the ellipse be extended to include the boxes on Climate Change and Ozone Depletion? b) Should there be an arrow directly from the ODSs box to the Climate Change box? c) Are the interactions from Climate Change to Ozone Depletion strong enough to be represented in the figure? d) Should the arrow from Ozone Depletion to Climate Change be named "Cooling"? e) Should "Atmospheric removal" be renamed "Atmospheric Decomposition"? (Government of Norway)
216	2	16	0	0	Figure SPM-1. Quantitative data needs to be incorporated in order to substantiate the correlations of the cooling effect of ozone depletion with the warming effect which influence the climate change. The graph between ODP and GWP will demonstrate such evidence explicitly to indicate the direct and indirect radiative forcing which is likely to induce the climate change. (Government of Sultanate of Oman)
217	2	18	0	0	A definition of a "Bank" is required early on in the SPM.

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of UK)
15	2	23	2	23	Replace "Greenhouse gas emission reduction options … " with "Options for reducing emissions from the gases considered in this report include …" (Government of Switzerland)
16	2	24	2	25	add "and training and certificacion programmes for the relevant personnel and for the companies and their personnel involved in thisactivities". This text is and extract from article 5 of the draft Regulation of the Council and the EP on certain fluorinated gases. (Government of Spain)
17	2	25	2	25	Please add "or no" before global warming potential. (Government of Germany)
218	3	1	3	10	The predictive graph between the time scale from 2010 to 2015 and the CO2-equivalent emissions of HFCs, PFCs, HCFCs and CFCs needs to be incorporated in order to reflect the direct GWP-weighted emissions from halocarbon the sector, as during this period, most of the CFCs and HCFCs are expected to be phased out. (Government of Sultanate of Oman)
18	3	1	0	3	The sentence indicates that that only HFCs and PFCs are considered. If this is the cases this should be stated explicitly. However, it is our impression from the main report that natural agents as for example Ammonia, HCs and CO2 are also considered - if so this should be stated in the introduction. (Government of Norway)
19	3	2	0	0	"in view of the authors" is confusing. The authors of the SPM, of the SROC or the publised litterature ? (Government of France)
219	3	2	0	0	2015 is rather short term. Is there any indication of trends in the longer term? Can we say what the pressure will be in 2015? (Government of UK)
20	3	3	3	3	Include "… contribution to combating global warming." (Government of Switzerland)
22	3	4	3	4	Please add to the end of the sentence "… options on the ozone layer, or the more complex links between polar ozone depletion, stratospheric circulation patterns, and surface climate". Rationale: It is important to flag to readers that the scope of the report is limited, but that there are other links between ozone and climate that may nonetheless be regionally relevant (e.g. for the southern hemisphere mid to high latitudes). Given the uncertainty about these findings (e.g. influence of Antarctic ozone hole on warming observed over the Antarctic Peninsula), I accept that the authors may not make any definitive statements in the SPM, but it is important that the report flags that there are more links between ozone depletion and the climate system than just the indirect globally averaged radiative forcing - even if the report then doesn't discuss these links in very much detail. The assessment of these links in the underlying report and Technical Summary is helpful however, thank you. (Government of New Zealand)
25	3	7	3	7	Footnote 4. In this footnote, the acronyms LCA, TEWI and LCCP are introduced for the fist time and should be explained. (Government of Netherlands)

SPM-Comment	From Page	From Line	To Page	To line	Comments
220	3	7	3	7	Footnote 4. LCA, TEWI and LCCP should be defined in the first instance they appear. (Government of UK)
26	3	7	3	7	Footnote 4: LCA, TEWI and LCCP, terms defined only in page 12. (Government of Brazil)
27	3	7	3	7	Footnote 4: We recommend to add the same text as in brackets on page 12, lines 20, 21, 22 and 33, respectively. (Government of Slovak Republic)
23	3	7	0	0	add after "energy use" in line 7 "associated to LCA". (Government of Spain)
24	3	12	0	0	add after "solvents" "and agriculture" (this is because of the emissions of methyl bromide, which is use for pest control). (Government of Spain)
221	4	1	0	0	Suggest changing heading to "Halocarbons, Ozone Depletion and Climate Change" (Government of UK)
45	4	3	0	0	A definition of "radiative force" "positive radiative force" and "negative radiative force" is needed at the beginning of chapter 2.1. In particular, IPCC (1990, 1992, 1994) and the Second Assessment Report (IPCC, 1996) (hereafter SAR) used the following definition for the radiative forcing of the climate system: "The radiative forcing of the surface-troposphere system due to the perturbation in or the introduction of an agent (say, a change in greenhouse gas concentrations) is the change in net (down minus up) irradiance (solar plus long-wave; in Wm-2) at the tropopause AFTER allowing for stratospheric temperatures to readjust to radiative equilibrium, but with surface and tropo-spheric temperatures and state held fixed at the unperturbed values". In the context of climate change, the term forcing is restricted to changes in the radiation balance of the surface-troposphere system imposed by external factors, with no changes in stratospheric dynamics, without any surface and tropospheric feedbacks in operation (i.e., no secondary effects induced because of changes in tropospheric motions or its thermodynamic state), and with no dynamically-induced changes in the amount and distribution of atmospheric water (vapour, liquid, and solid forms). Note that one potential forcing type, the second indirect effect of aerosols (Chapter 5 and Section 6.8), comprises microphysically-induced changes in the water substance (Government of Spain)
222	4	4	4	9	Cumulative sources of TFA (Trifluoroacetic Acid) from HFCs and other halocarbons are to be identified. Any impact of TFA emissions on the air quality is to be quantified and to be stated in this report. (Government of Sultanate of Oman)
223	4	5	0	0	An introduction/definition of ozone depleting substances would be useful. (Government of UK)
29	4	6	4	6	Change "have made substantial contributions" to "contributed". The modifier "substantial" is imprecise, and does not add to the specific number provided for the forcing. (Government of USA)
28	4	6	4	12	What about the other gases, CH3Br, CH3CCl3 and CCl4? (Government of Brazil)

SPM-Comment	From Page	From Line	To Page	To line	Comments
30	4	6	0	0	Change first sentence into" "Halocarbons, and particular ODSs because of their use for many years, have made..." (Government of Germany)
32	4	6	0	10	This part of the SPM can be hard to interpret, since the distinction between accumulated- and current effects is somewhat diffuse. To clarify this we propose that the text is changed as follows: "SINCE THEIR INTRODUCTION IN [year] Halocarbons, and in particular ODSs, have made substantial contributions to the direct radiative forcing and resulting global warming. The total positive direct radiative forcing due to INDUSTRIALLY PRODUCED halocarbons were estimated to be 0.34+/- 0.03 Wm-2 IN THE YEAR 2000, representing about 14% OF THE TOTAL INCREASE IN RADIATIVE FORCING SINCE PRE-INDUSTRIAL TIMES (1750). (Government of Norway)
31	4	6	0	0	We suggest including the following text from the Technical Summary (TS-5, lines 6-11) at the beginning of this paragraph: "Many halocarbons, including CFCs, PFCs, HFCs and HCFCs, are effective greenhouse gases (GHGs) because they absorb Earth's outgoing infrared radiation in a spectral range where energy is not removed by carbon dioxide or water vapour (sometimes referred to as the atmosheric window). Halocarbons can be many thousand times more efficient at absorbing radiant energy emitted from the Earth than a molecule of carbon dioxide, and small amounts of these gases can contribute significantly to radiative forcing of the climate system." (Government of Norway)
34	4	7	4	9	Put full stop after "climate" (i.e., delete "and resulting global warming"). The relationship between climate forcing and global warming is a complex issue that is not dealt with in the underlying text, and the focus should remain on positive forcing of the climate. Move parenthetical "see Figure SPM-2" to line 9 after W/m2 and before the comma because these are the relevant numbers illustrated in the figure. (Government of USA)
33	4	7	4	7	the concept of radiative forcing is first introduced here and should be explained (as it is not well known among “Montreal” policy makers). (Government of Netherlands)
35	4	8	4	8	Change "1750" to "1950" to be consistent with previously submitted data/figure (Government of USA)
36	4	9	5	9	4: line 9 the number 0.34 is used whereas on 5 line 9 is 0.33. I think they should be the same. (Government of Canada)
224	4	9	0	0	This should probably be 0.33 (rather than 0.34) to be consistent with elsewhere in the report (e.g. TS, SPM p5) (Government of UK)
37	4	11	0	0	HCFCs are not substitute gases. (Government of Brazil)
225	4	11	0	0	it is unclear if 0 to -3% is a range or uncertainty (Government of UK)
226	4	11	0	0	yr-1 is too scientific for SPM suggest use "per year" - this occurs many times throughout SPM (Government of UK)

SPM-Comment	From Page	From Line	To Page	To line	Comments
39	4	13	0	0	Add a sentence at the end of the paragraph: "The distribution of radiative forcing between types of gases will undergo significant changes as the transition away from ODSs e.g. by HFCs is approaching completion and banks of new gases build up. (Government of Germany)
42	4	14	4	14	Change "1750" to "1950" to be consistent with previously submitted data/figure (Government of USA)
41	4	14	4	15	Change sentence into "Radiative forcing (RF) due to historic halocarbon emission patterns from 1750 to 2000. " (Government of Germany)
40	4	14	0	0	Figure SPM-2. An added explanation "Indirect RF CAUSED BY OZONE DEPLETION" might enhance readability. (Government of Norway)
38	4	14	0	0	Figure SPM-2. The calculations shown in Figure SPM-2 are radiative effects, with little discussion on the feedback effects. However, feedbacks are probably too complex to discuss in this summary. (Government of USA)
227	4	14	0	0	Figure SPM-2. The key should read "Indirect RF due to ozone depletion". Replace chemical symbols with clear english for labels (i.e. methyl bromide, methyl chloroform, carbon tetrachloride) (Government of UK)
43	4	14	0	15	To avoid any misunderstanding with respect to accumulated effects, we propose that the text is changed to "Radiative forcing due to CURRENT ATMOSPHERIC CONCENTRATIONS (2000). (Government of Norway)
44	4	15	4	15	Some readers may not know what indirect radiative forcing means. It would therefore be helpful to add a more complete explanation to the figure caption to help the figure stand alone, using for example the following wording: "Direct RF describes the positive radiative forcing (warming of the climate system) caused by the direct absorption of infrared radiation by ODS. Indirect RF describes the negative radiative forcing (cooling of the climate system) caused by a depletion of ozone, which in turn is caused by a complex set of chemical reactions of ODS and their more reactive products in the stratosphere. The direct RF can generally be determined with greater accuracy and precision than the indirect RF." Alternatively, the authors may want to add a text box with the above text (or some slightly more detailed explanation) that would be placed next to the figure. (Government of New Zealand)
228	5	3	0	0	Add methyl chloroform and carbon tetrachloride to list (Government of UK)
46	5	3	0	0	Change to methyl chloroform (CH3CCl3), carbon tetrachloride (CCl4), and methyl bromide (CH3Br). NOT ALL POLICY MAKERS HAVE A CHEMISTRY BACKGROUND. (Government of USA)
47	5	4	0	0	"There is an important interaction between global climate change and stratospheric ozone depletion: the temperature increase in the lower atmosphere (troposphere) ist opposed by a significant cooling of the stratosphere. This cooling favors the formation of ice particles and stratospheric clouds, which tend to contribute to ozone destruction. This global warming leeds to a delay in the process of

SPM-Comment	From Page	From Line	To Page	To line	Comments
					ozone layer recovering." This interaction isn't described in the SPM. The proposed text could be inserted at page 5 after line 4 . (Government of Germany)
229	5	6	5	7	Unclear what the subject is of "is an indirect effect of the ODs". Solution: rephrase the sentence. (Government of Belgium)
48	5	6	0	0	To make the messages in the paragraph more understandable we suggest including the following text from the Technical Summary (TS-5, lines 28-32) at the beginning of this paragraph: "Apart from their direct effect, some gases have an indirect climate effect either from forcing caused by their degradation products or through their influences on atmospheric chemistry. Halocarbons containing chlorine and bromine are ozone-depleting substances (ODSs) and, because ozone is a strong absorber of UV radiation, they have an indirect cooling effect which is significant compared to their warming effect." (Government of Norway)
230	5	7	5	7	Replace "Changes in ozone are believed to currently contribute …" by 'The decrease in stratospheric ozone density in 2005 is believed to contribute …' (Government of Belgium)
49	5	8	5	8	It would be helpful to explain to point readers to the fact, and explain why, the uncertainty in indirect forcing is so considerably larger than the direct forcing. Suggestion: "The large uncertainty of this estimate is due to uncertainties in the vertical distribution of the chemical reactions leading to ozone depletion, and the uneven latitudinal and seasonal distribution of ozone depletion and the resulting cooling effect when averaged over the entire globe." (Government of New Zealand)
50	5	9	5	9	Does the use of the words "very likely" correspond to the agreed definition of the probability as it was the case in the TAR ? If not, indicate the probability that they intend to convey (Government of Switzerland)
52	5	9	0	0	0.33//0.34 quoted page 4, line 4. use the same figure at both places (Government of France)
51	5	9	0	0	check number with number at page 4 line 9 they are slightly different. (Government of Germany)
53	5	10	0	0	The important summary from chapter 1.5 is totally missing. it is essential with regard to the relation between CC and ozone depletion. It should be included at page 5 after line 10:" In terms of the global mean radiative forcing , since 1980 ozone depletion has more-or-less effectively masked the effect of increases in the directive forcing from ODSs and their substitutes.....However , in the next few decades, as ozone recovers, we are likely to realise relatively large increases in the net radiative forcings of halocarbons(ca. 10%). .. This future positive forcing from ozone recovery is not included in current SRES scenarios. Therefore , employing these scenarios may slghtly underestimate the temperature increases over the next few decades. (Government of Germany)
56	5	12	5	14	Not clear, need more details explaining the statement in bold character (Government of Madagascar)

SPM-Comment	From Page	From Line	To Page	To line	Comments
55	5	12	5	12	Replace "of the climate by" with "associated with" to create parallelism in the two climate forcings. (Government of USA)
54	5	12	5	14	The statement about the differences between direct and indirect radiative forcing is useful, but I find it somewhat weak and slightly misleading, because it could be read to imply that the direct and indirect climate forcing mechanisms are different ONLY in geographical and seasonal extent. However we know that even the underlying physico-chemical processes for direct and indirect forcing are very different, with important consequences for uncertainty and evolution over time of the forcing terms. I would therefore suggest adding another sentence at the end of the paragraph as follows: "Furthermore, the cooling effect of ozone depletion is caused by a complex set of chemical reactions which strongly depend on stratospheric conditions and the local concentrations of various ODS and their by-products. As a consequence, the indirect radiative forcing that can be attributed to the emission of a given amount of an ODS will decrease over time as the ozone layer recovers, in contrast to the direct radiative forcing exerted by each molecule." This is quite an important difference that should not be understated. (Government of New Zealand)
231	5	14	0	0	Expansion of the spatial and seasonal distributions would be useful (Government of UK)
57	5	16	5	17	Change first sentence into "To date each type of gas has had different greenhouse warming and ozone depleting effects (see Figure SPM-2) depending on historic emission patterns, effectiveness as a greenhouse gas, and the amount of chlorine and/or bromine in each molecule" (Government of Germany)
232	5	16	0	0	"...gas has had different…" delete "had" (Government of UK)
58	5	16	0	0	Since atmospheric lifetime is not mentioned here, we propose that the text is clarified by adding "AT A GIVEN TIME each type of gas….. " (Government of Norway)
59	5	20	5	21	…but cause no significant cooling . should be deleted in accordance with fig.2 (Government of Madagascar)
60	5	20	0	21	We propose the following addition: "HFCs and PFCs contribute to warming but cause no significant INDIRECT coolling DUE TO OZONE DEPLETION" (Government of Norway)
233	5	21	0	0	add "as they do not deplete ozone directly" to end of sentence (Government of UK)
61	5	21	0	0	delete "significant" and add after "cooling" "by ozone depletion" (Government of Germany)
62	5	26	5	34	A useful description of the effect of the Montreal Protocol until today is given. However, we miss a description of the possible future development. We suggest to include figure 1.18 or 1.19 and give a brief description.

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Germany)
234	5	26	5	35	It is quite contradictory with reference to the correlation impact on climate change due to chlorine and bromine loading to atmosphere and Greenhouse Gases. Ozone depletion phenomenon is related to the stratosphere and Greenhouse Gas generation is limited to the lower atmosphere i.e., troposhere. Stratosphere and Troposphere have different physical and chemical characteristics with reference to the meteorology, chemistry and thermal equilibrium etc. Clarifications are to be incorporated in this report to substantiate and justify this inconsistency. (Government of Sultanate of Oman)
63	5	26	5	28	We think the message in this paragraph is somewhat unbalanced, e.g. since the important observation that the concentrations of some of the most common CFCs are increasing is lacking. In addition, we see from Section 3 of the SPM that substantial amounts of the emissions of ODSs come from their banks and not current production, indicating that ozone depletion will continue in the coming decades. Some reflections on these issue and a link to Section 3 should be added to enhance concistency. Regarding observed concentrations of CFCs in the atmosphere, some important conclusions are contained in the Technical Summary (TS-6, lines 33-42) and in the summary of Chapter 1, and we suggest including them here as well. The proposal is hence to include the following text in line 28 after "...loading.": "Stratospheric chlorine levels are at or near their peak and are expected to slowly decrease in the future. Observations of annual changes in atmospheric concentrations provide the most reliable estimates of total global emissions for long-lived gases. For example, by 2003 the mixing ratios for CFC-12 were close to their peak, CFC-11 had clearly decreased while the mixing ratios of HCFCs and halons were still increasing." (Government of Norway)
64	5	26	0	33	GWPs are introduced here but described in the text later. We propose considering converting the text on page 6 to a footnote, and referring to this footnote the first time the phrase GWP is used. (Government of Norway)
65	5	27	0	28	To facilitate reading, we propose the following change: "These actions have begun to reduce atmospheric LOADING OF OZONE DEPLETING CHLORINES" (Government of Norway)
66	5	28	5	33	We suggest separating these lines from the preceding ones in a new paragraph, since it otherwise may be a bit confusing when concentrations are mixed with emissions. (Government of Norway)
67	5	29	0	30	We propose the following change: "…, their TOTAL CO2-equivalent DIRECT emission has also been reduced." (Government of Norway)
235	5	30	0	0	replace "has" with "have" (Government of UK)
71	5	32	0	0	Add respective elements of uncertainty to the 7 GtCO2 value - as presented for the 2000 figure. (Government of Germany)
70	5	32	0	12	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM

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					(Government of France)
69	5	32	0	0	Unclear relation: Cut the sentence into two separate parts: "...near 2000. The latter value nevertheless corresponds to about 10% of that year's CO2 emissions due to fossil fuel burning" (Government of Germany)
72	5	32	0	33	We think that the wording is somewhat unprecise, since emissions are referred to as "near 2000", while later reference is made to "that year's CO2 emission…." (Government of Norway)
73	5	33	5	33	Rewrite the last part of the sentence : "… CO2 emission due to global fossil fuel burning" (Government of Switzerland)
74	5	33	0	0	Add : " the amount and speed of further reduction is significantly influenced(determined) by the concrete options chosen for substitition." rational: The phasing out of ODS in conclusion is a great success with respect to future recovery of stratospheric ozone. With respect to global climate change it is important too, but largely dependent on how far emissions of GHG can be minimised in the course of ODS substitutuon. In this context it is relevant, to which extent use and emissions of HFCs can be avoided. This should be considered in the context of deriving decisions for furhter ODS substitution. (Government of Germany)
75	5	34	0	0	We think some wording on the recovery of the ozone layer in general should be added, and propose the following sentences from the summary of Chapter 1: "The ozone layer will not necessarily return to its pre-depleted state, even when the stratospheric chlorine and bromine abundances return to previous levels. "Recovery" of the ozone layer is a complex issue: it depends not just on the extent to which the ODSs are replaced by non-depleting substances, but also on emissions of gases (including the ODS substitutes) that impact the climate system directly". (Government of Norway)
77	5	35	5	41	In our view, this paragraph is unbalanced and not consistent with the underlying chapters and should therefore be amended. We haven't found information in the report which supports the strong conclusion that "an Arctic "ozone hole" similar to that currently observed over the Antarctica is not likely to occur". The occurence of thin ozone layers in springtime is highly dependent on meteorological conditions as well, and we think some more information should be included on these connections before we are presented to the definite conclusion that "ozone holes" over the Arctic are not likely to occur. We would also like to see information in this paragraph on whether "ozone holes" over the Antarctica are expected in the future. In addition, we would like to see information on why the "ozone holes" occur over the Antarctica in the SPM as well as in the TS, and the relation to climate change (that climate change in general result in higher temperatures in the troposphere and lower temperatures in the stratosphere, the formation of Polar Stratospheric Clouds at low temp. and the generation of active chlorine which deplete ozone with radiation from the sun). Also information on the polar vortex is relevant in this context. Text from chapter 1 should be included, e.g. the follwing lines: "A complete removal of anthropogenic halogens from the atmosphere will take more than a century. During this period of enhanced levels of halogens due to past anthropogenic emissions, the polar stratosphere will remain vulnerable to climate perturbations such as increasing water vapour or a cooling of the stratosphere leading to enhanced ozone destruction"

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Norway)
76	5	35	5	41	Replace by: Assuming full compliance with measures under the Montreal Protocol, declining ODS concentrations are expected to lead to a slow recovery of the ozone layer in the 21st century (see Figure SPM-3, and figure 1.15 from Chapter 1). The recovery period is uncertain, due to model deficiencies and to poorly quantified interactions with atmospheric dynamics and with GHGs other than ODSs. Early detection of recovery of the ozone layer is difficult because of a high year-to-year variability, which is not described by the models. [1.4] Rationale: The original text is not explicit enough about uncertainties. Figure 1.15 from Chapter 1 of the full report deals with the recovery of the Antarctic Ozone Hole and provides important information. The statement about the Arctic Ozone Hole is too strong, and may be better omitted. (Government of Netherlands)
78	5	35	0	41	Since focus first is on slow RECOVERY of the ozone layer, we are somewhat surprised of the later mentioning of hypothetical new problems like the Arctic "ozone hole". We propose considering a shift of focus towards recovery in the Antarctic and the worldwide ozone situation (ref. Figure SPM-3) (Government of Norway)
79	5	38	5	38	Same remark as previously (no …) on the use of the word "likely" (Government of Switzerland)
236	5	39	5	41	"…, projected increases in other well-mixed greenhouse gases could influence ozone layer recovery but …". This part of the sentence is too general and abstract to provide some information / message to PM (Government of Belgium)
237	6	0	0	0	Figure SPM-3. The ordinate "Ozone change from 1980 (%)" is not clear to PM (nor to other non-insiders in the OC discussion). Suggestion 1 (Figure SPM-3 title): Observed and modelled low- and mid-latitude (60 S-60 N) column ozone amounts as % deviations from the 1980 values. Suggestion 2 (ordinate title): 'Column Ozone Amounts relative to 1980 values. (Government of Belgium)
238	6	0	0	0	Figure SPM-3. Why in Figure SPM-3 does the range of model prediction decrease ~1993 to 1998? Why do the models (on average) predict a positive ozone change in 2050? (Government of UK)
239	6	8	6	9	Small adaptation suggested: "GWPs are indices for representing …, averaged globally and over an appropriately chosen time horizon." [Remove "simplified". Add "an appropriately".] (Government of Belgium)
80	6	8	0	0	A definition for GWP is needed. The definition contained in the IPCC-TAR Glossary of Terms is the following: "global warming potential" an index, describing the radiative characteristics of well-mixed reenhouse gases, that represents the combined effect of the differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.This index approximates the time-integrated warming effect of a unit mass of a given greenhouse gas in today's atmosphere,relative to that of carbon dioxide.

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					(Government of Spain)
240	6	8	0	0	delete "simplified" (Government of UK)
81	6	8	0	9	Since GWP as an index is quantity-independent, we think that this sentence is misleading. We propose the following change: "GWPs are simplified indices representing relative warming or cooling effects associated with A CERTAIN TYPE OF GAS, averaged globally and over a chosen time horizon." (Government of Norway)
83	6	10	0	0	This statement is misleading. Change into "a year to two decades for many HFCs and HCFCs, decades to centuries for some HFCs and most halons and CFCs, and millenia to over 50,000 for PFCs. (Government of Germany)
85	6	13	6	13	Correction: change "qith" to "with" (Government of USA)
84	6	13	6	13	Spelling mistake: "qith" should be "with". (Government of New Zealand)
241	6	13	6	14	The reference "(see Figure SPM-3)" does not explain that "Indirect GWPs are subject to much greater uncertainties than direct GWPs". The figure shows only a range of predictions. Either cancel the reference in brackets or explain. (Government of Belgium)
88	6	13	0	0	"with" and not "qith" (Government of Brazil)
87	6	13	0	0	"with" instead of "qith" (Government of Germany)
86	6	13	0	0	qith to be replaced by with (Government of France)
242	6	13	0	0	replace "qith" with "with" (Government of UK)
243	6	14	0	0	reference should be to Figure SPM-2 not 3 (Government of UK)
89	6	14	0	0	see Figure SPM-3 should read see Figure SPM-2 (Government of France)
90	6	16	0	0	There is in general little information on substitute species that are not greenhouse gases in the SPM, which we think is unfortunate. We had expected to find information on future pathways/scenarios of substitution of ODSs and related radiative forcing, which emphasised the small radiative forcing of non-greenhouse gas substitutes. As a minimum we suggest the inclusion of the follwing sentence from Chapter 2 here. "VOCs and NH3 considered as replacement species for refrigerants or foam blowing agents have lifetimes of several

SPM-Comment	From Page	From Line	To Page	To line	Comments
					months or less making their distributions more spatially and temporally variable. It is therefore difficult to quantify their climate impacts with single globally averaged numbers. Their direct and indirect radiative forcings are likely to be small globally and regionally because of smaller abundances in the atmosphere." (Government of Norway)
244	7	2	7	4	Title: "GWP and lifetime of Montreal and Kyoto Protocols gas molecules assessed in this report relative to CO2 with a 100-year time horizon, and UNFCCC reported GWP" (Government of Belgium)
245	7	4	0	0	Table SPM-1. Add in column 2 and 3 headings the word 'radiative' before "forcing" (Government of Belgium)
95	7	4	0	0	Table SPM-1. Change entry for CF4 in column for lifetime to ">50,000" - the literature value provides only a theoretical lower bound for this virtually inert substance. (Government of Germany)
93	7	4	0	0	Table SPM-1. Even though ODSs are not covered under UNFCCC, they are discussed in detail in this report. The SPM should include ODPs in this table. It would make it a much more valuable table. This table also needs compound names in addition to chemical formulas such as methyl bromide, carbon tet., etc. (Government of USA)
92	7	4	0	0	Table SPM-1. Table is confusing. The reader may be confused as to what is the significance of a negative number for the Global Warming Potential of the negative indirect forcing - even if this may be correct. On the other hand, a policy person would probably not worry about the sign and think "smaller is better" (mentally taking the absolute value). (Government of USA)
91	7	4	0	0	Table SPM-1. The center column is labeled "GWP for negative radiative forcing". The entries are negative so that there is the possibility of confusion on the part of the reader. The GWPs should be negative. As stated in the table, the GWPs for "negative" forcing should be positive (definition minus sign x GWP minus sign = positive sign). This should be more carefully defined. (Government of USA)
94	7	4	0	0	Table SPM-1. Why are no values available for the indirect forcing from CFC-114 and CFC-115? Is it possible to quote older literature values? (Government of Germany)
246	7	6	7	7	When the title suggested above (line 2 to 4) is adopted note (a) may be cancelled (Government of Belgium)
247	7	8	7	8	Why is the column heading "positive direct" different from "direct positive" in this footnote What does "(2-σ)" mean? (Government of Belgium)
96	7	8	0	0	Please check whether footnote is right: Is the confidence interval +-35% eq corresponding 2-sigma. Shouldn't it be +-95%? (Government of Germany)
248	7	10	7	10	Why is the column heading "negative indirect" different from "indirect negative" in this footnote

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Belgium)
249	7	12	7	12	" … as discussed in the text" . Where is this discussion? (Government of Belgium)
97	7	13	7	13	Footnote (d) should state that the figures used by UNFCCC are those provided by the IPCC in its second assessment report (with appropriate reference). Otherwise this looks like the UNFCCC randomly selected some GWPs that have no basis in science, but they were the best then available figures! (Government of New Zealand)
98	7	15	0	0	GWP values for HFC-245fa and HFC-365mfc are not included in the SAR but have been estimated in the TAR. (Government of Spain)
251	7	0	0	0	Table SPM-1 needs to be consistently formated. Numbers with commas (e.g. 50,000) do not align with others (Government of UK)
250	7	0	0	0	Table SPM-1: The gases in the table are sequenced according to the GWP volume, which is not consistent with the traditional way of classifying ODS gases, thus somewhat confusing. It is proposed to come back to the Montreal Protocol classification, namely, CFC, Halon, HCFC, HFC, PFC and so on and so forth. (Government of China)
252	7	0	0	0	The arrangement of Table SPM-1 in descending order of GWP is unhelpful for easy reference. Alpha-numeric presentation (i.e. in "families" of products CFCs, HCFCs, HFCs and PFCs) in line with the other tables within the report is preferred. This would be firstly consistent and secondly, enable policymakers to find a specific chemical (or check that it is in the Table) without having to check each entry. The current arrangement gives a false impression that GWP, on its own, equates directly with environmental impact. This neglects the effect of the quantities emitted, which, elsewhere in the report, is shown to completely change the order of the environmental impact of, say CFCs relative to HFCs. Furthermore, the current ordering makes the list vulnerable to recalculations of global warming potentials than an alphanumerical list: a change in value alters the position of the compound in the list as well as the number that is shown. Indeed, the list has already been rendered obsolete: in the case of CF4, the GWP has been revised from 5820 to 7200 (see Journal of Geophysical Research, vol 110, D02102, doi:10.1029 /2004JD005201, 2005), elevating CF4 by two positions on the list. (Government of UK)
99	8	4	8	4	Insert a sentence inspired form the background document that provides some introductory explanation to the subject of section 2.3 : "Intermediate and final products resulting from the degradation of ODS substitutes are removed from the atmosphere via deposition and washout processes and may accumulate in ocean, lakes and other reservoirs." (Government of Switzerland)
100	8	6	8	8	Referring to section 2.6.1, p. 230, lines 9-10 of the background document, we propose to replace the sentence "Small but not negligible …" with "Nevertheless, HFCs and their replacements may exert an impact on the composition of the troposphere and hence may influence air quality on global, regional, and local scales. Such increases may be of some concern, for instance in areas that currently fail to meet local standards, e. g. urban areas."

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Switzerland)
101	8	11	8	11	Does the word "likely" used in this context has a probabilistic meaning ? If yes, is this consistent with the approach adopted in the TAR ? (Government of Switzerland)
102	9	6	0	0	Put reference to specific substances into perspective - change second sentence into: "For substances with an extented use history, in particular for CFCs and HCFCs, a significant contribution of emissions comes from their respective banks" (Government of Germany)
103	9	7	9	8	The sentence "There are no regulatory obligations …" is somehow in contradiction with the following paragraph (lines 10 to 13) where there is a mention of "banks of (relatively) new applications HFC", because HFC are regulated under the Kyoto Protocol (Government of Switzerland)
104	9	7	0	8	Statement that "there are no regulatory obligations…is misleading. Many parties to the Protocol have promulgated regulations aimed at reducing bank emissions. (Government of USA)
105	9	10	9	13	The term "bank" deserves more explanation in our view, to make the following paragraphs easier to understand to policy-makers. (Government of Norway)
106	9	10	0	0	Change sentence: "The term "bank" is used for the amount of a substance that have been ..." (Government of Germany)
253	9	10	0	0	redraft as "Banks are reservoirs of substances..." (Government of UK)
254	9	12	9	13	" … of HFCs will – in the absence of additional bank management measures – significantly determine post 2015 emissions". (Government of Belgium)
255	9	17	0	0	The paragraphs below cover the important issue of the relationship between emissions, atmospheric concentration of substances and banks. We understand from the main text of the report that there are significant uncertainties in estimating bank size. Are we sure that the conclusions drawn below are sufficiently robust? (Government of UK)
256	9	18	9	21	In view of the discussion in Appendix 11b, the statements concerning CFC-11 in the SPM are unsupported by the chapter. SPM indicates that a substantial fraction of the emissions of CFC-11 come from banks built up through past production. The emission from the banks built up through past production are about 30 kt/yr compared with observations of 70-90 kt/yr. A substantial fraction of CFC-11 emissions are more likely to be coming from current production. (Government of UK)
107	9	18	0	24	The rationale behind limiting this description to only a few gases should be explained. (Government of Norway)
257	9	19	9	19	" … from observations of atmospheric concentrations. The emissions are larger than estimated …" (Government of Belgium)

SPM-Comment	From Page	From Line	To Page	To line	Comments
108	9	20	0	0	It should be considered whether the wording "substantial fraction" should be substituted by "main part". (Government of Norway)
258	9	23	9	23	" … is believed to equal the amount in banks .." (Government of Belgium)
109	9	24	0	0	Add a sentence on HFC-23 and PFCs as a contrary example to avoid the impression that emissions are always a banks issue. (Government of Germany)
110	9	26	9	34	As given for the year 2002 we suggest to include the information on the shares of the different substances for the year 2015 as well. So far for the year 2015 the sum is given only. (Government of Germany)
259	9	28	9	28	"Banks in 2002 of CFCs … are estimated at about 21 GtCO2-eq." (Government of Belgium)
111	9	28	9	34	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
112	9	28	9	31	We would be interested to know the assumptions of the BAU scenario for banks and the relative contributions from the different classes of species (CFCs, HCFCs, HFCs, non-GHG substitutes etc.), since a figure of the GWP-impact has been calculated. E.g. what is the contribution from HFCs and HCFCs compared to other non-GHG substitutes? The uncertainty of the given figure should also be added. (Government of Norway)
260	9	29	9	29	"… banks will increase in volume, but …" (Government of Belgium)
261	9	29	9	29	Footnote 7: Cancel first sentence. Cancel 'as assessed in this report and' (Government of Belgium)
113	9	29	0	0	The storyline of "a business as usual scenario" needs to be defined at least briefly - otherwise the conclusions are prone to be perceived as arbitrary. (Government of Germany)
115	9	30	0	0	Add short remark why is the decline expected. (Government of Slovak Republic)
114	9	30	0	0	State the reason for the decline. That is the decrease in the demand of high GWP ODSs as a result of the phaseout under the MP. (Government of USA)
262	9	32	9	32	"In 2002 CFCs … contribute respectively about …" (Government of Belgium)
116	9	32	9	32	The sentence should be in past tense, i.e. "contributed" rather than "contribute". (Government of New Zealand)
117	9	32	0	0	add "banks" after HFCs.

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Spain)
263	9	33	0	0	An error of the estimate of bank error would be useful (Government of UK)
118	9	33	0	0	We learn from this text that only PFCs used as ODS replacements are considered. Since substantial emissions of PFCs also originate from other sources (eg. Aluminium production) it might be relevant to describe these limitations in the scoop of the report clearly here or in the introduction. (Government of Norway)
119	9	0	0	0	Footnote 7: A reference to Column 2 in the Table SPM-1 might facilitate reading. (Government of Norway)
120	10	1	0	0	Figure SPM-4. IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
122	10	1	0	0	Figure SPM-4. The content is fine, but please make sure that the individual bar charts are of the same size when the y-axis goes to the same numerical values. At the moment the top charts are higher than the bottom charts. (Government of New Zealand)
264	10	6	10	8	Figure SPM-4. Title: "Historic data for 2002 and BAU projections for 2015 of GHG CO2-eq. banks …. (bottom). 'Other' includes …" (Government of Belgium)
121	10	12	10	13	Footnote 9. Given the importance of the "mobile air–conditioning (MAC)" equipment, in particular in cars, MAC should also be defined in the footnote 9 (Government of Switzerland)
265	10	13	0	0	Clarifcation as to whether MAC refers to all modes of transport is needed (Government of UK)
266	11	5	0	0	bracketed numbers should be on line 3 (Government of UK)
124	11	7	11	12	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
123	11	7	11	30	This section can be shortend because some figures are given twice (e.g. sum of CFC and HCFC emissions as well as CFC emissions and HCFC emissions as seperate figures). Currently the amount of numerical values is overwhelming. (Government of Germany)
125	11	7	11	12	We note that a figure related to the emissions of non-GHG ODS substitutes in 2015 is lacking and suggest it be added. We would further like to know the assumptions of the BAU scenario in particular with regard to the contribution from non-GHG substitutes. As mentioned in our comment on the BAU-banks (page 9, lines 28-31), we would like to know the assumptions of the BAU scenatios for 2015, which we believe is very relevant information. (Government of Norway)
126	11	7	0	0	The storyline of "a business as usual scenario" needs to be communicated - otherwise the conclusions are prone to be perceived as

SPM-Comment	From Page	From Line	To Page	To line	Comments
					arbitrary. (Government of Germany)
267	11	10	0	0	insert "three-fold" after "increasing" (Government of UK)
135	11	11	0	0	Footnote 10 is not clear. What GWP has been used for the stimation in line 11 of this page, if not the UNFCCC GWP?. (Government of Spain)
136	11	11	0	0	Footnote 10: "If the UNFCCC GWPs were to be used ...": What kind of GWP have been used, if not UNFCCC, and what is the difference? (Government of Slovak Republic)
268	11	15	11	16	stationary air conditioning (SAC) and mobile air conditioning (MAC) - were defined on previous page and do not need to be redefined (Government of UK)
127	11	21	11	22	"will have been emitted" does not sound correctly. We recommend to replace by "will be emitted". (Government of Slovak Republic)
128	11	23	11	25	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
129	11	25	11	26	This statement appears to contradict Ch.11 p.8 lines 4-16. Recommend that Ch. 11 p. 8 lines 4-16 be revised. The trend in HCFC-22 is an important one given the overall purpose of the report, and it's important to be consistent. To a reader not familiar with the details of the calculation assumptions and methodologies, this statement could appears to contradict Ch.11 p.8 lines 4-16. Recommend that Ch. 11 p. 8 lines 4-16 be revised or explained further. The trend in HCFC-22 is an important one given the overall purpose of the report. The assumption in Ch. 11 is that in developed countries, the consumption of HCFC-22 will follow exactly the HCFC consumption limitations imposed by the Montreal Protocol, i.e., from 1996-2003 consumption is allowed at 100% of the cap and beginning 1/1/2015, consumption is allowed at 10% of the cap, so HCFC-22 consumption is assumed to be 10% of its 2000-2003 This assumption is not valid for many developed countries. For example, in the US a significant portion of consumption from 2000-2003 consisted of HCFC-141b. The limits of the Montreal Protocol caps are for total ODP-weighted consumption of all HCFCs, not each individual HCFCs such as HCFC-22 as this section states. The assumption therefore seems simplistic for a report of this nature. The section should be revised to recognize the trend (at least in the US -- which according to Chapter 10 produces one-third of that produced in all developed countries.) Generally, HCFC-22 use in the US is growing, and is unlikely to shrink to just 10% of 2002 values by 2015. The future use in the U.S. will depend on a number of factors, including economic growth, phase-in of HFC products, increases in refrigerant charge per cooling demand based on Jan 2006 US Department of Energy energy efficiency requirements, etc. Also, note that much of the consumption in 2002 would be for equipment that will still exists (and leak and require servicing/refilling) in 2015. For an estimate of all developed countries, look at AFEAS reported total production of HCFC-22, 124, 141b and 142b. AFEAS shows about 75-78% of the ODP-weighted production in 1998-2002 being HCFC-22; the U.S. would most likely be lower than that average due to its use of HCFC-141b. (Government of USA)

SPM-Comment	From Page	From Line	To Page	To line	Comments
269	11	32	0	0	bracketed numbers should be on line 30 (Government of UK)
270	11	34	11	39	No allusion is given to the factors of three discrepancies between the inventory calculations and atmospheric observations for CFC-11, HCFC-141b and HCFC-142b. The spirit of the material in Appendix 11b is not reflected here. Would like to see some statement that we have little confidence in the current inventories and their projections into the future for these compounds. (Government of UK)
130	11	34	11	134	The use of the word “projections” makes the sentence unclear : are we considering future emissions (“projections”) or current ones ? The rest of the paragraph suggests that we are considering current emissions, therefore we would propose to use the word “reconstruction” instead of “projections” (Government of Switzerland)
131	11	34	0	39	In this context a reference to the methods used to compile the emissions referred to in this reports might be relevant. (Government of Norway)
132	11	41	0	0	Footnote 4: It shoul be repeated here this footnote 4 or a new footnote 11 referring to footnote 4. (Government of Brazil)
133	11	42	11	44	This sentence is misleading. Change into "For individual applications, the relevance of indirect GHG emissions over a life cycle can range from low (e.g. aerosols and fire-fighting), to roughly equal (e.g. mobile air conditioning and commercial refrigeration) to high (e.g. domestic refrigeration or rigid foams with well managed end-of-life treatment). (Government of Germany)
137	12	3	12	5	Change question into: "What Major Opportunities Have Been Identified for Reductions of Greenhouse Gas Emissions and How Can They be Assessed?" (Government of Germany)
138	12	5	0	12	We think that this is one of the key presentations in the SPM. Since the regulatory approaches differ fundamentally for the different groups of gases (CFCs, HCFCs and HFCs), the usefulness of this information could be significantly improved if the presentation was extended to include information on type of gas. (Government of Norway)
139	12	7	12	13	In order to emphasize the fact that the mitigation options identified in this report apply to all sectors, we propose to move the sentence of line 13 in the chapeau of line 7 :”Reductions in direct GHG emissions are available for all sectors discussed in this report and can be achieved through :” (Government of Switzerland)
271	12	9	12	9	‘loading’ instead of “charge” (Government of Belgium)
272	12	11	0	0	insert "and" at end of line (Government of UK)
140	12	13	12	13	You state that the given mitigation options are available for all sectors discussed in the report. We wonder about this is true for

SPM-Comment	From Page	From Line	To Page	To line	Comments
					aerosols and HFC23 as a by-product. (Government of Germany)
141	12	13	0	0	Add a new bullet: training and certificacion programmes for the relevant personnel and for the companies and their personnel involved in thisactivities". This text is and extract from article 5 of the draft Regulation of the Council and the EP on certain fluorinated gases. (Government of Spain)
142	12	14	0	0	We recommend to include a new paragraph giving some information on the most relevant life-stages (use phase, production, end-of-life) regarding direct emissions. (Government of Germany)
273	12	17	12	17	'almost' instead of "currently virtually" (Government of Belgium)
274	12	19	12	19	'are' instead of "include" (Government of Belgium)
144	12	20	12	33	Footnote 4 (page 3): We recommend to add the same text as in brackets on page 12, lines 20, 21, 22 and 33, respectively. (Government of Slovak Republic)
275	12	20	0	0	insert hyphen in use-phase to be consistent with line 36 (Government of UK)
276	12	27	12	28	'require' instead of "are only meaningful if / is used" (Government of Belgium)
145	12	27	0	0	Change into "Comparative economic analyses are extremely important to identify cost-effective reduction option. However, they are only meaningful if a ..." (Government of Germany)
146	12	32	12	33	The coverage of LCA is placed at a strange location. Move it up and add it at the end of the section page 12 lines 15-25. Change the text into: "Life Cycle Assessment (LCA) is used to also asses additional environmental impacts." (Government of Germany)
147	12	36	12	42	The sentence "Most indirect energy-related emissions..." should read as follows: " For many cases energy efficiency improvements can result in significant GHG emissions reductions, particularly where the use phase of the application is long (e.g. refrigeration, stationary air conditioning)". (Government of Germany)
277	12	40	12	40	'dependent on' instead of "dependent of" (Government of Belgium)
148	12	44	12	46	The message conveyed by the two sentences may be improved e. g. : "Through global application of best practices and recovery methods, about half (1.2 GtCO2-eq yr-1) of the BAU direct emissions from ODS and their substitutes that affect the global climate can be reduced by 2015. About 60% of this reduction potential concerns HFCs emissions, 30% HCFCs and 10% CFCs" (Government of Switzerland)

SPM-Comment	From Page	From Line	To Page	To line	Comments
149	12	44	0	0	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
278	12	45	12	45	'emissions can be eliminated by ' instead of "emissions can be reduced by" (Government of Belgium)
279	12	45	12	46	Replace by: 'This potential stems from about 60% HFC, 30% HCFCs and 10% CFCs emission reductions.' (Government of Belgium)
280	12	46	0	0	Recommend adding this as a % of the total GHG emissions by 2015 to provide some sense of scale (Government of UK)
150	13	9	0	0	IPCC reports express emissions in GtC and not GtCO2. To avoid confusion, use GtC in this SPM (Government of France)
151	13	11	13	11	it must be noted though that alternative substances may have other environmental drawbacks such as volatile organic compounds that are smog precursors. (Government of Netherlands)
152	13	13	13	13	The information contained in this section on the reduction potential in each sector and the cost per ton could be summarized in a table, improving he readability (Government of Switzerland)
154	13	13	15	26	The information given here should be consistent with the information given in the whole report. Emission reduction scenarios and cost estimates have to be explained and discussed in detail (in the relevant chapters) before there results are to be cited in the SPM. The assumptions for the mitigation scenarios have to be consistent with the information in the relevant chapters. Example: Chapter 4 gives detailed information about emission reduction measures (1. containment, 2. recovery and recycling and end of life treatment, 3. reduction of charge, 4. non-fluorocarbon refigerants, 5. energy efficiency ...) in the refrigeration sector (commercial, domestic, industrial...). Chapter 11 assumes that emissions can be reduced by 1. improved containment, 2. recovery and recycling and end of life treatment of HFCs (11-21: 1-2). Chapter 11 (11-22) also gives information on emission reduction measures in the refrigeration sector: commercial: 1. ?, 2. containment, 3. improved energy efficiency, 4. lower LCCP due to reduction of charge, non-fluorocarbon refigerants ..., table 11.9: commercial: 1. containment, 2. reduction of charge. We cannot see what finally have been the assumptions for the mitigation scenario in the refrigeration sector that led to the reduction potential given in the SPM. (Government of Germany)
153	13	13	15	16	This whole section which covers a major part of the original scope of the report remains very brief, in fact too brief and general to be of much use for decision makers. The wide and non-differentialted abatement cost ranges are not particularly. Overly conservative cost estimates send the message "nothing reasonable can be done" - which contradicts recent developments across the world and many sophisticated cost analyses. It is proposed to either delete the cost information or make it much more differentiated

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Germany)
281	13	16	13	18	Substitute "below 0.2 US$/tCO2-eq" by giving a range for the abatement cost. There is no relevant information in Section 10.3 to support this estimation. Based on the EU case mentioned in Section 10.4 (page 10-23, line 44-50), the annual abatement cost is higher than 0.2 US$/tCO2-eq, considering meanwhile that this may not be applicable in all cases. (Government of China)
155	13	16	13	17	The given reduction potential seems to be very high due to the assumption of 4% HFC-23 emissions from new HCFC22 plants (compared to 2% from existing plants) in the BAU scenario. (Government of Germany)
156	13	17	0	0	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
157	13	18	13	18	Insert from Ch.11 p8 lines 34-38: " Reduction of HCFC-22 production due to market forces or national poicies, or improvements in facility design and construction to reduce HFC-23 could further …"reduce HFC-23 emissions. (Government of USA)
158	13	20	0	27	Since refrigeration is a key sector with regard to reduction potential, we think that this information should be more specific. We propose that some of the most promising specific solutions in terms of costs, reduction potential and technical applicability are highlighted in the text. (Government of Norway)
159	13	22	13	23	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
162	13	23	0	0	Footnote 12: Since the cost savings (win-win situations) referred to in this footnote are very policy relevant information, this should be elaborated in the main text body. (Government of Norway)
160	13	23	0	0	This whole section which covers a major part of the original scope of the report remains very brief, in fact too brief and general to be of much use for decision makers. The wide and non-differentialted abatement cost ranges are not particularly. Overly conservative cost estimates send the message "nothing reasonable can be done" - which contradicts recent developments across the world and many sophisticated cost analyses. It is proposed to either delete the cost information or make it much more differentiated (Government of Germany)
161	13	29	0	33	Referring to TS-22, line 29-35, the vapor compression technology looks very promising. We think that this should be mentioned in the SPM. (Government of Norway)
282	13	31	0	0	difference in what needs clarifying (Government of UK)
163	14	1	14	4	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)

SPM-Comment	From Page	From Line	To Page	To line	Comments
164	14	2	14	3	This whole section which covers a major part of the original scope of the report remains very brief, in fact too brief and general to be of much use for decision makers. The wide and non-differentialted abatement cost ranges are not particularly. Overly conservative cost estimates send the message "nothing reasonable can be done" - which contradicts recent developments across the world and many sophisticated cost analyses. It is proposed to either delete the cost information or make it much more differentiated (Government of Germany)
165	14	3	0	0	Footnote 12: reference to an previous footnote (page13). (Government of Brazil)
166	14	4	0	0	Delete "...leading in some cases to overall savings of 75 US$/tCO2-eq." This value is arbitrary. (Government of Germany)
283	14	4	0	0	insert "cost" before "savings" (Government of UK)
284	14	7	14	7	Replace 'charge' by 'loading' (Government of Belgium)
169	14	10	14	11	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
168	14	10	14	11	This whole section which covers a major part of the original scope of the report remains very brief, in fact too brief and general to be of much use for decision makers. The wide and non-differentialted abatement cost ranges are not particularly. Overly conservative cost estimates send the message "nothing reasonable can be done" - which contradicts recent developments across the world and many sophisticated cost analyses. It is proposed to either delete the cost information or make it much more differentiated (Government of Germany)
170	14	10	0	17	We think that measures related to servicing (TS-31, line 34-37) and indirect measures related to the operating time of MAC system (TS-32, line 22-24) should also be mentioned in this paragraph. (Government of Norway)
171	14	11	0	0	Footnote 12: reference to an previous footnote (page13). (Government of Brazil)
172	14	14	14	15	New systems with either CO2 or HFC-152a are likely to enter the market in the coming decade… (remove "penetrate") (Government of USA)
173	14	16	14	17	Delete sentence: " Hydrocarbons are in use as service refrigerants in several countries against manufacturerer recommendations" (not supported by text of chapter 6, not relevant to summary in SPM of reduction potential in MVACs sector) (Government of USA)
285	14	16	14	17	What is the meaning of the sentence? (Government of Belgium)
174	14	16	0	17	We propose that the wording in TSP-32, line 9-11 is used: "HCs even if they are low GWP refrigerants and efficient when properly used, are not seen as suitable options by car makers and suppliers due to safety conserns.

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Norway)
176	14	19	14	20	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
175	14	19	14	30	This section needs to make explict mentioning of one component foams which are a key emission source and differ from closed cell foams very significantly in respect to many policy relevant aspects. (Government of Germany)
178	14	20	0	0	Footnote 12: reference to an previous footnote (page13). (Government of Brazil)
177	14	20	0	0	This whole section which covers a major part of the original scope of the report remains very brief, in fact too brief and general to be of much use for decision makers. The wide and non-differentialted abatement cost ranges are not particularly. Overly conservative cost estimates send the message "nothing reasonable can be done" - which contradicts recent developments across the world and many sophisticated cost analyses. It is proposed to either delete the cost information or make it much more differentiated (Government of Germany)
179	14	25	14	26	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
180	14	31	14	32	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
181	14	32	14	34	Please replace by: "But it has to be taken into account, that there has been little progress if any in blowing agent recovery techniques from insulation products used in buildings so far. Preliminary indications from previous work show that recovery from traditional buildings may be uneconomical. However, this potential could increase significantly in the period between 2030 and 2050, when large quantities of building insulation foams will be decommissioned. [7]" The information given here should be consistent with the information given in the whole report. Primarily chapter 7 containes more detailed information on this subject. (Government of Germany)
183	14	36	14	37	Delete "the low emission level" - while there is little doubt about the other two reasons presented, the claim of low emissions from the sector is subjective and questionable. (Government of Germany)
184	14	37	14	38	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
286	14	40	14	42	Delete first half of sentence "The heath…decision, and". Capitalise "There" (Government of UK)
185	14	40	14	40	We suggest to add after "... reduction of GHG emissions for metered dose inhalers (MDIs) would be the completion of the transition from CFC to HFC MDIs beyond what was already assumed as BAU": "and the broader use of dry powder inhalers." The next sentence already explains the restrictions.

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Germany)
186	14	43	13	43	please delete the word "only" - this is an unnecessary value judgement (the numbers speak for themselves). (Government of New Zealand)
187	14	44	14	45	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
287	14	0	0	0	A table would show the information more clearly (Government of UK)
188	15	4	0	0	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
189	15	4	0	0	We propose that "Seventy five percent" is written "75%". (Government of Norway)
190	15	14	0	26	Since the first (highlighted) sentence focuses on the limitations, while the rest of the text focuses on the possibilities, we think that this part of the text is somewhat ambiguous. Quantification of reduction potential and descriptions of specific limitations might make the message clearer. (Government of Norway)
191	15	16	0	0	IPCC reports express emissions in tC and not tCO2. To avoid confusion, use tC in this SPM (Government of France)
192	15	19	15	19	the accronym HFE is first introduced here and should be explained. (Government of Netherlands)
288	15	19	0	0	"HCFCs by Hydro Flourinated Ethers (HFEs)… HFE is not previously defined (Government of UK)
193	15	19	0	0	HFE: not defined in the text (hydrofluoroethers). (Government of Brazil)
194	15	20	15	20	Please replace "novelty aerosol products" by: "non-technical aerosol products". Some countries have banned the use of HFCs in all aerosols, except for technical aerosols that are used for dedusting electronic equipment. (Government of Germany)
195	15	23	15	26	Please replace by: A variety of organic solvents and not-in-kind technologies can replace HFCs, PFCs and ODSs in many applications. These alternative fluids include lower GWP compounds such as traditional chlorinated solvents, HFEs, hydrocarbons, oxygenated solvents, and n-propyl bromide. Many not-in-kind technologies, including no-clean and aqueous cleaning processes, are also viable alternatives. (Government of Germany)
196	15	25	15	25	n-propyl bromide has a distinct ODP and it is currently being discussed to be added to the Montreal substances list. (Government of Netherlands)
197	15	25	0	0	This latter (n-propyl bromide) might be in the future included in the Montreal Protocol (ODP = 0.026)

SPM-Comment	From Page	From Line	To Page	To line	Comments
					(Government of Spain)
198	15	32	0	0	REGULATIONS should include mandatory service practices mandating refrigerant recovery and recycling, restrictions on the sales of ODS and GHGs at the point of sale, labeling of products containing or manufactured with ODSs or GHGs. (Government of USA)
200	15	38	15	39	Insert "To some extent," at the beginning of this sentence. Current phrasing could be taken to mean that there is not more to be done, since the instruments have already been implemented or considered. (Government of USA)
199	15	38	15	43	It would be useful to evaluate the situations in which the different instruments are most or least effective. Although that evaluation is probably beyond the scope of this report, please add: "Although beyond the scope of this report, an evaluation of the situations where the various policy measures and instruments are most effective and most cost effective could assist policy makers worldwide." (Government of USA)
201	16	2	0	0	Table SPM-2. 'Regulations', Second item. Change to Certification of companies and technicians for servicing… ADD new line for restrictions on sales of ODS and GHG products ADD new line for labeling of products containing or manufactured with ODSs or GHGs. (Government of USA)
296	16	2	0	0	Table SPM-2. "Regulations", Second item. Add “certification of personnel carrying out servicing of installations and equipment” (Government of UK)
289	16	2	0	0	Table SPM-2. 'Financial Incentives and Market Mechanisms', First item. What is the meaning of the sentence “Financial incentives can further shape this cost differential between substances and technologies”? (Government of Belgium)
295	16	2	0	0	Table SPM-2. "Financial Incentives and Market Mechanisms / Taxation": It is necessary to differentiate Annex I countries and non-Annex I countries because HFC and PFC are greenhouse gases instead of ODS. Therefore, the taxation for HFC and PFC is the same as carbon tax in nature. lt is premature for developing countries to introduce such taxation, which runs counter to the UNFCCC and the Kyoto Protocol. It is proposed to delete this term or clarify it as applicable only to developed countries. Otherwise, there might be the emergence of undesired "green" barriers facing developing countries in their production and international trading processes. (Government of China)
290	16	4	0	0	add HCFCs (Government of UK)
202	16	7	16	8	The sentence “However, as there are no technical or legal limits …” is not correct : the legal limit is the Kyoto Protocol. The sentence is in contradiction with the following paragraph in line 14 to 20 where it is mentioned that the EU intends to put some legal limits to the use of HFC-134a (Government of Switzerland)
291	16	9	0	0	Add "global" before "production capacity" to avoid confusion. (Government of China)

SPM-Comment	From Page	From Line	To Page	To line	Comments
203	16	10	16	12	Delete the sentence on "HCFC-22" at this place, because this information does not relate to the given question. The growth of the HCFC 22 production and the relating emissions should be discussed at an appropriate place (3.3 ?). (Government of Germany)
204	16	10	16	10	Insert the words "In a Business-As-Usual scenario, demand and production …" because it is not clear what will be the attitude of developing countries in the future towards ODS substitutes (in particular if some of them commit themselves under the Kyoto Protocol and/or in projects under the CDM) (Government of Switzerland)
205	16	14	16	14	Replace the words "is expected to" with "may" because the future will depend on the attitude of industrialized countries (e. g. in regulating ODS substitutes) as well as on the attitude of developing countries towards these substances (Government of Switzerland)
206	16	14	0	0	Change into "Production capacity is expected to expand with additions taking place mainly in developing countries" (Government of Germany)
292	16	15	0	0	Add "global" before "production capacity" to avoid confusion. (Government of China)
293	16	18	0	0	needs to read "mobile air conditioners in cars" as trucks, trains etc are not included (Government of UK)
294	16	19	16	20	Delete "may lead to increased overcapacity" (Government of UK)

Annex Proposal China

In order to give the decision-makers an overall picture, it is proposed to insert an additional component in the SPM that briefs on the two international environment oriented conventions including their implementations. For example, their profiles can be compared as follows:

Names	The Vienna Convention On the Protection of the Ozone Layer	UNFCCC
Objective	Protect ozone layer	Mitigate climate change
Date of signature	22 March 1985	9 May 1992
Date of effectiveness	September 1989	21 March 1994
Agreements under conventions	The Montreal Protocol on Substances that Deplete Ozone Layer	Kyoto Protocol
Objective	Control ODS	Control GHG
Date of signature	16 September 1987	11 December 1997
Date of effectiveness		16 february 2005
Process and performance of implementation	ODS was phased out in developed countries by 1 January 1996; Most developing countries are committed to phasing out ODS ahead schedule before 2010; So far so good	The implementation has just been kicked off. The years 2008-2012 is the first commitment period for GHG reduction. Due to the USA withdrawal, the Kyoto Protocol would be badly compromised in performance.

Second Joint Session of IPCC Working Groups I and III
Addis Ababa, Ethiopia, 6-8 April 2005

IPCC/TEAP Special Report on
Safeguarding the Ozone Layer and the Global Climate System:
Issues related to Hydrofluorocarbons and Perfluorocarbons

Comments of Organizations on the Summary for Policymakers (11 February 2005)

As submitted by March 29, 2005 12:00 CET

Organizations that have submitted comments
IPAC
Environmental Policy Council (Trane TCS American Standard Companies)

SPM-Comment	From Page	From Line	To Page	To line	Comments
13	2	15	0	0	At the end, add "… positively or negatively, so it is desired that the full global environment effects of alternatives be assessed." (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
21	3	3	0	0	Change to read " … significant contribution to the reduction of global …". (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
68	5	30	0	0	After the word reduced add "CO2-equivalent emissions can be reduced further by full consideration of GWP in the selection of replacement substances." (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
82	6	10	6	11	Since the HFCs in this report tend to have longer atmospheric lifetimes than the Montreal Protocol Class II substances, change to read "… about a year to two decades for most HCFCs and HFCs, decades …". (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
134	11	46	0	0	After application, add "containment during useful life," (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
143	12	15	0	0	Change to read "A comprehensive assessment would cover ozone depletion and global warming and both direct and indirect …" (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
167	14	8	0	0	Change to read "…containment, (iv) selection of refrigerants with low GWP, and (v) the use of …" (James Wolf, Environmental Policy Council, Trane TCS American Standard Companies)
182	14	36	14	45	This section regarding the emission reduction opportunities/costs for the medical aerosol sector is well done and should not be substantively altered. Importantly, it accurately and fairly reflects the full chapter on medical aerosols (Chapter 8). (Maureen Donahue Hardwick, International Pharmaceutical Aerosol Consortium)