



**IPCC EXPERT GROUP MEETING ON FACTORING OUT
DIRECT HUMAN-INDUCED CHANGES IN CARBON STOCKS
AND GHG EMISSIONS FROM THOSE DUE TO INDIRECT
HUMAN-INDUCED AND NATURAL EFFECTS**

Report of the Meeting

**Geneva, Switzerland
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This report was prepared by Riitta Pipatti, Leandro Buendia, Kiyoto Tanabe, Todd Ngara, Kyoko Miwa, and Akiko Kawase of the Technical Support Unit for the IPCC National Greenhouse Gas Inventories Programme. In preparing this report, consultations were made with TFB Co-Chairs: Taka Hiraishi and Thelma Krug, the facilitators and rapporteurs of the Breakout Groups, and all meeting participants. We are grateful for the contributions from them all.

1 BACKGROUND AND OBJECTIVES

1. The Marrakesh Accords decision 11/CP.7 on Land use, land-use change and forestry (LULUCF) invites the IPCC to develop methodologies and good practice guidance for LULUCF related issues. The IPCC has divided this work into three tasks in the NGGIP-LULUCF Programme:

Task 1 - Development of good practice guidance for the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and supplementary methods and good practice guidance arising from the Kyoto Protocol (covers paragraphs 3(a) and 3(b) in 11/CP.7).

Task 2 - Development of definitions for direct human induced 'degradation' and 'devegetation' and methodological options to inventory and report on emissions from these activities (covers para 3(c) in 11/CP.7).

Task 3 - Development of practicable methodologies to factor out direct human-induced changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks from changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks due to indirect human-induced and natural effects (such as those from carbon dioxide fertilization and nitrogen deposition), and effects due to past practices in forests (covers 3(d) in the 11/CP.7).

2. Task 1 and 2 have started their work and the First-Order Drafts of the reports are under preparation to be sent out for the first combined Government/Expert Review in December 2002. These tasks are scheduled to be finalised by COP9 in December 2003.
3. Task 3 is still in its scoping phase. The Expert Group Planning Meeting was organised to advance the scoping of the task. The objectives and tasks of the meeting were
 - To assess science relevant to changes in carbon stocks and greenhouse gas emissions and removals due to indirect human-induced and natural effects (such as those from carbon dioxide fertilization and nitrogen deposition), and effects due to past practices in forests (pre-reference year).
 - To identify categories of activities that cause direct human-induced changes in carbon stocks and greenhouse gas emissions and removals.
 - To assess capability for the development of practicable methodologies to factor out direct changes in carbon stocks and greenhouse gas emissions and removals from changes in carbon stocks and greenhouse gas emissions and removals due to indirect human-induced and natural effects (such as those from carbon dioxide fertilization and nitrogen deposition), and effects due to past practices in forests in pre-reference year.
 - To develop a recommendation on type of report for IPCC work for the Task.
 - To develop TOR, TOC and WP for the task

2 DAY 1: PLENARY 1 PRESENTATIONS AND DISCUSSIONS

2.1 OPENING OF THE MEETING

4. The meeting was opened by Taka Hiraishi (Co-Chair of the TFB) who introduced Geoff Love, the Secretary of the IPCC, Thelma Krug (the other Co-Chair of the TFB), Riitta Pipatti (TSU Head) as well as members of the Planning Group (Sergio Gonzales and Art Jaques) of Task 3 who were present at the meeting and WGIII representative (Eduardo Calvo). Geoff Love made opening

remarks on the importance of inventory work, the challenges in the work as well as extended words of welcome to the experts.

2.2 AGENDA OF THE MEETING

5. Taka Hiraishi talked about the preliminary draft of the agenda of the meeting and highlighted the fact that it was flexible. A major item in the agenda was the initial presentations of the different background papers by selected experts in areas of expertise relevant to the deliberations of the meeting. The range of presentations in terms of content and subject matter could be either narrower or wider since they were meant to be mere examples of aspects of the task ahead. The purpose of the presentations was to set the stage for the main discussions of the meeting or alternatively to introduce the brainstorming phase of the meeting.
6. There were no amendments to the provisional agenda.

2.3 PRESENTATIONS

Taka Hiraishi(TFB Co-Chair):

Background and objectives of the meeting

7.

- (a) Taka Hiraishi gave the background to the meeting citing paragraph 3(d) of the Marrakesh Accords (Decision 11/CP.7) and the invitation to the IPCC by the UNFCCC to undertake the task whose finished product is expected to be submitted to COP10 in 2004. **He emphasized the fact that the mandate of this meeting was to develop a draft plan for the execution of the task and not to develop methodologies for the task as yet.**
- (b) Taka Hiraishi also mentioned that the IPCC Panel had established a Planning Group to oversee the initial stages of the Task.
- (c) In consonance with one of the objectives of the meeting, Taka Hiraishi also dwelt at length on the types of reports produced by the IPCC (Assessment reports, Methodological reports, Special reports – new sciences and Technical Papers – only information already included in IPCC reports. Either a Special Report (SR) or Methodology Report would be applicable for Task 3. The SR would include a Summary for Policy Makers (SPM) which would need a line-by-line approval by the IPCC Panel). The Expert Group Planning Meeting was requested to recommend to the IPCC Panel the type of report to be produced.
- (d) This was followed by some discussions on the stages and type (Governments and Experts) of reviews of various IPCC products. Taka Hiraishi also informed the meeting that the LULUCF methodology reports on Task 1 and Task 2 will be reviewed in two stages by both Governments and Experts.
- (e) In the case of the Task at hand, the next IPCC Bureau and Panel will approve or amend the TOR, TOC and WP coming out of this meeting. The slate of authors will be approved or amended by the IPCC Bureau.
- (f) Some discussions on the tightness of the timeline for completion of the work followed.

Heikki Granholm (UNFCCC):

Background to the invitation to the IPCC on “factoring out” in the Marrakesh Accords

8. Heikki Granholm’s presentation focused on the following:

- (a) “Factoring out” has been a key negotiating issue and it has influenced the decisions related to LULUCF accounting:
- Limited gross-net accounting for Afforestation, Reforestation and Deforestation - since 1990 (Art. 3.3);
 - Revegetation, Cropland management and Grazing land management – net-net accounting (Art. 3.4)
 - Forest Management - cap for individual countries (limited gross-net-accounting), partly derived from application of a discounting formula (Art. 3.4);
- One of the guiding principles in draft decision on Land use Change and Forestry explicitly mentions that the accounting excludes removals resulting from some indirect human-induced effects and past practices;
- (b) Issues for consideration in the work could include: the list on possible indirect effects (such as CO₂ fertilization and nitrogen deposition - not comprehensive), the importance of different effects, the spatial distribution, uncertainty (especially management of uncertainty). Development of practicable methodologies to be applied by all Parties may bring in the question of Tiers into the methodologies as well as the answer to the questions – can the separation be done and at what costs?
- (c) The ensuing discussions highlighted the fact the results of the “factoring out.” Task 3 might be more relevant for the 2nd Commitment Period whose negotiations are expected to start in 2005 since caps etc. are already in place for the first Commitment Period. It was also noted that the results for this Task should not only be scientifically relevant but also policy relevant. The invitation expects submission of the report on the practicable methodologies for factoring out by COP10.

Luiz Glyvan Meira Filho (Brazil) Paper summarised by Thelma Krug

Why factor out the removal of CO₂ into the terrestrial biosphere not directly attributable to human action?

9. This paper emphasized the necessity of factoring out residual CO₂ flux. The transfer of carbon from the atmosphere to the terrestrial biosphere is estimated by global carbon cycle models to be of the order of 2 Gt C/year. This is much bigger than the estimated emission reduction commitments under the Kyoto Protocol, which are in the order of 0.35 Gt C/year. It was noted that though this paper is relevant from a scientific point of view, it tackled the problem from a top-down approach rather than a bottom-up approach which is what is required in Task 3.

Brian Stocks(Canada):

Natural Disturbance Regimes in Boreal Forests

10. Brian Stocks focused on natural effects including synergies attributed to loss of carbon due to insect defoliation of forests as well as forest fires on the boreal carbon budget in Canada. The following points were highlighted:

- (a) Annual area affected by insects defoliation of forests is comparable to that of forest fires. Knowledge on episodic/annual forest fires in Canada is essential for ecosystem maintenance and the carbon budget cycle since approximately 40 percent of the terrestrial carbon is found in the boreal forests.
- (b) It was also graphically shown that in Canada, changes in fire disturbance regimes in the past influence the GHG sources/sinks today. Brian Stocks further explained that increased fire suppression in Canada is not economically possible (law of diminishing returns) or ecologically desirable (annual fires encourage regrowth and are important for biodiversity).

- (c) He gave some circum-boreal forest fire statistics: Annual burned area – 5 to 15 million ha mainly in Canada, Alaska and Russia. In Canada about 8 000 fires cover 2.8 million ha/year; Lightning fires account for 35 % of total annual fires and 85% of the total annual fire area; Fire size - 3% of fires burn greater than 200 ha and these represent 97 percent of the area burned. In general, number of fires and area burned show considerable inter-annual variability.
- (d) The presentation showed that boreal fires are characterised by high fuel consumption (approx. 25 tonnes/ha); fast spread rates; sustained high intensity levels, towering columns - upper troposphere/stratosphere and long-range smoke transport.
- (e) Preliminary estimates for atmospheric averages for carbon release through fire (usually episodic) are 27 Tg C/yr (20 percent of Canada's fossil fuel emissions). There is also biogenic carbon release through decomposition. Post fire carbon sequestration is weaker, as carbon sequestration is weaker in younger forests than in mature forests. Satellites measurements show that it takes 20-30 years to fully recover after fire.
- (f) Projected impacts of fire episodes were also presented as the following:
- ✓ More area burned;
 - ✓ Shorter fire return intervals;
 - ✓ Eco-system boundary/vegetation shifting;
 - ✓ Less terrestrial storage;
 - ✓ Positive feedback to climate change (changes in albedo and carbon transport).
11. In the subsequent discussions, the issue on how forest fires influence the C sequestration and whether they should be considered in the factoring out or not were addressed. Thelma Krug raised the question of how to categorize action or non-action by Governments in the event of fires that have human-induced or natural origins. She also noted that accounting of carbon loss due to fires may not be necessary because of the regrowth process. However, this is not the case with methane and nitrous oxide emissions.

Walter Baethgen (IFDC):

Factoring out changes in carbon stocks – methodologies and data availability

Mark Broadmeadow (United Kingdom):

Process models as tools to factor out impacts of elevated CO₂, nitrogen deposition and atmospheric pollutants

12. The two papers mentioned above dealt with **process or physiological models** that could be used to “factor out” non-human induced changes in carbon stocks as well as those due to natural effects.
- a) Walter (IFDC) talked at length on carbon balances and use of Simulation models such as Century, DSSAT and IDSS. Constraints associated with these models were mentioned. These included data availability and extension of plot simulation results to global scales. He also addressed how field measurements (long time scales, specific difficulties with certain gases like methane, etc.) and remote sensing data could contribute to the task. Factoring out of elevated CO₂ concentrations or N deposition is challenging due to the huge site-specific variations in the effects due to the complex interactions with other variables and limiting factors for growth.
- b) Broadmeadows (UK) addressed in brief the trends in CO₂ levels and concentrations of air pollutants (nitrogen compounds, tropospheric ozone, SO₂) that could be important in factoring

out. He also mentioned that the impacts of climate change (rising temperature etc.) would be important. He further emphasized that process models are the only tools (so far) available for the factoring out. However, these models have considerable technological complexities and shortcomings related to verifiability of the models; representativeness of the results; suitable scale (temporal and spatial), applicability to GHG inventories and available input data.

13. Other points which were raised in the discussion included the following:

- ✓ Considerable variability of stomatal behaviour in elevated CO₂ in as far as it relates to photosynthesis;
- ✓ How does one take care of stochastic events which are not part of the process models?
- ✓ Process models have been so far successful in plots, extension to global or regional scales is still an area of research;
- ✓ The long-term effects, especially effects on changes in soils, make modelling difficult. The relationship between effects of the aboveground biomass and soils is interesting. Yoshiki Yamagata wondered whether the generally positive effects on biomass could be cancelled by the effects on soils. Broadmeadow was not aware of this kind of results; an increase in aboveground biomass generally results in an increase in soil carbon also.
- ✓ Mats Olsson asked whether changes in the ground-water table in natural peatland and their impact on CO₂ and N emissions would be considered as direct or indirect human-induced effect.

1.4 MANDATES OF BOGS

14. After the presentations and discussions on the background papers, Taka Hiraishi explained that Attachment 1 (Draft Scoping Paper to Address Request outlined in Decision 11CP/7 in the Marrakesh Accords) and Attachment 2 (Preliminary Draft TOR and TOC for Task 3 in NGGIP LULUCF Programme) developed at the Expert Group Planning Meeting in Geneva 6-8 August 2001 have not yet been discussed by the Panel. This will be done at IPCC XX in February 2003. The revised versions will be sent up-line through the following procedure: Task 3 Planning Group, TFB, IPCC Bureau and finally the IPCC Panel for approval.

15. The Co-chairs then introduced discussion on the mandates of the break-out groups (BOGs). It was decided to start the work in two BOGs. BOG1 was tasked to deal with natural and indirect human-induced changes in carbon stocks and the BOG2 with direct human-induced changes in carbon stocks. The suggestion to pay enough attention to the “past practices” was accepted. It was agreed that this would be done within BOG2.

16. There were also some discussions on whether the type of report to be produced should be discussed in a separate BOG. It was, however, agreed that this issue could be decided only after the substantive BOG discussions since the type of report depended on the BOG outcomes. Similarly, it was also decided that the discussion on procedures or Work Plan should come after the scientific discussions.

17. The BOGS were further mandated to critically examine the draft TOR and TOC and amend them, if necessary, so as to be clear enough to give guidance to the authors.

2 BREAK-OUT GROUP 1

2.1 BOG1 MANDATE

18. Walter Oychantcabal (Uruguay) and Mark Broadmeadow (UK) were the facilitators and Peter Stephens (New Zealand) the rapporteur for the group.
19. The group was tasked to discuss the following:
 - The general approach to factoring out;
 - Relevant factors associated with factoring out indirect and natural effects;
 - Modelling approaches that could be used to factor out effects;
 - Develop table of contents for the IPCC work for the Task (Task 3), and
 - Develop terms of reference for the work Task 3

2.2 GENERAL APPROACHES TO FACTORING OUT

20. It was noted that process models are by their very nature data intensive and not necessarily applicable at global scale. Their qualification for discussion in the factoring out process is that they are predictive and can be used to simulate growth responses to a range of known anthropogenic changes, a number of which are outlined in Table 1 below. The challenge is to formulate a mechanism by which model simulations can provide robust estimates applicable at an inventory scale (representative of the entire global climatic environmental range) of those natural and indirect factors that are deemed as necessary to discount. Both positive and negative factors should be considered by the modelling system, although only a limited number (of positive factors) are likely to be applied.

Where available, empirical data should be used to augment and validate the modelling approach. Although a modelling or interpretive theoretical approach may complicate the factoring out process and reduce clarity, it is a necessary process for separating those elements of observed stock changes that are a result of direct human-induced activity from those resulting from natural change or indirectly, through human activity.

21. Taking cognisance of this, Mike Apps (Canada) presented two optional approaches for the Task. In the first approach (Figure 1), the natural and indirect human-induced effects, and the direct human-induced effects would be separately estimated. The sum of these effects should then be equal to what is actually seen on the ground – i.e., the actually observed or measured quantity (carbon stocks, GHG balance, etc). A difficulty with this approach is ensuring that the sum of the separate estimates agrees with reality (the observed or measured state of the system being accounted).

Figure 1 1st Approach

Starts with separate estimates of natural or indirect contributions and direct contributions to the C stocks, changes and GHG

Various factors: indirect human influences (N, CO₂, climate change, etc), natural causes, response to Pre -1990 activities, etc

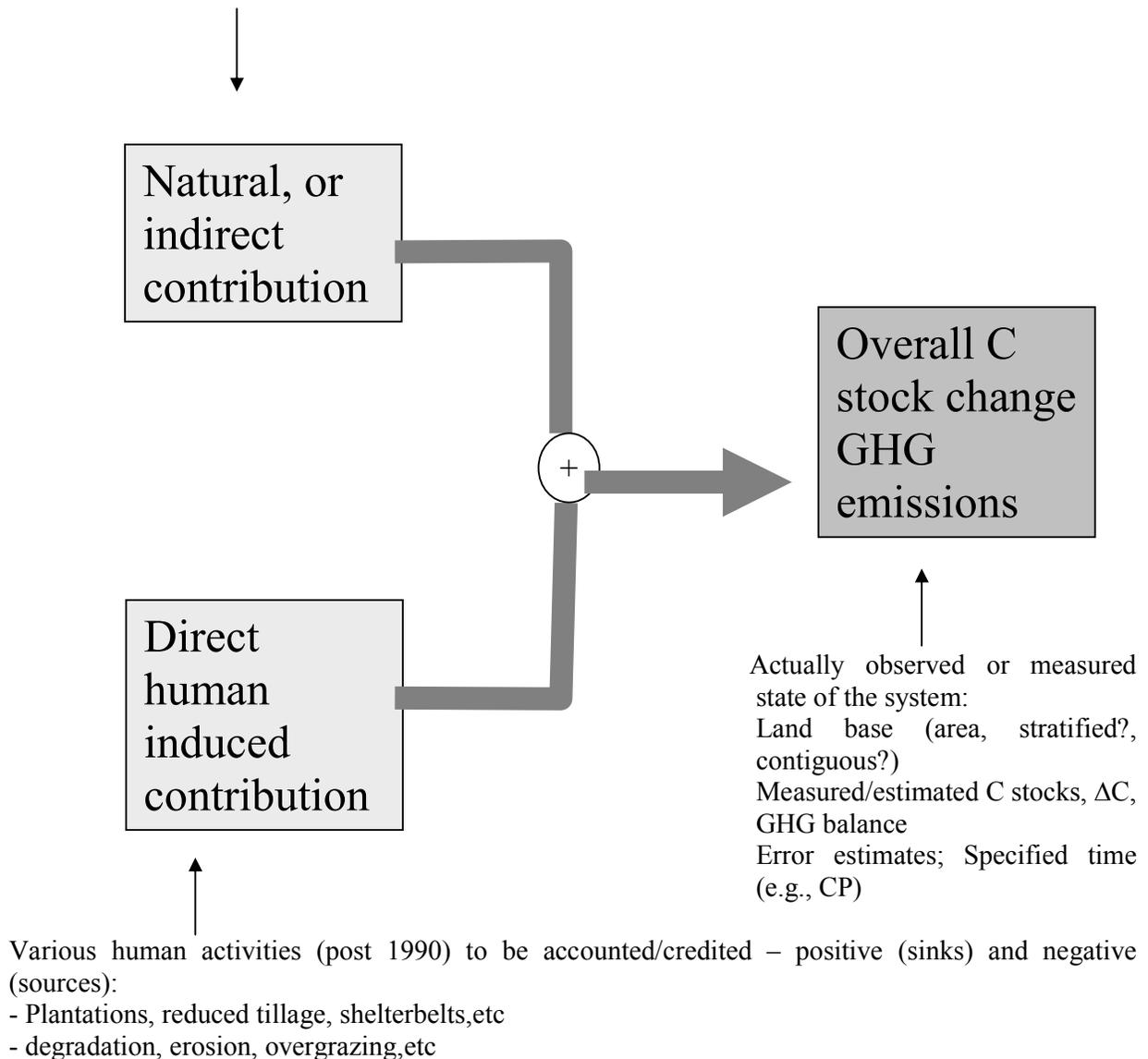
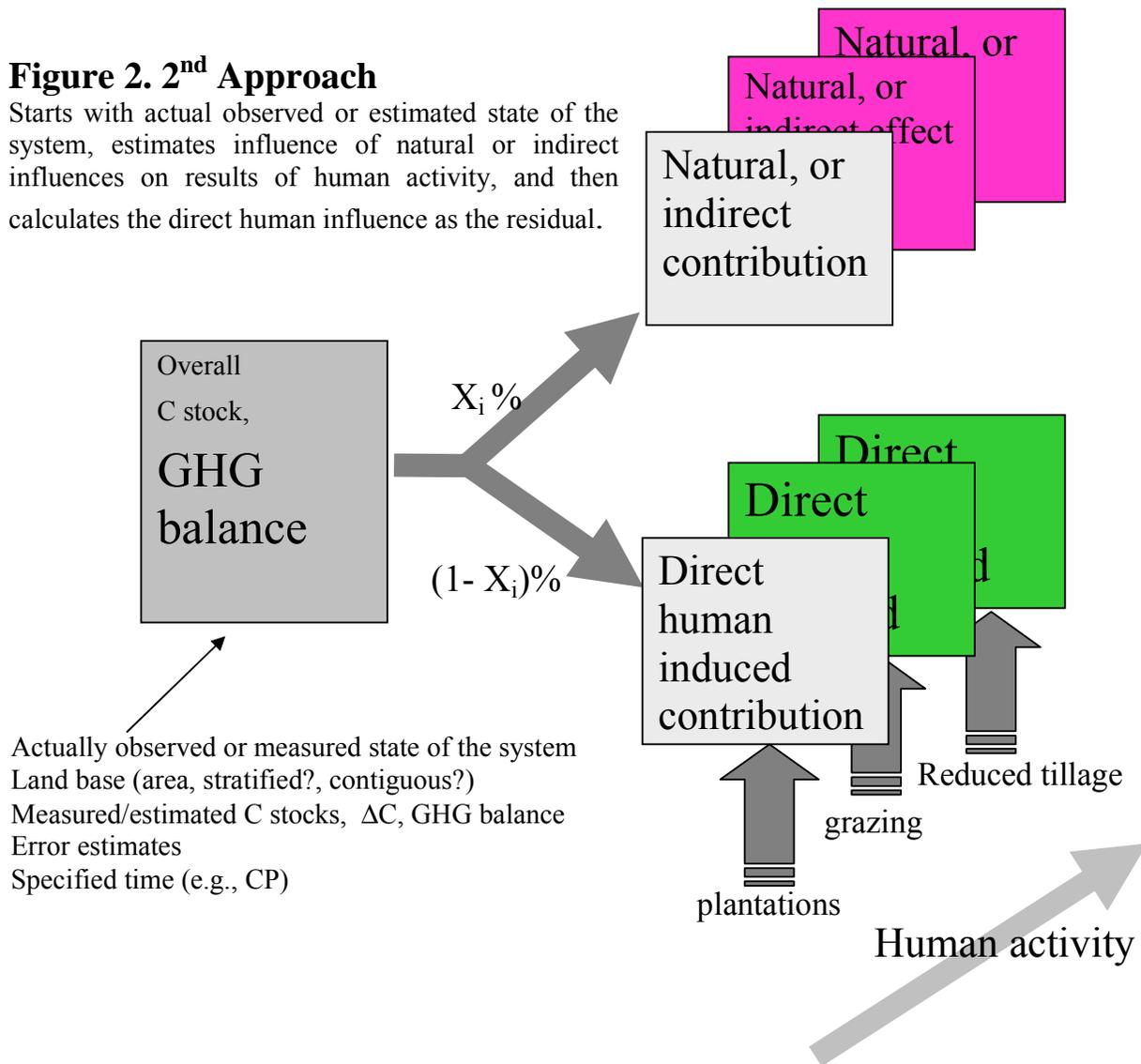


Figure 2. 2nd Approach

Starts with actual observed or estimated state of the system, estimates influence of natural or indirect influences on results of human activity, and then calculates the direct human influence as the residual.



Actually observed or measured state of the system
 Land base (area, stratified?, contiguous?)
 Measured/estimated C stocks, ΔC , GHG balance
 Error estimates
 Specified time (e.g., CP)

In the second approach (Figure 2), the starting point would be the observed or measured effect. The natural and indirect human influence (nitrogen or CO₂ fertilization, climate change effect etc) would be estimated by the factor subscript X_i (where the subscript i refers to the different indirect or natural influences to be considered or factored out) and the direct human-induced component then estimated as the residual. The factor X_i could be estimated by the process models, experimental data or whatever other source of information exists. (An alternative and mathematically identical approach view would be to use the transformed variables with factor $Y_i = 1 - X_i$ for the direct human-induced influence and the indirect/natural effects as the residual $1 - Y_i$). A refinement of this approach would be to segregate the indirect influences into their different influences on the various direct human activities/practices as shown in Figure 2.

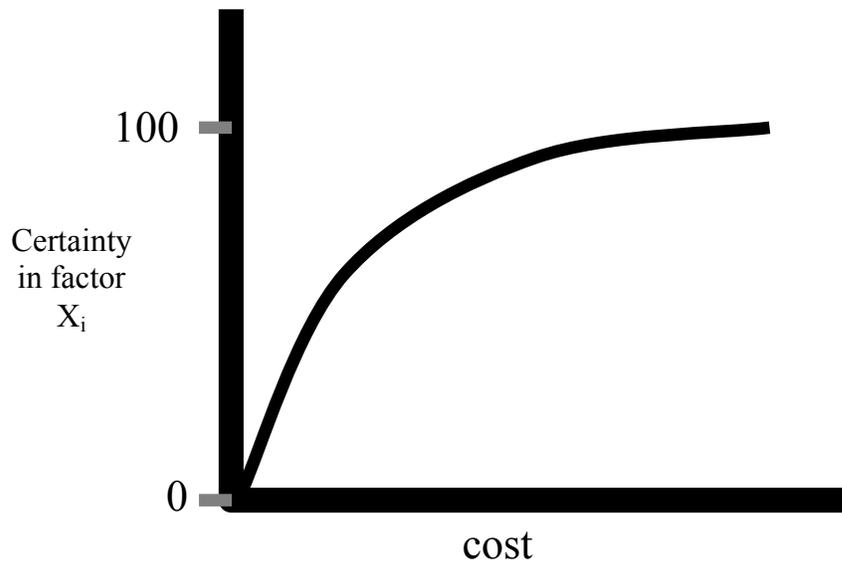
A secondary advantage to this second approach is that it lends itself to cost-benefit estimation for Parties to decide how much effort reduction in uncertainty is worth to them. To err on the side of caution, the degree to which the credited influence (i.e., the direct component) is reduced (i.e., how much assigned factor X_i is increased) would increase with certainty in that factor. (For a less certain factor, less credit results for the direct influence). The uncertainty in a given Party's estimates could be reduced by more extensive research and measurements but this has cost implications: the costs probably rise on a marginal cost curve as in Figure 3.

Figure 3 Cost implications for reducing uncertainty

Err on side of caution:

Discounting of credited amount inversely proportional to Certainty in estimate of factor X_i

High certainty, little discount,



22. The group favoured the second approach which was taken as the starting point for the work in the group. The question whether a land-based or activity-based accounting would be more suitable for the factoring out was also addressed.
23. BOG1 considered the following factors (variables, environmental drivers) needed to be considered in the factoring out exercises: CO_2 , N (NO_x , NH_3), O_3 (PANs etc.), SO_2 , VOCs, acidification, particulates, heavy metals, temperature, water availability, vapour pressure deficit, wind, solar radiation, fire, pathogens, insects, and growing season.
24. BOG 1 agreed that the best way to consider the factors was to list them in a table, along with likely approaches, constraints and magnitude of effects. Table 1 shows this information. Not all rows have been completed. BOG1 considered that only rows related to different groups of variables need be completed, to indicate the type of information and consideration that deemed appropriate.

Table 1 Shows list of important variables and associated activities

Variable	Fact or out?	Spatial exposure	Methodology (empirical or model)	Spatially operating limiting factors	+/-/0	Potential magnitude of factor (LMH)	Comments
CO2		N	Y*	N, P, climate, age	+	H	
N		Y	Y*		0/+	H	
O3 (PANs)		Y	Y=dose N=response	H2O,			
SO2							
Acidification							
Particulates		Y	Y=dose N=response		-/+	L	May be local effects of microclimate through changes in air temperature
Heavy metals etc.							
Temperature		Y	Y****	many	+/-	H	
Water availability							
VPD							
Wind				Storm damage			
Solar radiation							
Fire		Y	Y*	Climate, age, biome, cause, management	+/-	H	Potentially huge effect on annual fluxes; long time response
Pathogens							Biology not well understood
Insects		Y	Y****				Biology not well understood
Growing season		X					

Comments/explanations of the table:

The table and data is still incomplete. The column headers would need to be assessed and their descriptiveness improved.

Factor Out? The intention was to provide an answer in the column if it would be feasible to develop practicable methodologies for factoring out for the variable. BOG1 was unsure whether to insert Y or N here. Discussions were not completed.

Spatial exposure. Whether variable varied spatially

Methodology. Likelihood of empirical or process model being available and suitable for the variable. Asterisks (*) denoted where there was some concern about suitability of methodology, and the level of concern was related to number of asterisks.

Spatially operating limiting factors. This column showed the factors (which varied spatially) that need to be considered (in models etc.) and which have an influence on the magnitude any factoring out component. To also show that inter-relationships between variables, and the nature of datasets required.

+/-/0. Shows whether the impact is likely to be positive, negative or zero. There was some discussion in BOG 1 about being concerned about negative impacts. The Group decided that it was important to consider what science could contribute, regardless of impact.

Potential magnitude of Factor (L,M,H). Could be useful when there was a need to rank or score variables/effects.

Comments. As required.

2.3 MODELLING APPROACHES:

25. Modelling approaches that would need to be considered included the following:

- ✓ Empirical models
- ✓ Statistical models- multivariate analysis
- ✓ Remote sensing
- ✓ Process driven ('full-blown', plant functional type, biome, ecosystem, modifying inventory, and 'stratified') approaches

26. Considerations on the scale should also be addressed:

- ✓ Spatial (stand, grid square, national, regional, continental) considerations would entail national break-up of country into bioclimatic zones.
- ✓ Temporal considerations would include hour, day, month, year, commitment periods.
- ✓ UNFCCC reporting at annual scale; yearly reporting for the Kyoto Protocol, but accounting can be done also for the whole commitment period. According to the Decision 19/CP.7, annex to draft decision -/CMP.1 (FCCC/CP/2001/13/Add.2, paragraph 8(d), Parties are requested to provide, prior the beginning the 1st commitment period, information "Identification of whether, for each activity under Article 3, paragraph 3 and 4, it [a Party] intends to account annually or for the entire commitment period."

27. The following modelling/factoring out issues (validation/verification; scale of errors - gross emissions versus carbon stocks; mean climate during commitment period; default parameters and models and the question whether Parties can use individual models and parameters?) as well as their applicability (whether country/Party level, Commitment period and whether model scale must be equal or smaller than inventory scale) were identified.

2.4 ELABORATION OF THE TOR AND TOC

28. The group elaborated the draft TOR and TOC. Its view was that the report would need a section where the science of factoring out would be assessed to provide the basis and rationale for the methodology. Therefore a hybrid between a SR with a methodology report was considered to best meet the request of the SBSTA invitation to the IPCC. A sentence reflecting this view was proposed to be included in the TOR for the Task.

29. The preliminary draft of the Annotated Table of contents was elaborated so that:

Chapter 1 would give background for the work by e.g. addressing the following:

- what is meant by direct and indirect human-induced, and natural effects;
- giving a short summary of what was written in the SR LULUCF and also latest scientific information on the issue and the importance of the residual terrestrial sink in the global carbon balance would also be addressed in this chapter.

Chapter 2 would give the scientific basis for the methodologies. The preliminary draft was to elaborate the following issues:

- the relative magnitude of the effects indicating regional variability;
- guidance on the certainty of the factoring out values and cost related to narrowing

the uncertainties and a review of available driving data and suitable developing and emerging models.

Chapters 3 and 4 were proposed to be merged. The new chapter 3 would address the methodological guidance, the scientific assessment would be in Chapter 2. An argument for minimizing the number of chapters was that it facilitates the consistency and minimises possible contradictions within the report.

3 BREAK-OUT GROUP 2

3.1 BOG2 MANDATE AND ITS REVIEW FOR IPCC WORK

30. The facilitators for the BOG were Mike Jebson (New Zealand) and Emil Cienciala (Czech Republic) while Opha Pauline Dube (Botswana) and Mats Olsson (Sweden) were the rapporteurs.
31. The BOG was tasked to discuss the following:
 - ✓ Identify the categories of significant “direct human induced” practices that effect; changes in carbon stocks and other greenhouse gas emissions and removals;
 - ✓ effects due to past practices in forests (pre- reference year);
 - ✓ review/assess the state of science relevant to these activities, and
 - ✓ consider terms of reference and table of contents for the development of factoring out methodologies.
32. BOG2 reviewed its mandate on the issue of whether the focus for developing methodologies to “factor out” should be for all Land Use, Land Use Change and Forestry (LULUCF) activities under article 3.3 and 3.4 of the Kyoto protocol or be restricted to issues associated with only “Forest Management” under article 3.4.
33. It considered that the main focus for the work should be on developing factoring out methodologies related to “forest management”. It further noted that although the request to the IPCC in paragraph 3(d) of decision 11/CP.7 covers carbon stocks and other greenhouse gas emissions and removals in general, the Kyoto Protocol and Marrakesh Accord decision 11/CP.7 define afforestation, deforestation and reforestation in article 3.3 as direct human induced activities and undertaken since 1990. The restriction of Article 3.3 activities to activities taken since 1990 and the practice of net-net accounting for cropland management, grazing land management, and revegetation activities appears to lessen the need to develop methodologies for these activities.
34. The facilitators of BOG2 noted that this is a matter that may require further consideration by the IPCC Bureau and/ or guidance from SBSTA of the UNFCCC.
35. The BOG2 discussed the distinction between “practices” and “activities” and noted that the 11/CP.7 referred to the following LULUCF activities:

Article 3.4

- “Forest management”,
- “Cropland management”,
- “Grazing land management”,
- “Revegetation” and

Article 3.3:

- “Afforestation,
- “Reforestation” and
- “Deforestation

36. “Practices” in this context were considered to be those “direct human induced” actions that had an effect on greenhouse gas emissions and removals attributable to the listed LULUCF activities. According to Marrakesh Accords forest management, cropland management and grazing land management have been defined as “the system of practices”.

3.2 APPROCHES: FACTOR OUT OR FACTOR IN

37. BOG2 identified that measurable and verifiable changes in carbon stock and other greenhouse gas emissions and removals attributable to the land use activities such as forest management are the sum of the effects of:

- ✓ “direct human induced” practices that occurred before the reference year 1990 (e.g. past practices in forests such as species selection) plus;
- ✓ “direct human induced” practices that occurred after the reference year 1990 plus (e.g. pest/weed fire management) plus;
- ✓ “natural effects” (e.g. sunshine hours) plus
- ✓ “indirect human induced” effects (e.g., CO₂ fertilisation).

38. One way of quantifying “natural” and “indirect human induced” effects and effects due to past practices pre the reference year, for the purposes of factoring out these effects during the second commitment period, is not to measure these effects directly but to instead quantify and “factor in” the effects of “direct human induced” practices that occurred after 1990.

39. This was an alternative approach to that being considered by BOG1. BOG1 was considering the reverse situation - quantifying “natural” and “indirect human effects”.

40. It was noted that there was a significant number of “direct human induced” practices that would have an influence on changes in greenhouse gas emissions and removals associated with each of the LULUCF activities and that there could be significant spatial and temporal variation in the size of these effects. Consequently, the approach of factoring in the effects of “direct human induced” practices would be more suitable for the development of Tier 2 methodologies. This would have influence on the development of the Table of Contents.

3.3 IDENTIFICATION (“DIRECT HUMAN INDUCED”)

41. BOG2 developed the matrix in Table 2 and brainstormed the list of direct human induced practices as recorded down the x axis and listed the LULUCF activities across the y axis. A subgroup was tasked with grouping and rationalising the list of practices.

Table 2 Direct human-induced effects / changes and significance for different activities

Practices	Activities in 3.4			
	Cropland management	Grazing-land management	Forest management	Revegetation
Pest management	√	√	√	√
Weed management	√	√	√	√
Change rotation length			√	
Fertilization / mycorrhization	√	√	√	√
Introduce continuous cover	√	√	√	√
Production of fuelwood / biofuels	√		√	?
Change species mix	√	√	√	√
Water management changes (draining, irrigation, etc.)	√	√	√	√
Improved (natural) regeneration			√	√
Change harvesting systems (incl. reduced impact logging)	√		√	?
Change stocking rates	√	√	√	√
Change pruning regime			√	
Improved community practices	√	√	√	√
Thinning practices			√	?
Wood ash application	√		?	
Breeding practices / genetic selection	√	√	√	√
Sylvo-pastoral management/ Agroforestry	√	√	√	√
Conservation/ biodiversity protection	√	√	√	√
Ecotourism development ***			?	?
Urban forest management (planting, pruning) ***				
Tillage practices	√	√	√	√
soil pH management	√			
Residue management	√		√	
Crop rotation (incl. fallow systems)	√			
Shelterbelts, windbreaks, shade trees and riparian zones	√	√		
Slash and burn ***				
Organic fertilisation, green manure	√	?		
Grazing intensity: density /rotation		√	√	√
Fire management (incl. Prescribed burning)	√	√	√	√
Grassland rejuvenation		√		

*** These are "overarching" concepts that incorporate other individual practices

42. Practices prior to 1990 may significantly affect the sequestration during the commitment period by changed species composition, age structure, adequacy of stocking, nutrient balance, etc.

43. BOG2 noted that many of the categories of “direct human induced” practices were applicable to the majority of LULUCF activities. For “forest management”, BOG2 suggested that the authors should:
- ✓ consider the significance (high, medium, low) of the individual practices with respect to their effect on the uptake and removal of greenhouse gases.
 - ✓ indicate the state of scientific knowledge concerning the quantification of the effect of each practice.
44. BOG2 considered that this would help to prioritise the development of practical methodologies for measuring and “factoring in” direct human induced effects as an alternative approach to factoring out natural and indirect effects.

3.4 FACTORING OUT EFFECTS DUE TO PAST PRACTICES IN FORESTS

45. BOG2 assumed that the reference to factoring out effects due to past practices in forest implies direct human induced effects including planting history as well as other forest management practices. Several approaches to this problem were discussed. It further noted that there was a requirement to factor out the “effects” of “forest management” practices that occurred prior to 1990 but there is no requirement to factor out effects arising from the application of practices post 1990. The joint chairs considered that it would be difficult in some circumstances to separate the pre- and post reference years effects.

3.5 RECOMMENDATIONS

46. BOG2 considered that it should work in conjunction with BOG1 in reviewing the draft TOR and TOC.
47. The BOG2 recommended that the work under Task 3 should be coordinated with the development of LULUCF good practices (Task 1) and definitions of direct human induced degradation and devegetation (Task 2).

4 DAY 2: PLENARY 2 (AFTERNOON) DISCUSSIONS *(continued)*

48. The discussions and outcomes of BOGs 1 and 2 were presented (see above chapters 2 and 3).
49. Based on the BOG2 presentation there were considerable discussions on whether to factor out activities only under Article 3.4 or also under Article 3.3. It was noted that the request to the IPCC in paragraph 3(d) in Decision 11/CP7 covers both carbon stocks in general. However, restriction of Article 3.3 activities to activities undertaken since 1990 and the practice of net-net accounting for cropland and grazing land management and revegetation activities appears to reduce the need to develop methodologies for factoring out in these areas. Some experts felt that this issue should not be highlighted.

50. BOG1 had almost finalised its tasks whereas the BOG2 had not had time to address the TOR and TOC. In the interest of time, it was felt that Plenary 3 should continue (open-ended) with further elaboration of the TOR, TOC and discuss and develop the work plan.

5 DAY 3: PLENARY 3 DISCUSSIONS (*continued*)

51. The Day 3 Plenary Session started with a presentation by the BOG2 facilitator Mike Jebson on the outcomes of BOG2 that would affect the development of the TOR and TOC.
52. Before the final modifications on the TOR and TOC, the recommendation on the type of report was discussed (*methodological report or special report*). The Co-chairs intimated that a clear recommendation would be desirable (a “hybrid report” does not yet exist in the IPCC history). A recommendation on a special report with a SPM, containing two components, i.e., (i) scientific assessment, and (ii) methodological framework was agreed upon.
53. Discussions on whether there should be a two stage Governments/Experts review or that Governments should be approached only once for the second review (normal IPCC procedure). On this point, Co-chairs advised it may be prudent to involve Governments right from the beginning. They also advised that this question would be addressed in subsequent considerations by the Planning Group and the IPCC Bureau. After some discussions this was agreed upon.
54. Mohammed Yassin suggested that the zero-order drafts of Tasks 1 and 2 (after Governments/Experts Review) should be made available to the Task 3 authors for better coordination. This was accepted by both the Co-Chairs and the experts.
55. The development of TOR, TOC was based on the draft produced by BOG1. The tight time schedule for the Task caused concerns and these were addressed in the development of the WP by the attempt to have the first Authors/Experts meeting in April 2003 and introducing chapter writing team meetings and expert workshops on practical application of methodologies to the programme
56. The Co-Chairs summarised the way forward: that the report will be forwarded to the Task 3 Planning Group, TFB in November, IPCC Bureau in December and the IPCC Panel in February. The Co-Chairs thanked the experts for their time and the good work done.

3.6 OVERVIEW OF THE DISCUSSIONS

57. After three days of discussions, the Expert Group Planning Meeting recognised the challenges ahead both in terms of the availability of the necessary science to meet the objectives of the Task as well as the short timelines for producing the IPCC Special Report as outlined in the draft TOR (Attachment 1) below. The meeting also noted the high expectations to produce a firm set of numbers for factoring out, while the scientific community consensus on these expected numbers has not yet been reached. Over and above that, the IPCC is expected to produce this Report in two years’ time. This explains

the sentiments expressed by some to explore the possibility of delaying product delivery beyond COP10.

The widespread concerns expressed at the meeting were against this background. In view of these potential difficulties, it was felt that the IPCC should only promise a framework, at least, that could be modified with time rather than a definite methodology complete with facts and figures. The draft TOR (Attachment 1), draft TOC (Attachment 2) and the draft Work Plan (Attachment 3) should be considered/ read against these guarded sentiments lest the IPCC finds itself in a potentially damaging position of failing to deliver definite factoring out methodologies by COP 10 as contained in the invitation.

ATTACHMENTS

Attachment 1	Draft Terms of Reference
Attachment 2	Draft Table of Contents
Attachment 3	Draft Work plan
Attachment 4	List of Participants

ATTACHMENT 1

DRAFT TERMS OF REFERENCE (TOR)

In response to the decisions of the IPCC XVII, XVIII and IPCC XIX and to the invitation in decision (11/CP.7) from the UNFCCC, the IPCC will develop a report on addressing practicable methodologies to factor out direct human-induced changes in carbon stocks, and greenhouse gas emissions by sources and removals by sinks, from changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks due to indirect human-induced effects, natural effects and effects due to past practices in forests.

The IPCC will base its work, *inter alia*, on:

- IPCC Special Report on Land Use, Land-Use Change, and Forestry
- All IPCC Assessment Reports (FAR, SAR, and TAR)
- Latest Scientific Information on the subject matter

A scientific assessment is deemed as necessary to provide the basis and rationale for the development of practicable factoring out methodologies, and therefore the report will contain two components, i.e., (i) scientific assessment (Chapter 2), and (ii) methodological framework (Chapter 3). The report will contain Summary for Policy Makers, and consequently it will be an IPCC Special Report.

ATTACHMENT 2

DRAFT ANNOTATED TABLE OF CONTENTS (TOC)

- **SUMMARY FOR POLICY MAKERS**
- **PREFACE**

(This will consist of a summary of the structure of the report)

Chapter 1: Introduction

This chapter will provide background information for development of practicable methodologies to factor out direct human-induced changes in carbon stocks, and greenhouse gas emissions by sources and removals by sinks, from changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks due to indirect human-induced effects, natural effects and effects due to past practices in forests, taking into account, among others;

- A scientific assessment which is deemed as necessary to provide the basis and rationale for the development of practicable factoring out methodologies, and
- What is meant by direct and indirect human induced and natural effects and those due to past practices in forests (pre-reference year) in the context of this report.

A short summary of the latest scientific information related to the theme, including those contained in SR LULUCF and TAR will be provided. The importance of the residual terrestrial sink in the global carbon balance will be assessed to provide the context.

Chapter 2: Scientific bases for development of practicable methodologies

Identified direct and indirect human-induced effects as well as natural effects that may influence the changes in carbon stocks and greenhouse gas emissions by sources and removals by sinks will be assessed.

Both positive and negative effects on carbon removal from the atmosphere and greenhouse gases exchange will be addressed. Guidance will be given on the relative magnitude and duration of these effects, indicating regional variability in carbon stock and greenhouse gas emissions and removals by sinks. Guidance will be given on the certainty in the factoring out values, and costs, in particular those related to narrowing the uncertainties will be assessed. A review of available driving-data and suitable models and technologies applicable to deriving the factoring out factors will be provided. Developing and emerging technologies, programmes and data collection/management approaches that are relevant to the factoring out process will be discussed.

Chapter 3: Methodologies for factoring out

This chapter will review methodological approaches and options for factoring out, and provide practicable methodologies that could be used to separate direct human-induced effects from indirect and natural effects. The interactions between direct and indirect effects will be discussed including the practicability of separation across multiple time periods. This chapter will also include the relationship to inventory accounting and links to the LULUCF *Good Practice* Guidance work.

The development of practicable methodologies will include an assessment of applying possible methodologies given the range of potential LULUCF management actions. This assessment will include an estimation of the costs and uncertainties related to the implementation.

Endnote: 1

Issues on factoring out the effects of past practices in forests will be addressed in Chapters 2 and 3 as specified separate sub-chapters. These sub-chapters will provide background and methodologies that might be used to factor out the effects of past practices in forests (pre-reference year). They will also include the relationship to inventory accounting and links to good practice guidance.

The sub-chapter in chapter 2 would provide the science review, background information, and model descriptions, while the sub-chapter in chapter 3 will be the basis of the methodological guidance.

The development of practicable methodologies will include an assessment of applying possible methodologies given the range of potential LULUCF management actions. This assessment will include an estimation of the costs of implementing the approaches.

ATTACHMENT 3

DRAFT WORKPLAN (WP) for “Factoring Out Direct Human-Induced Changes” Report

Date	Activity	Objectives and expected output
16 – 18 September 2002	Expert Meeting	Draft TOR, TOC, Workplan and a recommendation of the type of report
	Planning Group	
December 2002	IPCC Bureau	Approval of the TOR, TOC, Workplan and type of report
December 2002	Nomination letter to governments	Governments’ recommendations of authors
February 2003	IPCC Panel	Approval of the TOR, TOC, Work plan and type of report
February 2003	Planning group consideration	Draft Slate of authors
February 2003	Bureau consideration on Slate of authors	Approval of authors
April 2003	First authors meeting	Zero order draft
Mid 2003	Chapter writing team meetings (3 sessions of CLAs/LAs) and two (TBC) expert workshops on practical application of methodologies.	[subject to budget approval by IPCC XX: Additional CHF 200K (50 travel supports)]
September 2003	Second authors meeting	First order draft (Zero order draft SPM)
December 2003 – January 2004	Review (Combined Governments/experts)	Comments on first order draft
March 2004	Third authors meeting	Second order draft
May - June 2004	Review (Combined Governments/experts)	Comments on second order draft
July 2004	Fourth authors meeting	Final draft for government consideration
September 2004	IPCC Panel	Acceptance/approval of the report
October-November 2004	COP10	Presentation of the report for COP/SBSTA

ATTACHMENT 4

List of Participants for IPCC Expert Group Meeting on Factoring Out Direct Human-Induced Changes in Carbon Stocks and GHG Emissions from those Due to Indirect Human Induced and Natural Effects

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16-18 September 2002**

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