Annex A: Comparison of AR4 and AR5 Approaches[1]

The "Guidance Notes for Lead Authors of the AR4 on Addressing Uncertainties," finalized in July 2005 and made available to all AR4 authors, outlined qualitative and quantitative approaches to describing uncertainties. Qualitative assessment of uncertainty was based on the amount of evidence (from theory, observations, or models) and the degree of agreement (the level of concurrence in the literature on a particular finding). This approach was used by Working Group III. Quantitative assessment of uncertainty was based on confidence (the correctness of underlying data, models, or analyses, determined by expert judgment) and likelihood (uncertainty in the occurrence of specific outcomes, determined by expert judgment and statistical analysis of observations or model results). Working Group II used a combination of confidence and likelihood, and Working Group I predominantly used likelihood.

Consistent treatment and communication of uncertainty across the Working Groups is a key cross-cutting issue for the IPCC and goal for the AR5. To address this important issue, the Co-Chairs of the three Working Groups convened a small meeting 6-7 July 2010 at the Jasper Ridge Biological Preserve in Stanford, CA, USA. The outcome of the meeting was a decision to produce updated Guidance Notes for AR5, with the goal of improving the distinction and transition between different metrics and their consistent application across the Working Groups in the AR5.

The "Guidance Notes for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties" present an approach for the treatment of uncertainty and the communication of key findings of the AR5 that can be applied consistently in each Working Group. The approach builds upon the foundation of the AR4 guidance, but important features differ that together provide a more integrated framework for evaluating and communicating the degree of certainty in findings of the assessment process. These key differences in the approach are described below.

Evidence and Agreement

The AR4 guidance (paragraph 12)[2] presented calibrated language to describe the amount of evidence and degree of agreement regarding a finding in qualitative terms. The AR5 guidance (paragraph 8) extends this approach to incorporate explicit evaluation of the type, amount, quality, and consistency of evidence, with a modified set of summary terms. Author teams are instructed to make this evaluation of evidence and agreement the basis for any key finding, even those that employ other calibrated language (level of confidence, likelihood), and to provide a traceable account of this evaluation in the text of their chapters.

Confidence

The AR4 guidance (paragraph 13) presented quantitatively calibrated levels of confidence intended to characterize uncertainty based on expert judgment regarding the correctness of a model, analysis or statement. The AR5 guidance (paragraph 9) retains these terms, but no longer defines them quantitatively. Instead, levels of confidence are intended to synthesize author teams' judgments about the validity of findings as determined through their evaluation of evidence and agreement, and to communicate their relative level of confidence qualitatively.

Likelihood

The AR4 guidance (paragraph 14) presented the quantitative likelihood scale, to be used when describing a probabilistic assessment of a variable or its change, or some well defined outcome having occurred or occurring in the future. The AR5 guidance (paragraph 10) retains this scale, more explicitly instructing authors to base likelihood assignments on quantitative analysis and noting that three additional terms were used in AR4 in limited circumstances and may be used in AR5 when appropriate. The AR5 guidance also is more explicit about the relationship and distinction between confidence and likelihood, and encourages the presentation of more precise probabilistic information (e.g., percentile ranges, probability distributions) instead of likelihood when possible.

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[1] The Annexes are authored by the Working Group Co-Chairs.
[2] Parenthetical paragraph references refer to the relevant numbered paragraphs in either the AR4 or AR5 Guidance Notes.

Annex B: Addressing the InterAcademy Council Recommendations

The 2010 independent review of the IPCC by the InterAcademy Council (IAC)[3], released on August 30, 2010, included six recommendations related to the evaluation of evidence and treatment of uncertainty in IPCC reports. These recommendations are listed below, with brief summaries explaining how the AR5 guidance addresses their key elements.

Recommendation: *All Working Groups should use the qualitative level-of-understanding scale in their Summary for Policy Makers and Technical Summary, as suggested in IPCC's uncertainty guidance for the Fourth Assessment Report. This scale may be supplemented by a quantitative probability scale, if appropriate.*

The IAC recommendation refers to the summary terms for evidence and agreement in the AR4 guidance as a level-of-understanding scale. The AR5 guidance instructs all author teams to make an evaluation of evidence and agreement the basis for any key finding. Paragraphs 8-11 describe the process and distinct qualitative and quantitative language to be applied to communicate the degree of certainty in key findings based on this evaluation. This includes similar summary terms for evidence and agreement, a qualitative level of confidence scale used to synthesize author teams' judgments about the validity of findings as determined through evaluation of evidence and agreement, and a quantitative likelihood scale for use when appropriate.

Recommendation: *Chapter Lead Authors should provide a traceable account of how they arrived at their ratings for level of scientific understanding and likelihood that an outcome will occur.*

The AR5 guidance explicitly instructs author teams to provide, for all key findings, a traceable account that describes their evaluation of evidence and agreement in the text of their chapters (see paragraph 2).

Recommendation: *Quantitative probabilities (as in the likelihood scale) should be used to describe the probability of well-defined outcomes only when there is sufficient evidence. Authors should indicate the basis for assigning a probability to an outcome or event (e.g., based on measurement, expert judgment, and/or model runs).*

The AR5 guidance provides specific instructions explaining that a likelihood or probability should be assigned for the occurrence of well-defined outcomes for which probabilistic information is available. Such an assignment should only be made when confidence is "high" or "very high," indicating a sufficient level of evidence and degree of agreement exist on which to base such a statement (paragraph 11).

Recommendation: *The confidence scale should not be used to assign subjective probabilities to ill-defined outcomes.*

The AR5 guidance presents confidence as a qualitative rather than quantitative scale, preventing interpretation of levels of confidence as subjective probabilities.

Recommendation: *The likelihood scale should be stated in terms of probabilities (numbers) in addition to words to improve understanding of uncertainty.*

The AR5 guidance is more explicit regarding the numerical probabilities represented by each likelihood term. These definitions will be highlighted more frequently in AR5. It also encourages the presentation of more precise (numerical) probabilistic information (e.g., percentile ranges, probability distributions) instead of likelihood when possible.

Recommendation: *Where practical, formal expert elicitation procedures should be used to obtain subjective probabilities for key results.*

The AR5 guidance (paragraph 2) encourages the use of formal expert elicitation methods when appropriate.

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[3] InterAcademy Council. 2010. Climate Change Assessments, Review of the Processes and Procedures of the IPCC, available at:
http://reviewipcc.interacademycouncil.net/