

# Biodiversity in a Changing Climate: Assessing Uncertainties

- Aspen Global Change Institute
- the IUCN-World Conservation Union
- QUEST Quantifying and Understanding the Earth System

# Purposes of this Workshop

- Provide qualitative (not quantitative) assessment of current state of science of biodiversity impact projections (from data, from models, from expert opinion)
- Use above assessment to provide guidance to applied conservation biologists on best/worst uses of biodiversity projections
- New research priorities

# Outputs and Audiences

- Short turnaround high-impact: *e.g.* Science Policy Forum
- Conservation Biology, Biological Conservation,
- White paper / report - distributed by IUCN, AGCI and QUEST (websites and / or info sheet)
- Scientists in field
- Scientists in other disciplines
- NGOs, national policy-makers (DC)
- IPCC
- basic and applied conservation biologists
- Funding agencies
- managers
- local policy makers

# Priority for this weekend is to develop a consensus on state of science

- connect climatological and biological literature

- Identify sources of uncertainty and error in data & models, climate & biological
- Identify existing approaches & tools that are being used
- Identify existing approaches and tools from other disciplines that could be adapted
- Identify areas where new approaches and tools are needed

# IPCC jargon: Quantitative Levels of Confidence

**Very high confidence**

**At least 9 out of 10 chance of being correct**

**High confidence**

**About 8 out of 10 chance**

**Medium confidence**

**About 5 out of 10 chance**

**Low confidence**

**About 2 out of 10 chance**

**Very low confidence**

**Less than 1 out of 10 chance**

# Intergovernmental Panel on Climate Change

## Attribution question

Causal link between biological changes and anthropogenic climate change?

## Impacts question

Are changes negative, neutral or beneficial?

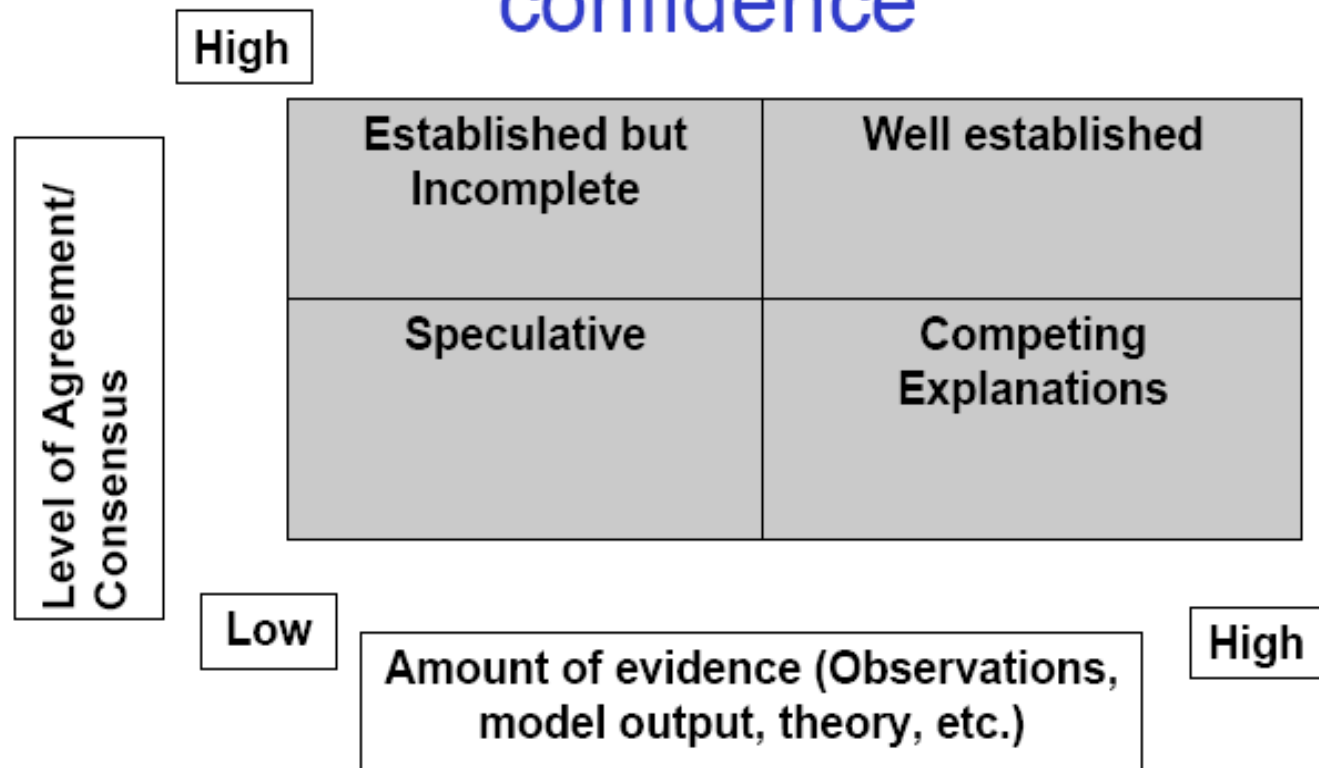
Global effects on biodiversity?

## Vulnerability question

Which species most at risk?

Which regions most sensitive?

# Qualitatively defined levels of confidence



# IPCC - no agreed jargon

Category	Distributed Guidance Note	WG2 proposal (TAR)	Addis Ababa proposal
Low-agreement-little-evidence	Exploratory	Speculative	At an early phase of research
Low-agreement-much-evidence	No agreed explanations	Competing explanations	Differing or no explanations
High-agreement-little-evidence	Agreed but not fully established	Established but incomplete	Established but incomplete evidence
High-agreement-much-evidence	Well established	Well established	Well established

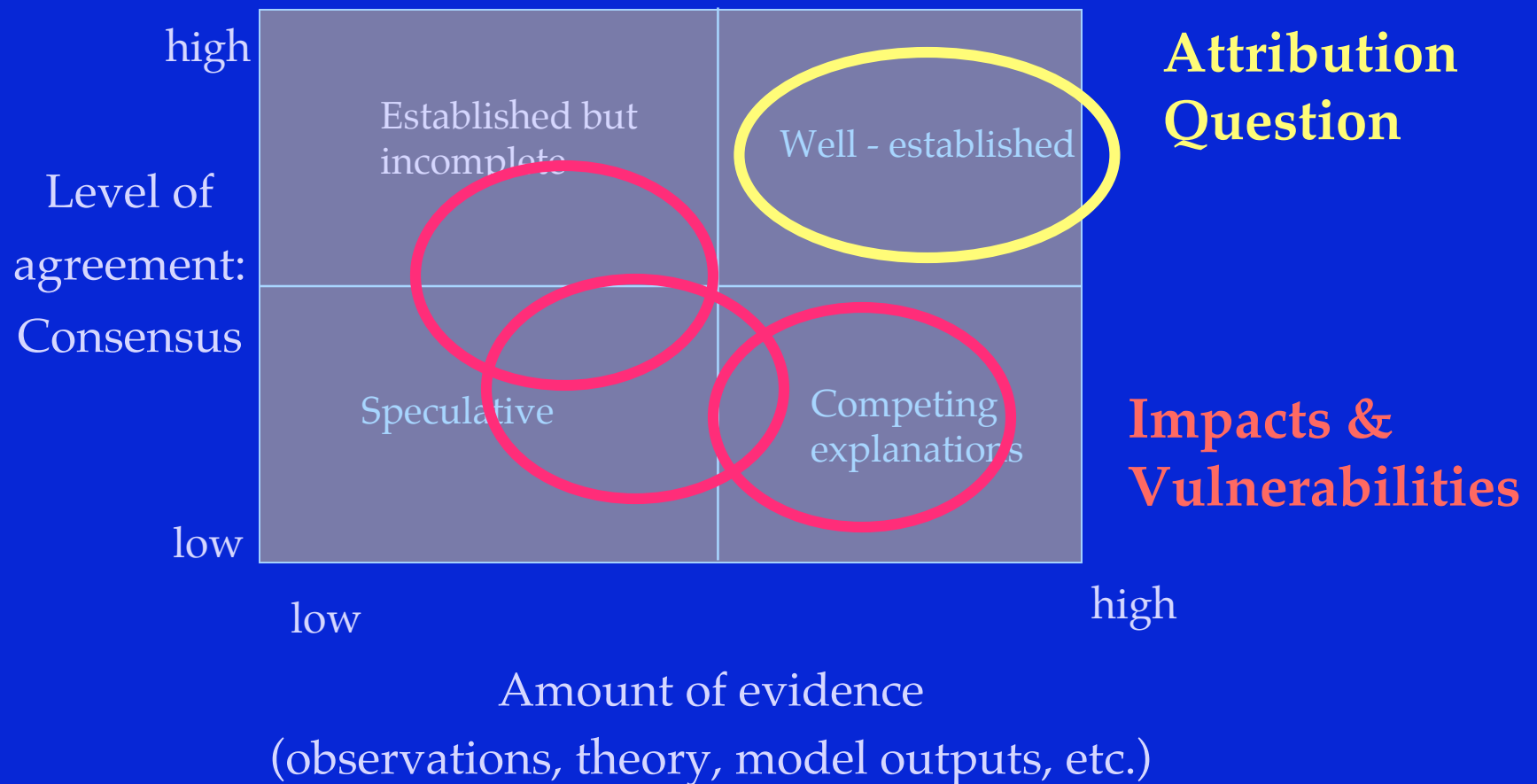


# Confidence $\neq$ likelihood

## Quantitative Statements of Likelihood

<b>Virtually certain:</b>	<b>&gt;99% probability of occurrence</b>
<b>Very likely:</b>	<b>90 – 99% probability</b>
<b>Likely:</b>	<b>66 – 90% probability</b>
<b>About as likely as not</b>	<b>33 – 66% probability</b>
<b>Unlikely:</b>	<b>10 – 33% probability</b>
<b>Very unlikely:</b>	<b>1 – 10% probability</b>
<b>Exceptionally unlikely:</b>	<b>&lt;1% probability</b>

# State of Science: IPCC Uncertainty Framework



# Layers of uncertainty

## Climate

- Data
  - 20% of precipitation trend due to instrument change
- Emission scenarios
- Climate sensitivity
  - threshold responses?
  - clouds?
- Models
  - 3°C difference in model output for same emission scenario

## Biology

- Data
  - sampling gaps (space & time)
  - bias (taxon, observer)
  - data absence = real absence?
- Basic knowledge (lack of knowledge of processes)
- Models



**output**

## Thought questions

- 1) Are climate data being appropriately used by biological community?  
RE inhomogeneities, data gaps
- 2) Are climate projections being appropriately used by biological community? RE scale issues, differences in projections
- 3) Downscaling climate projections - state of science?
- 4) How to assess species with poor distribution data?
- 5) How deal with disagreements among biomodels - lessons from climate community? RE consensus, ensemble, weighting, pdfs
- 6) Approaches from economic theory? RE: low prob, high risk or irreversible outcomes, robust approaches
- 7) use of ipcc framework on uncertainty - useful for conservation?
- 8) others ????