

Climate Science Survey

PBL Netherlands Environmental Assessment Agency

This survey exists of the following 3 groups of questions:

Part I. General questions

Part II. Detailed questions

Part III. Background questions

PART I

Part I. General questions - global warming, attribution, sensitivity, timescale

Recent trend - attribution

What fraction of global warming since the mid-20th century can be attributed to human induced increases in atmospheric greenhouse gas (GHG) concentrations?

Question	Condition	
1a		What fraction of global warming since the mid-20th century can be attributed to human induced increases in atmospheric greenhouse gas (GHG) concentrations?
		More than 100% (i.e. GHG warming has been partly offset by aerosol cooling)
		Between 76% and 100%
		Between 51% and 76%
		Between 26% and 50%
		Between 0 and 25%
		Less than 0% (i.e. anthropogenic GHG emissions have caused cooling)
		There has been no warming
		Unknown due to lack of knowledge
		I do not know
		Other (please specify)

Recent trend - confidence level

Question	Condition	
1b	If > 50%	What confidence level would you ascribe to the anthropogenic GHG contribution being more than 50%?
	If < 50%	What confidence level would you ascribe to the anthropogenic GHG contribution being less than 50%?
		Virtually certain (>99% likelihood)
		Extremely likely (>95% likelihood)
		Very likely (>90% likelihood)
		Likely (>66% likelihood)
		More likely than not (between 50% and 66% likelihood)
		Unknown due to lack of knowledge
		I do not know
		Other (please specify)

Changes in recent trend

Question	Condition	
2a		Has the trend in global average temperature changed in the past decade, compared to the preceding decades?
		The trend over the past decade is approximately the same as before
		The trend over the past decade is slightly higher than before
		The trend over the past decade is slightly lower than before
		The trend over the past decade is approximately zero (i.e. no change in temperature)
		The trend over the past decade is negative (i.e. cooling)
		10 years is too short to establish a significant (change in) trend
		Amidst the uncertainty
		Unknown due to lack of knowledge
		I do not know
		Other

Interpretation of recent trend

Question	Condition	
2b		What is your interpretation of the trend over the past decade with respect to the long term (multi-decadal) trend?
		Long-term warming trend has changed as indicated by my previous answer
		Long-term warming trend has not changed; it is masked by short-term variations
		It is not possible to state whether the long-term trend has changed or has not changed
		Unknown due to lack of knowledge
		I do not know
		Other

Attribution

Question	Condition	
3a		How would you characterize the contribution of the following factors to the reported global warming of ~0.8 degrees C since pre-industrial times?
		Note that the scale allows for both warming and cooling effects.
		strong cooling - moderate cooling - slight cooling - insignificant - slight warming - moderate warming - strong warming - it is unknown - I do not know
		Greenhouse gases (CO ₂ , CH ₄ , N ₂ O, O ₃ , halocarbons)
		Aerosols (reflection, absorption, indirect effects via clouds)
		Land use and land cover change
		Sun (total solar irradiance, cosmic rays, UV)
		Internal variability (random variation, oscillations)
		Spurious warming (urban heat island effect, siting of weather stations)
		"?": Examples are given in brackets; these need not be exhaustive. ""Spurious warming"" refers to global mean surface temperature

		change being overestimated due to artefacts in the data. Greenhouse gas emissions resulting from land use and land cover change should be included under ""Greenhouse gases""."
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Attribution - level of scientific understanding

Question	Condition	
3b		How would you describe the level of scientific understanding for each of these factors?
		very low - low - medium low - medium - medium high - high - I don't know
		Greenhouse gases (CO ₂ , CH ₄ , N ₂ O, O ₃ , halocarbons)
		Aerosols (reflection, absorption, indirect effects via clouds)
		Land use and land cover change
		Sun (total solar irradiance, cosmic rays, UV)
		Internal variability (random variation, oscillations)
		Spurious warming (urban heat island effect, siting of weather stations)

Aerosol

Question	Condition	
3c	If aerosols warming	You attributed part of the warming to aerosols. Which factors cause the net aerosol effect to be warming?
		check any that apply
		Absorption by black carbon outweighs reflection by the other aerosol and indirect effects via clouds
		Indirect effects via clouds cause warming
		Other (please specify)

Land use change

Question	Condition	
3c	if LULCC warming	You attributed part of the warming to land use and land cover change. What are the main mechanisms via which this has caused warming?
		Check any that apply
		Decreasing surface albedo
		Decreasing evaporation
		Other (please specify)

Sun

Question	Condition	
3c	if sun warming	You attributed part of the warming to the sun. What are the main mechanisms via which the sun exerts influence over Earth's climate?
		Check any that apply
		Directly, via total solar irradiance
		Indirectly, via its shielding effect on cosmic rays, thus suppressing cloud cover

		Indirectly, via effects of the ultraviolet part of the solar spectrum
		Other (please specify)

Natural variability

Question	Condition	
3c	if not var warming	You attributed part of the warming to internal variability. Which processes or oscillations are most important in this respect?
		Check any that apply
		Random variations
		Spontaneous changes in cloud cover
		Pacific Decadal Oscillation (PDO)
		Atlantic Multidecadal Oscillation (AMO)
		El Nino Southern Oscillation (ENSO)
		Other (please specify)

Warming Bias

Question	Condition	
3c	if not spurious warming	You indicated part of the warming to be spurious (i.e. overestimated). Which factors contribute to, or provide an indication of, this overestimation?
		Check any that apply
		Urban heat island effect
		Micro-siting problems (e.g. measurements close to local heat sources)
		Data adjustments
		Decreasing number of measurement sites
		Satellites show less warming of the lower troposphere
		Other: (please specify)

Sensitivity

Question	Condition	
4a		What is your estimate of equilibrium (Charney) climate sensitivity, i.e. the temperature response (degrees C) to a doubling of CO₂?
		Please provide both a best estimate and a likely range (66% probability interval)
		Skip this question if you think it is unknown or if you do not know
		Most likely value: [number] degrees C
		Lower bound of likely range: [number] degrees C
		Upper bound of likely range: [number] degrees C
		?: Here the Charney sensitivity is meant, i.e. taking into account feedbacks that operate on a timescale of decades to centuries. Slow response of ice sheets and vegetation is excluded.

Question	Condition	
4b	if no answer	Please indicate why you did not enter a most likely value

		It is unknown due to lack of knowledge
		I do not know
		Other: [please specify]

Sensitivity – explanation

Question	Condition	
4c	If < 2.5	Please indicate the reason(s) for your estimate being lower than IPCC's
		Cloud cover acts as a thermostat (negative feedback)
		Positive cloud cover feedback is overestimated
		Positive water vapor feedback is overestimated
		Cooling by natural aerosols acts as a negative feedback
		Positive feedbacks would imply a 'run-away' warming
		Simplified energy balance calculations show that climate sensitivity is small
		Aerosol cooling is overestimated, thus net positive forcing is underestimated and climate sensitivity overestimated
		Effect of natural variability has been underestimated
		Effect of natural forcings has been underestimated
		Current warming is less than predicted by climate models
		Other: [please specify]

Question	Condition	
4d	If > 3.5	Please indicate the reason(s) for your estimate being higher than IPCC's
		Open answer

Lifetime

Question	Condition	
5		What is your estimate of the perturbation lifetime of anthropogenic CO₂, i.e. the time needed for a peak in atmospheric CO₂ concentration to return to its background level?
		5 years
		20 to 50 years
		100 to 200 years
		100-200 years to remove two thirds of elevated CO ₂ ; remainder takes millennia
		Other (please specify in the textbox)
		Unknown due to lack of knowledge
		I do not know

PART II

Part II. Professional background and views on science and society

These questions are not mandatory

Professional background

Question	Condition	
6		Please indicate your field(s) of expertise in climate science
		Check any that apply
		Adaptation
		Aerosols and clouds
		Arctic / Antarctic
		Atmospheric chemistry
		Attribution
		Carbon cycle
		Climate impacts
		Climate modeling
		Climate observations
		Climate policy
		Climate sensitivity
		Computer science
		Engineering
		Geology
		Glaciology
		Hydrology
		Meteorology
		Mitigation
		Oceanography
		Paleoclimatology
		Radiative transfer
		Remote sensing
		Sea level rise
		Solar physics
		Statistics
		Other (please specify)

Publications

Question	Condition	
7a		For how many years have you been professionally involved in climate change issues?
		[number]

Question	Condition	
7b		Please indicate the approximate number of climate related articles you have published in peer reviewed scientific journals, including as co-author
		[number]

Breadth of knowledge

Question	Condition	
8a		How would you describe your general knowledge of physical climate science?
		very broad - quite broad - moderately broad - slightly broad - not broad - other [comment box available]

		?: This refers to the breadth of your knowledge: How wide is the range of topics, related to physical climate science, that you consider yourself reasonably knowledgeable about?

Depth of knowledge

Question	Condition	
8b		How would you describe your specialist knowledge of one or more aspects of physical climate science?
		very deep - quite deep - moderately deep - slightly deep - not deep - other [comment box available]
		?: This refers to the depth of your knowledge on one or a few aspect(s) related to physical climate science

Origin of controversy

Question	Condition	
9a		How important are the following factors according to you in having contributed to public controversy about climate change?
		Very important - Important - Moderately important - Slightly important - Not important - No answer
		Lack of public understanding about the nature of science
		Lack of public knowledge about climate science
		Relative immaturity of climate science
		Serious mistakes made by climate scientists
		Suppression of alternative viewpoints
		Suppression of uncertainties
		Opposition to proposed mitigation measures
		Differences in worldview
		Undermining the credibility of climate science and scientists
		Other factors
		?: Only assign a degree of importance if you deem the statement to be (at least somewhat) true.

Question	Condition	
9b	if "other factors" (very) important	If an important reason for the public controversy was not listed, please describe it here
		open answer

Science and society

Question	Condition	
10		To what extent do you agree with the following statements regarding the role of science in society?
		strongly agree - agree - neutral - disagree - strongly disagree - No answer

		Scientists should communicate with policymakers about climate change
		Scientists should communicate with the general public about climate change
		Uncertainties should be emphasized in communicating with the general public
		What is solidly known should be emphasized in communicating with the general public
		Risks should be emphasized in communicating with the general public
		Existing uncertainties in climate science make the case for mitigation stronger
		Climate science is too uncertain to be useful for policymaking on climate change

Media exposure

Question	Condition	
11		How frequently have you been featured in the media regarding your views on climate change?
		very frequently - frequently - occasionally - rarely - never [comment box available]
		?: Examples of media include newspapers, magazines, television, radio, on-line platforms, etc.

Concern

Question	Condition	
12		How concerned are you about climate change as a long-term global problem?
		very concerned, somewhat concerned, not very concerned, not concerned at all [comment box available]

PART III

Part III. Detailed questions - Other climate observations, model projections, etc

These questions are not mandatory

Past sea level rise

Question	Condition	
13		Which of the following best describes your view of global average Sea Level Rise (SLR) since pre-industrial times?
		SLR has accelerated gradually to the current multi-decadal trend of ~3 mm/yr
		SLR has been steady (~2 mm/year)
		SLR has been small (<1 mm/yr) and steady for thousands of years
		Unknown due to lack of knowledge
		I do not know
		Other (please specify)

Future sea level rise

Question	Condition	
14		What is your estimate of the likely range (66% probability interval) of sea level rise by the year 2100, compared to 2000?
		lower bound of likely range approximately ... cm
		upper bound of likely range approximately ... cm
		?: No emissions scenario is specified; please include scenario uncertainty in your answer.

Climate observations

Question	Condition	
15		How would you describe the change in the following quantities over the past few decades (or since it has been measured; whichever period is shorter)?
		Strongly decreased - Somewhat decreased - No change - Somewhat increased - Strongly increased - It is unknown - I do not know
		Glacial length
		Minimum arctic sea ice extent
		Minimum antarctic sea ice extent
		Greenland ice sheet mass
		Antarctic ice sheet mass
		Upper ocean heat content (0 to 700 m)
		Deep ocean heat content (0 to 2000 m)
		Hydrological extremes (floods, droughts)
		Hurricane intensity

Hockeystick

Question	Condition	
16a		How does global average temperature compare between this past decade and Medieval times (900-1200 AD)?
		Currently very likely warmer than in Medieval times
		Currently likely warmer than in Medieval times
		Approximately the same
		Currently likely cooler than in Medieval times
		Currently very likely cooler than in Medieval times
		Unknown due to lack of knowledge
		I do not know
		[comment box available]
		?: Very likely refers to >90% probability; Likely refers to >66% probability

Hockeystick – explanation

Question	Condition	
16b	No if statement	What factors contribute to your judgment on this comparison?
		Check any that apply

		Regional historical evidence indicates high Medieval temperatures
		Only few tree ring data series show exceptionally high current temperatures
		The uncertainty and low time resolution of proxy reconstructions preclude a meaningful comparison
		There are statistical flaws in the data analysis of proxy temperature reconstructions
		Divergence problem suggests that tree rings are bad proxies for temperature
		Other: [please specify]

Sun (recent)

Question	Condition	
17		What fraction of global warming since the mid-20th century can be attributed to the sun?
		none, since the sun has been slightly cooling over that period warming less than 10%
		10 to 25%
		25 to 50%
		more than 50%
		Unknown due to lack of knowledge
		I do not know
		[comment box available]

Statements on attribution

Question	Condition	
18a		Do you agree with the following statements?
		agree - neutral - disagree - it is unknown - I do not know
		Greenhouse effect of CO ₂ is saturated
		During the ice age cycles CO ₂ followed temperature
		The greenhouse effect is constant
		Climate has changed throughout earth's history
		There are multidecadal periods when CO ₂ and temperature don't correlate
		Anthropogenic CO ₂ emissions are smaller than natural CO ₂ emissions to the atmosphere

In the following questions, 'global warming' refers to the warming since pre-industrial times

Effect on attribution

Question	Condition	
18b	if GHE saturated	You indicated that the greenhouse effect of CO₂ is saturated. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no

	if CO ₂ followed T	You indicated that during the ice age cycles CO₂ followed temperature. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no
	if GHE constant	You indicated that the greenhouse effect is constant. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no
	if climate changed before	You indicated that climate has changed throughout earth's history. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no
	if not always correlation	You indicated that there are multidecadal periods when CO₂ and temperature do not correlate. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no
	if natural emissions larger	You indicated that anthropogenic CO₂ emissions are smaller than natural CO₂ emissions to the atmosphere. Can this be reconciled with a dominant anthropogenic cause of global warming?
		yes - no

Statements on climate models

Question	Condition	
19a		To what extent do you agree with the following statements?
		strongly agree - agree - neutral - disagree - strongly disagree - it is unknown - I do not know
		Global warming over the past 15 to 20 years is less than projected
		Climate is chaotic and can not be predicted
		Climate models are useful in aiding our understanding of global climate
		Climate models are useful in allowing projections of future climate
		Climate models are elaborate curve fitting exercises
		Climate model parameters are tuned to produce the desired result
		The predicted tropospheric hot spot has not been observed

Statements on climate models – explanation

Question	Condition	
19b	If model tuning	You indicated that climate model parameters are tuned to produce the desired result. What is/are the most important parameter(s) for model tuning?
		Open answer

	if no hotspot observed	You indicated that the predicted tropospheric hot spot has not been observed. Is this discrepancy primarily due to inaccuracies in the observations or in the models?
		Inaccuracies in the observations
		Inaccuracies in the models
		Inaccuracies in both
		Unknown due to lack of knowledge
		I do not know
		[comment box available]

The End

Question	Condition	
		Thank you for your cooperation! If you wish to provide feedback on this survey you may use keywords in the textbox below
		Open answer