



Concept Symposium 2016

Governing the Front-End of Major Projects

The probable, the uncertain, and the hypothetical: Problems of assessment and communication



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Inexact estimates of future outcomes and past events can be communicated in a variety of ways: Numerically, as probabilities or as uncertainty (confidence) intervals, and verbally, in words or phrases denoting likelihoods and doubts. We discuss in this paper some general issues and problems with both kinds of estimates for assessors, communicators and recipients of the communication, illustrated by current research within the psychology of judgment and decision making.

- Subjective probability estimates of multiple outcomes do not add up to 100%, and are often assessed by a simple proximity heuristic, sometimes making hypothetical outcomes (what could have happened, but did not) more imaginable and likely in retrospect
- Subjective uncertainty intervals are typically too narrow, and appear insensitive to the degree of confidence required
- Revised forecasts are perceived as trends that will continue into the future
- Single bound ranges (“more than 5 mill”, “less than 10 percent chance”) imply qualitative messages in addition to the quantities involved (e.g., opinions, recommendations, and the existence of trends)
- Verbal phrases are of two kinds: Positive (possible, a chance) or negative (not certain, unlikely). They are directional, by asking recipients to consider either the occurrence or the non-occurrence of a target outcome.
- Communicators regularly use the modal verb can to describe extreme (top) outcomes, regardless of their probabilities. However, such estimates are often perceived by recipients to denote expected rather than extreme values, leading to exaggerated claims.

These judgmental aspects of words and numbers are often neglected, but should be taken into account in all stages of project management.

Keywords: Subjective probability estimates; Uncertainty intervals; Verbal probabilities; Communication

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(NFR project: “Uncertainty communication and climate change”)

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How degrees of risk and knowledge are expressed

- Numerically
 - As **probabilities** (60% probability of a 2 degrees rise in temperatures)
 - As outcome **intervals** (a rise of 1 – 4 degrees)
 - As confidence interval (a 90% probability of 1-4 degrees rise)
 - As probability ranges (60 – 80% chance of a 2 degrees rise)
 - With verbal modifiers (**single bound** intervals): (more than 60% likely; at most 4 degrees warmer)
- Verbal phrases
 - Positive (it is likely)
 - Negative (it is uncertain)

Biases of judgmental estimates

- Probabilities are too large
 - Additivity neglect
 - Proximity heuristic
- Intervals are too narrow
 - Insensitive to probabilities
- Verbal phrases are vague
 - Illusion of communication
- Most estimates "leak" surplus (qualitative) information
 - Reveal attitudes, warnings and recommendations

Additivity neglect or: how to break the 100% rule

- The policy rate (styringsrenten) is now (August 2009) 1.25 %.

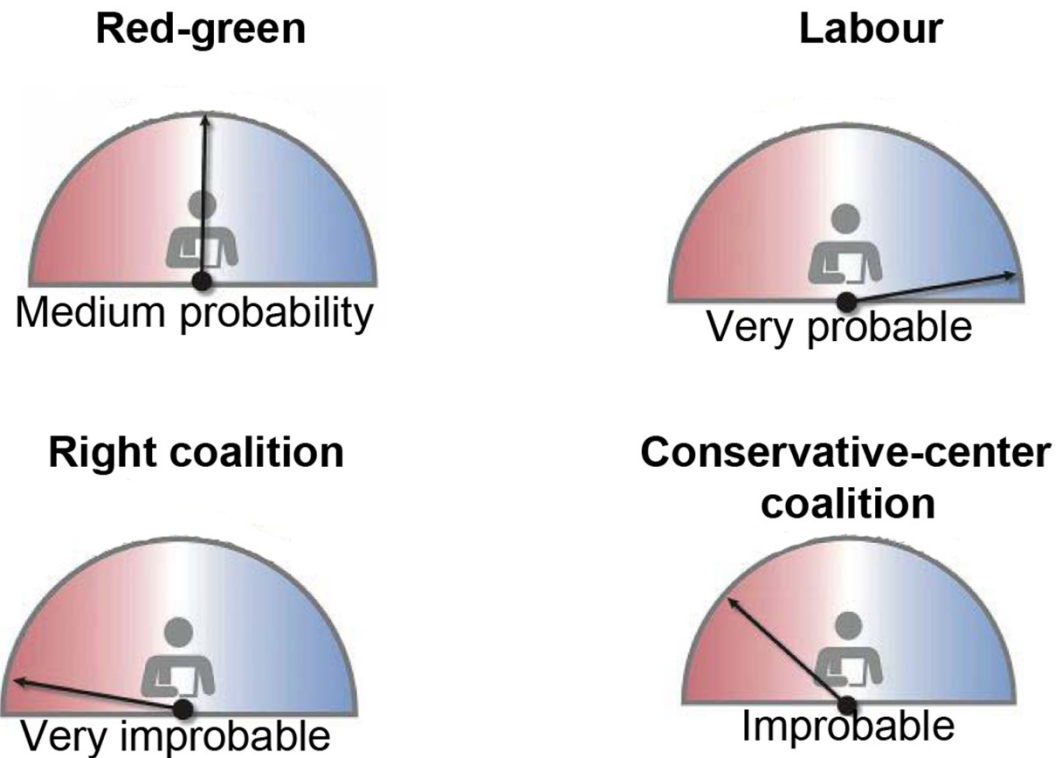
This is an all-time low and a rise is expected. What is the probabilities for next year?

- under 2.5 % 51 %
- 2.5 % or more 48 % Sum: 99%

- under 2.0 % 36 %
- 2.0—3.0 % 49 %
- over 3.0 % 22 % Sum: 109%

- under 2.0 % 40 %
- 2.0—2.5 % 44 %
- 2.5—3.0 % 34 %
- over 3.0 % 21 % Sum: 139%

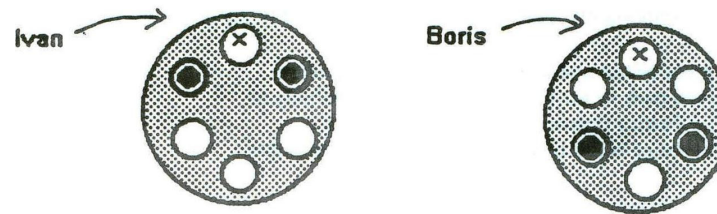
Expert predictions of the most likely government coalitions after the general election in Norway (Aftenposten, 20.8.2009)



Probabilities after the fact

- Chances of what actually happened and what **could have happened** are judged differently
- Counterfactual probabilities are often based on a **closeness heuristic** («almost»)

- Ivan and Boris play Russian roulette with two bullets. It ends well



- What were their chances of survival?
- What were their chances of being killed?

Counterfactual probabilities

Closeness to death study

- Have you ever been in a situation in which your life was in danger? (yes or no).
- If yes, describe the situation briefly
- Estimate your probability of actually being killed.
0 10 20 30 40 50 60 70 80 90 100%
- How "close" were you to death, on a scale from 0 to 10.
- How many other students (out of 100) do you believe have been in an equally or more dangerous situation?

Common problems with interval (range) estimates

- They are always too narrow
 - 98% min-max intervals for work time led to 60% hits (Connolly & Dean, 1997)
- People are overconfident with high assigned probabilities
- High probability and low probability intervals are similar (Teigen & Jørgensen, 2005)
- Tight intervals are often believed to reflect high certainty (Løhre & Teigen, unpublished)

Why are the intervals too tight?

- We want to appear knowledgeable
- We want to be informative (Yaniv & Foster, 1995)
- We lack feedback about outcomes
- We do not keep records of them
- We think of each prediction as unique
- We consider only "normal circumstances"
- The unexpected cannot be predicted (by definition)
- We are anchored in the most likely value
- We only consider *likely* outcomes

Single-bound intervals

«more than X» «less than y»

- An under-researched topic
- Contain implicit messages about evaluations, recommendations and increasing or decreasing trends
- «More than x% is a lot»

- **Under fem prosent sjanse** for en fin, rolig og kald julaften
Det spøker for den hvite jula.

Bare 50 prosent sjanse for å unngå klimakatastrofe

EKSPERTENE FØR SKJEBNEKAMPEN:

- **UNDER TI PROSENT SJANSE** FOR NORGE-SEIER

Skyer kan kjøle ned klimaet mindre enn vi har trodd

Nesten helt sikkert ny global varmere rekord i år

Under 50 prosent sjanse for at Lynberger plassen

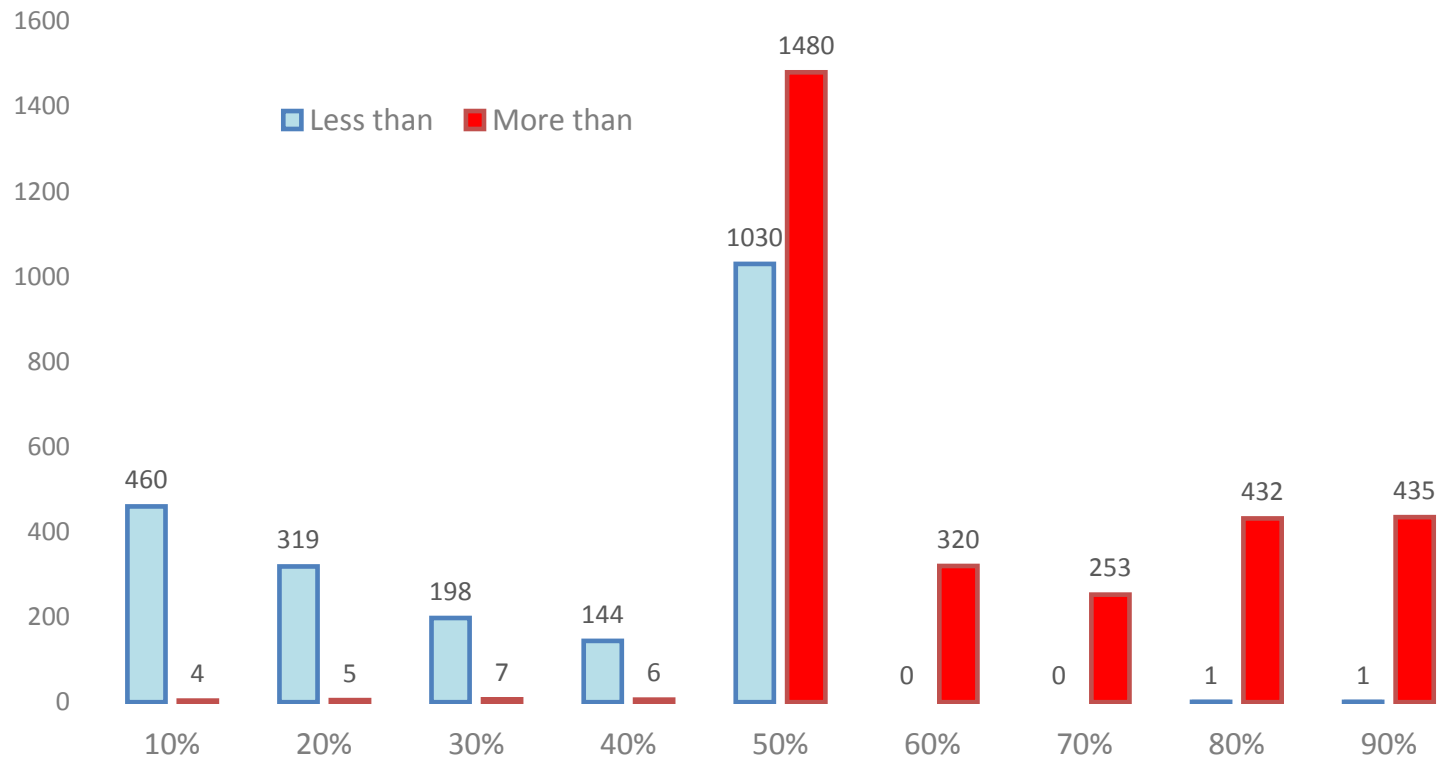
FNS KLIMAPANELS FEMTE RAPPORT

- **Klimaforskerne kan ikke bli sikrere**

FNs klimapanel er 95 prosent sikre på at menneskene har skylda for klimaendringene.

FNs klimapanel mente i 1990 at det var **mer enn 50 prosent** sannsynlighet for at klimaendringene var menneskeskapt. Nå er forskerne **mer enn 90 prosent** sikre. De mener sannsynligheten for at denne oppvarmingen skyldes naturlige klimaprosesser alene, er **mindre enn 5 prosent**.

Occurrence frequencies of «Less than x percent chance» and «More than x percent chance» in Google News



Common problems with verbal probabilities

- They are vague, elastic and idiosyncratic (difficult to translate into numbers)
- People have low variability awareness
- They are directional (positive or negative)
- They are selective in addressing different outcomes (the case of «can»)

Directionality:

Two kinds of verbal probabilities

Positive phrases

(pointing to occurrences)

- Almost certain
- Very probable
- Likely
- Not improbable
- Possible
- Not impossible
- It **Can** happen
- Perhaps
- Cannot rule out
- A chance
- A slight possibility
- A hope

Negative phrases

(pointing to non-occurrences)

- Not quite certain
- Not sure
- Somewhat uncertain
- Perhaps not
- Rather improbable
- Doubtful
- Improbable
- Unlikely
- Almost impossible
- Impossible

Positive/negative phrases and decisions

Marianne is considering a new treatment for migraine headaches, and asks you whether you think she should give it a try. You happen to know some physicians, who after discussion conclude:

Group 1: It is *quite uncertain* that the treatment will be helpful in her case.

On this background, would you advise Marianne to try the new method of treatment?

33% yes

Group 2: It is *some possibility*

91% yes

Group 3: The probability is about *30-35 per cent* ...

58% yes

Klimaforandringer **kan** påvirke turisme

– Global oppvarming **kan få alvorlige konsekvenser**

Det viser en ny rapport som klimapanelet la fram mandag. Den viser at den globale oppvarmingen vil øke hvis vi ikke gjør endringer i utslipp.

Global oppvarming **kan** overstige togradersmålet: – Vil få katastrofale konsekvenser

Økt temperatur **kan bremse produktiviteten i Sørøst-Asia**

Arbeidsliv og karriere

HMS og beredskap

Internasjonalt

Miljø

av Redaksjon -

28. oktober 2015

0

Havet **kan** stige 1,5 meter uten utslippskutt

Deler av Nordvest-Europa kan i verste fall vente seg en havnivåstigning på 1,5 meter i dette år en ny, dansk studie.

NTB

Vulkanutbrudd **kan** gi kaldere klima

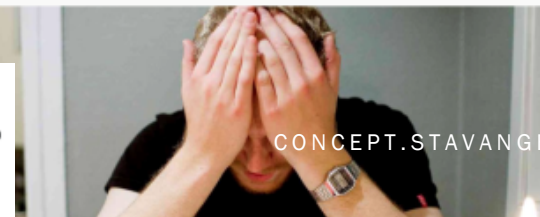
Den gloheite skyen fra Island kan gi en kald sommer.

Slik **kan** global oppvarming ødelegge helgekosen din

KARL MATHESSEN/THE GUARDIAN
OPPDATERT: 26.JUL. 2015 15:54 | PUBLISERT: 30.JUN. 2015 11:07



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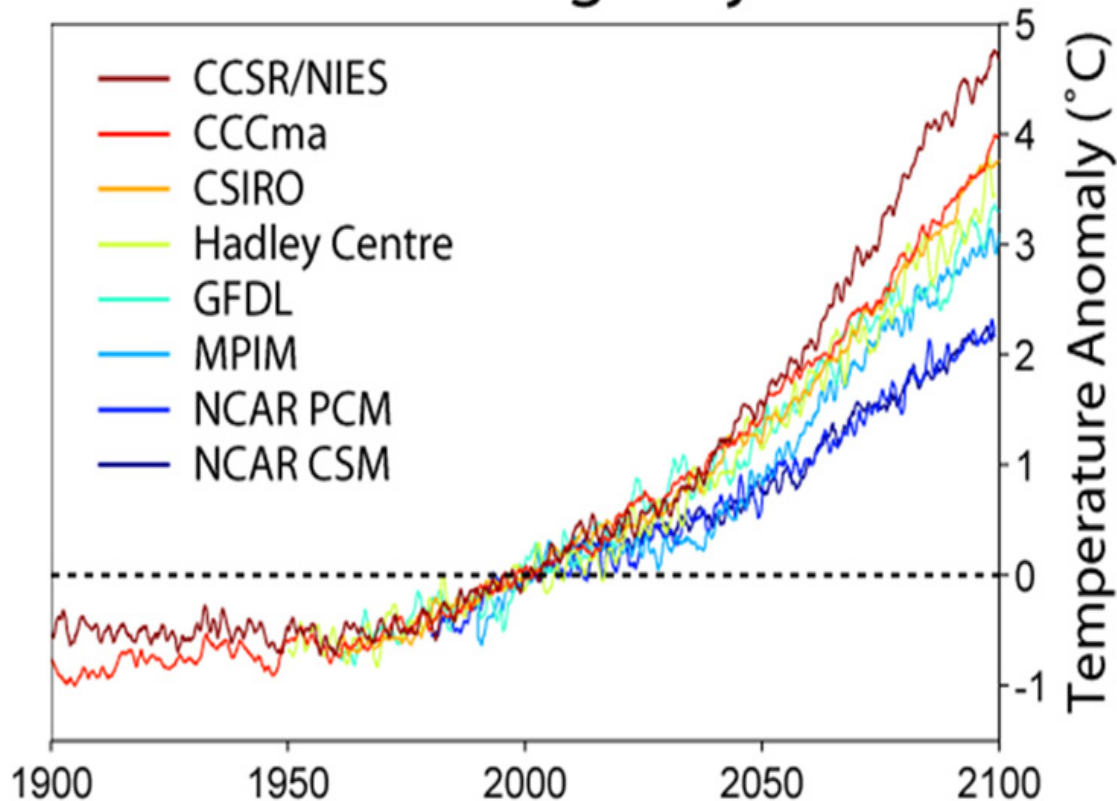


CONCEPT. STAVANGER

15/09/2016

It can be degrees warmer

Global Warming Projections



15/09/2016

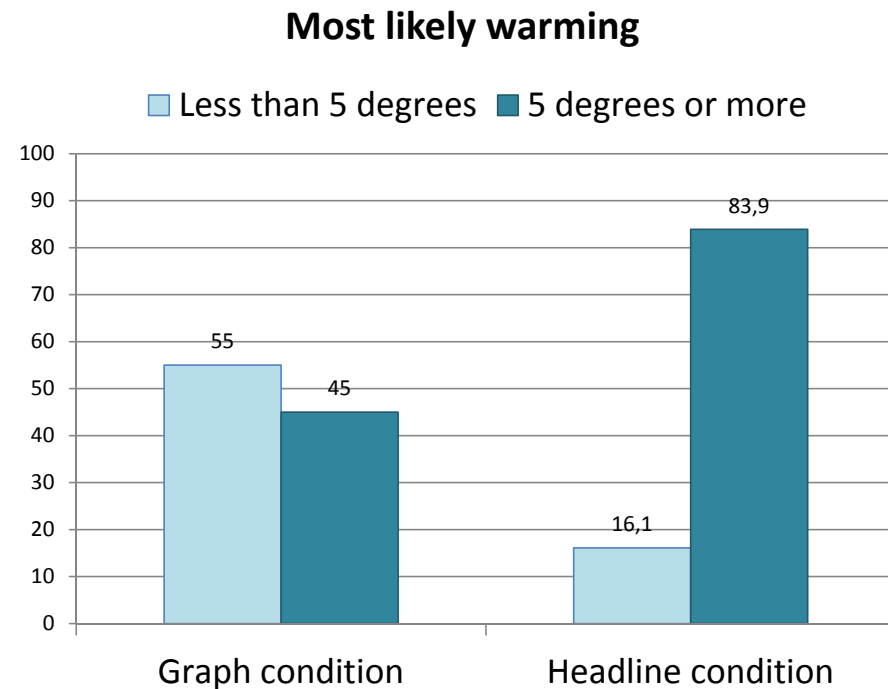
Concept.Stavanger

GRAPH CONDITION

- Imagine a journalist writing about eight different climate forecasts of global warming. What will he choose as a headline?
- «It can be degrees warmer by the year 2100»
- (but most likely less)

Headline condition

- Participants were not shown the graph, but told that the journalist had chosen this headline:
- «It can be 5 degrees warmer by the year 2100»
- Based on extant models it will most likely be ... degrees warmer
- People think «can» refers to a likely outcome



Can is an amazing verb

- It allows us to exaggerate and speak the truth at the same time

Conclusions

- When we communicate uncertainty we communicate imprecise (approximate) factual information
- But we also communicate opinions and recommendations
- Including our own prior expectations
- These pragmatic considerations must be investigated in their own right.

Why should we care about people's biases?

- We sometimes have to rely on judgmental input from lay people or experts' "gut feelings"
- Even "domain experts" are not always experts in forecasting
- Our judgments have to be communicated to decision makers and to the public, who share some of these intuitions
- Therefore, beware!