The ambiguous epistemic and deontic status of some typical statements about the future in the SPMs of WG II and III in IPCC's Fifth Assessment Report (AR5)

Pierre Lejeune
Faculdade de Letras de Universidade de Lisboa
lejeunepierre@hotmail.com

Plan

1. The readability of IPCC's predictions
   a) The contradiction between :
      - logics of *predictions /degrees of likelihood* of expected events
      - logics of *scenarios*
   b) The linguistic indetermination of utterances

2. The IPCC's self- declared mission of being

   «policy relevant, yet policy neutral and not policy prescriptive»

The IPCC

- «The IPCC is a scientific body under the auspices of the United Nations (UN). It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. »

IPCC's Working Groups

- «The IPCC Working Group I (WG I) assesses the physical scientific aspects of the climate system and climate change.
- The IPCC Working Group II (WG II) assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.
- The IPCC Working Group III (WG III) assesses options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere.»

Assessment Reports (AR)

- «These are published materials composed of the full scientific and technical assessment of climate change, generally in three volumes, one for each of the Working Groups of the IPCC, plus a Synthesis Report. Each of the Working Group volumes is composed of individual chapters, an optional Technical Summary and a Summary for Policymakers.
- The Synthesis Report synthesizes and integrates materials contained within the Assessment Reports and Special Reports and is written in a non-technical style suitable for policymakers and address a broad-range of policy-relevant but policy-neutral questions. It is composed of a longer report and a Summary for Policymakers.»

Corpus

2 documents belonging to AR 5 (published in 2013/14):

1. Summary for Policymakers (SPM) of *Climate Change 2014: Impacts, Adaptation and Vulnerability* (WG 2) (34 p.)

2. Summary for Policymakers (SPM) of *Climate Change 2014: Mitigation of Climate Change* (WG3) (32 p.)

Prediction

(1) 2/17 The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (*high confidence*).

(2) 2/19 Major future rural impacts are expected in the near term and beyond through impacts on water availability and supply, food security, and agricultural incomes, including shifts in production areas of food and non-food crops across the world (*high confidence*).

Prediction under climate change

- (3) 2/19 Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist (*very high confidence*). Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change (*high confidence*).
- (4) 2/17 Due to projected climate change by the mid 21st century and beyond, global marine-species redistribution and marine-biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity and other ecosystem services (*high confidence*).
- (5) 2/17 All aspects of food security are potentially affected by climate change, including food access, utilization, and price stability (*high confidence*). Redistribution of marine fisheries catch potential towards higher latitudes poses risk of reduced supplies, income, and employment in tropical countries, with potential implications for food security (*medium confidence*).

Multiple causes and causal chains

- (6) 2/14 Climate change is projected to reduce raw water quality and pose risks to drinking water quality even with conventional treatment, due to interacting factors: increased temperature; increased sediment, nutrient, and pollutant loadings from heavy rainfall; increased concentration pollutants during droughts; and disruption of treatment facilities during floods (*medium evidence, high agreement*).

- (7) 2/15 Increased tree mortality and associated forest dieback is projected to occur in many regions over the 21st century, due to increased temperatures and drought (*medium confidence*). Forest dieback poses risks for carbon storage, biodiversity, wood production, water quality, amenity, and economic activity.

Numerical predictions are rare

(8) 3/28 The demand reduction in transport fuel associated with a 1 % price increase is 0.6 % to 0.8 % in the long run, although the short-run response is much smaller.

Scenarios in IPCC's reports

- «Scenarios of how the future might evolve capture key factors of human development that influence GHG emissions and our ability to respond to climate change. Scenarios cover a range of plausible futures, because human development is determined by a myriad of factors including human decision making. Scenarios can be used to integrate knowledge about the drivers of GHG emissions, mitigation options, climate change, and climate impacts. »

(Technical Summary WG3)

AR 5: Representative Concentration Pathways (RCPs)

- «The standard set of scenarios used in the AR5 is called Representative Concentration Pathways (RCPs).
- The RCPs describe four different 21st century pathways of greenhouse gas emissions and atmospheric concentrations, air pollutant emissions and land use.
- The RCPs represent the range of greenhouse gas emissions in the wider literature well; they include a stringent mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0), and one scenario with very high greenhouse gas emissions (RCP8.5). Scenarios without additional efforts to constrain emissions ("baseline scenarios") lead to pathways ranging between RCP6.0 and RCP8.5. RCP2.6 is representative of a scenario that aims to keep global warming *likely* below 2°C above pre-industrial temperatures. »

AR4: SRES (Special Report on Emissions Scenarios)

- *There is no single most likely, "central", or "best-guess" scenario, either with respect to SRES scenarios or to the underlying scenario literature.* Probabilities or likelihood are not assigned to individual SRES scenarios. None of the SRES scenarios represents an estimate of a central tendency for all driving forces or emissions, such as the mean or median, and none should be interpreted as such. The distribution of the scenarios provides a useful context for understanding the relative position of a scenario but does not represent the likelihood of its occurrence.

IPCC's Website, 2015

Scenarios and Probabilities: an evolution

- «In SRES the variety of scenarios in the field of possibilities was not pointing at anything else than a healthy opening to foreseeable futures, a sort of bioversity of imaginaries, which was not liable to be linked to a distribution of probabilities.
- The fourth report introduced a remarkable inflection of this line or thought. It was then acknowledged that «projections may be probabilistic, while scenarios do not ascribe likelihoods». […] In other words, if paths representented by scenarios are not subject to probabilistic treatment, they have now started saying that the results of simulations can be. So much so that one has felt the necessity to codify climatic events' probabilities by means of calibrated expressions. « (Armatte 2010)

Calibrated IPCC Language regarding Uncertainty

- The summary terms for evidence are: limited, medium, or robust. For agreement, they are low, medium, or high. Levels of confidence include five qualifiers: very low, low, medium, high, and very high, and are typeset in italics, e.g., medium confidence.
- The likelihood, or probability, of some well-defined outcome having occurred or occurring in the future can be described quantitatively through the following terms: virtually certain, 99–100% probability; extremely likely, 95–100%; very likely, 90–100%; likely, 66–100%; more likely than not, >50–100%; about as likely as not, 33–66%; unlikely, 0–33%; very unlikely, 0–10%; extremely unlikely, 0–5%; and exceptionally unlikely, 0–1%.

IPCC Guidance Note on Uncertainty (2010)

Scenarios of the future described like a picture

(9) 3/20 Decarbonizing (i. e. reducing the carbon intensity of) electricity generation is a key component of cost-effective mitigation strategies in achieving low-stabilization levels (430 – 530 ppm CO2eq); in most integrated modelling scenarios, decarbonization happens more rapidly in electricity generation than in the industry, buildings, and transport sectors (medium evidence, high agreement) (Figure SPM.7). In the majority of low-stabilization scenarios, the share of low-carbon electricity supply (comprising renewable energy (RE), nuclear and CCS) increases from the current share of approximately 30 % to more than 80 % by 2050, and fossil fuel power generation without CCS is phased out almost entirely by 2100

Baseline (or «business as usual») scenarios

(10) 3/8 Without additional efforts to reduce GHG emissions beyond those in place today, emissions growth is expected to persist driven by growth in global population and economic activities.

(11) 3/22 In 2010, the buildings sector24 accounted for around 32 % final energy use and 8.8 GtCO2 emissions, including direct and indirect emissions, with energy demand projected to approximately double and CO2 emissions to increase by 50 – 150 % by mid-century in baseline scenarios (medium evidence, medium agreement).

Non-baseline scenarios with probabilities

(12) 2/20 By 2100 for the high-emission scenario RCP8.5, the combination of high temperature and humidity in some areas for parts of the year is projected to compromise normal human activities, including growing food or working outdoors (*high confidence*).

(13) 3/10 Mitigation scenarios reaching concentration levels of about 500 ppm CO2 eq by 2100 are more likely than not to limit temperature change to less than 2 °C relative to pre-industrial levels, unless they temporarily 'overshoot' concentration levels of roughly 530 ppm CO2eq before 2100, in which case they are about as likely as not to achieve that goal

Cases of indetermination

- (14) 2/19 More severe and/or frequent extreme weather events and/or hazard types are projected to increase losses and loss variability in various regions and challenge insurance systems to offer affordable coverage while raising more risk-based capital, particularly in developing countries.

- (15) 2/14 Freshwater-related risks of climate change increase significantly with increasing greenhouse gas concentrations (*robust evidence,high agreement*). The fraction of global population experiencing water scarcity and the fraction affected by major river floods increase with the level of warming in the 21st century.

Possible actions and expected outcomes

(16) 2/15 Management actions, such as maintenance of genetic diversity, assisted species migration and dispersal,manipulation of disturbance regimes (e.g., fires, floods), and reduction of other stressors, can reduce, but not eliminate, risks of impacts to terrestrial and freshwater ecosystems due to climate change, as well as increase the inherent capacity of ecosystems and their species to adapt to a changing climate (*high confidence*).

(17) 3/23 The energy intensity of the industry sector could be directly reduced by about 25 % compared to the current level through the wide-scale upgrading, replacement and deployment of best available technologies, particularly in countries where these are not in use and in non-energy intensive industries (high agreement, robust evidence). Additional energy intensity reductions of about 20 % may potentially be realized through innovation (limited evidence, medium agreement).

Expected outcomes of action under felicity conditions

(18) 3/21 GHG emissions from energy supply can be reduced significantly by replacing current world average coal-fired power plants with modern, highly efficient natural gas combined-cycle power plants or combined heat and power plants, provided that natural gas is available and the fugitive emissions associated with extraction and supply are low or mitigated (robust evidence, high agreement).

Expected outcomes and side effects

(19) 2/26 Risk financing mechanisms in the public and private sector, such as insurance and risk pools, can contribute to increasing resilience, but without attention to major design challenges, they can also provide disincentives, cause market failure, and decrease equity.

(20) 3/17 Mitigation policy could devalue fossil fuel assets and reduce revenues for fossil fuel exporters, but differences between regions and fuels exist (high confidence). The availability of CCS [Carbon Capture and Storage] would reduce the adverse effect of mitigation on the value of fossil fuel assets (medium confidence).

«Policy relevant not policy prescriptive»

- «The report also assesses mitigation options at different levels of governance and in different economic sectors, and the societal implications of different mitigation policies, but does not recommend any particular option for mitigation.» (SPM 3, p. 4)

Axiological modality

(21) 3/29 Providing access to modern energy services is an important sustainable development objective.

(22) 3/18 Infrastructure developments and long-lived products that lock societies into GHG-intensive emissions pathways may be difficult or very costly to change, reinforcing the importance of early action for ambitious mitigation (robust evidence, high agreement).

(23) 3/20 Efficiency enhancements and behavioural changes, in order to reduce energy demand compared to baseline scenarios without compromising development, are a key mitigation strategy in scenarios reaching atmospheric CO2eq concentrations of about 450 to about 500 ppm by 2100 (robust evidence, high agreement). Near-term reductions in energy demand are an important element of cost-effective mitigation strategies, provide more flexibility for reducing carbon intensity in the energy supply sector, hedge against related supply-side risks, avoid lock-in to carbon-intensive infrastructures, and are associated with important co-benefits.

Deontic Modality

(24) 3/21 While all components of integrated CCS [Carbon Capture and storage] systems exist and are in use today by the fossil fuel extraction and refining industry, CCS has not yet been applied at scale to a large, operational commercial fossil fuel power plant. CCS power plants could be seen in the market if this is incentivized by regulation and /or if they become competitive with their unabated counterparts, for instance, if the additional investment and operational costs, caused in part by efficiency reductions, are compensated by sufficiently high carbon prices (or direct financial support). For the large-scale future deployment of CCS, well-defined regulations concerning short- and long-term responsibilities for storage are needed as well as economic incentives.

Reported speech

(25) 3/28 The reduction of subsidies for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context (high confidence). While subsidies can affect emissions in many sectors, most of the recent literature has focused on subsidies for fossil fuels. Since AR4 a small but growing literature based on economy-wide models has projected that complete removal of subsidies for fossil fuels in all countries could result in reductions in global aggregate emissions by mid-century (medium evidence, medium agreement).

Bibliography

- Armatte, Michel, 2010 «La crise des scénarios du changement climatique». In J-Ph. Touffut (dir.), *Changement de Climat, changement d'économie*. Paris, Albin Michel : 101-126.
- Collins Luke C. & Nerlich Brigitte ,2015. «How certain is 'certain'? Exploring how the English-language media reported the use of calibrated language in the Intergovernmental Panel on Climate Change's Fifth Assessment Report». *Public Understanding of Science*, april 2015 : 1-18.
- Dahan Amy & Aykut Stefan, 2013. «After Copenhagen, Revisiting both the scientific and political framings of the climate change regime». In J-B.Saulnier & M.Varella (eds), *Global Change, Energy Issues and Regulation Policies*. Dordrecht : Springer Science. 221-237
- Fløttum, Kjersti, 2010. «A Linguistic and Discursive View on Climate Change Discourse». *La revue du GERAS*, *ASp* 58. 19-37.
- Hulme, Mike ,2011. «Reducing the Future to Climate: a Story of Climate Determinism and Reductio nism», *Osiris*, Vol. 26, No. 1 : 245-266.
- Malone Elisabeth L., 2009. *Debating Climate Change*. London : Earth Scan.