Uncertainty and Quality in Science for Policy

Lecturers from the Centre for the Study of the Sciences and the Humanities, University of Bergen:
Roger Strand (Course leader)
Silvio Funtowicz
Matthias Kaiser
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Guest Lecturers:
Andrea Saltelli, Institute for the Protection and Security of the Citizen (IPSC), European Commission-Joint Research Centre, Ispra, Italy
Jeroen van der Sluijs, Copernicus Institute of Sustainable Development, Utrecht University, the Netherlands

Concept: The main objective of this course is to equip the participants with methodological skills and insights for treating uncertainty and risk related to quantitative information, be it as data for research purposes or as part of scientific advice for public decision-makers. Upon completion of the course, the participants should be able to better identify, characterize and communicate the uncertainty and quality of quantitative information that they themselves produce or that they use from other sources. It is our experience that such skills and insights are useful in research work as well as a “transferable skill” that is particularly relevant when giving scientific advice and taking part in public administration.

In this course, we will introduce various typologies for uncertainty, the so-called NUSAP approach and similar methods for the characterization of uncertainty, the concept of sensitivity analysis and recent discussions on “extended peer review” and participatory approaches to knowledge production. In order to be able to apply such methods wisely, however, profound understanding of the philosophical and historical foundations of concepts of knowledge, evidence, probability, risk and uncertainty is needed. The course literature as well as some of the classes will accordingly go in depth on such theoretical issues.
Specifically, in their seminal book *Uncertainty and Quality in Science for Policy* (Kluwer, 1990), Silvio Funtowicz and Jerome Ravetz analysed the strengths, limitations and problems of applying quantitative information in public decision-making, in particular in decisions on environmental and technological risk. Funtowicz and Ravetz distinguished between technical, methodological and epistemic uncertainty. While the discipline of statistics provides concepts and methods for assessing and quantifying uncertainty at the technical level, other, complementary approaches are useful when dealing with methodological and epistemic uncertainty; the latter also known as ignorance. By this effort they paved the way for what later has been known as the field of *post-normal science*, which more than a philosophical theory on the relationship between science and public decision-making also is a field that has produced a number of concepts, methods and approaches to the characterization and management of uncertainty and quality in evidence. This course will provide a theoretical and practical introduction to a selection of these theoretical and methodological developments.

**Target audience:** (1) Researchers from all disciplines that apply quantitative methods or (2) rely on or use quantitative information in their research and/or (3) are likely to apply quantitative information in future (non-research) work, in particular in civil service or public policy.

**Expertise of the instructor team:** Our two guest lecturers, Andrea Saltelli and Jeroen van der Sluijs, are two of the leading researchers in the world on the topic of this course, and are invited world-wide to universities and governmental institutions to lecture and give advice. Furthermore, the course topic is one of the strongest research foci at SVT (the Centre for the Study of the Sciences and the Humanities). Silvio Funtowicz, a founder and one of the leading researchers in this field, is now Adjunct Professor (“Professor II”) at SVT. Funtowicz has given lectures and courses on the topic world-wide. Fjelland and Kaiser originally introduced these topics to Norwegian universities and academia already in the 1990s and have published and taught them ever since. Strand, together with Funtowicz and the proposed invitees (and others), has published and lectured the topic in Norway and abroad, including giving advanced courses at the Autonomous University of Barcelona and the National Autonomous University in Mexico, the European Parliament’s Directorate for Impact Assessment and European Added Value and the European Commission’s Joint Research Centre in Ispra, Italy. It would be our pleasure to share our internationally recognised expertise on uncertainty and quality with the Bergen Summer Research School.
Course preparation (in addition to reading materials): All participants should submit a paragraph (5-20 lines) on the topic:

“Are issues of uncertainty and quality of scientific information or knowledge relevant to your work? Do you encounter problems and challenges in this respect? Please explain.”

These texts will be used by the instructors to tailor some details of the course.

Outline of the course: We understand that the course should be structured as 15 sessions of approx. 90-150 minutes each. While the exact order of topics also would depend a bit on the background of the participants (and accordingly we always adjust the schedule along the way!) – a likely schedule is the following:

1. Introduction and overview. When and why is uncertainty a problem?
2. The “predict-then-act” decision-making model and its relationship with the legitimacy of scientific advice in public decision-making: a historical and philosophical perspective.
5. The precautionary principle.
6. Indeterminacy, the science-society interface and the framing of scientific problems and decision problems.
7. The NUSAP method.
8. Mapping issues of uncertainty and quality in participants’ fields.
9. Philosophical approaches to the concept of quality.
10. Introduction to sensitivity analysis.
11. Knowledge assessment methodologies.
12. The expert-citizen relationship and transdisciplinary approaches to uncertainty (including extended peer review).
13. The politicization of uncertainty.
15. Conclusions and further work (essays).

Credits: The participants’ own institutions must approve credits for the course. Course participants will receive a Course Certificate recommending the award of either 3 or 10 ECTS. A certificate recommending the award of 3 ECTS credits will be issued to students who participate fully in the BSRS mandatory sessions. A certificate recommending the award of 10 ECTS will be issued to students who, in addition to attending the BSRS
mandatory sessions, submit a paper of approximately 6000 words, and has this approved by the course leaders.

**Examination:** 3 ECTS credits will be awarded to students who participate in full in the BSRS mandatory sessions (course and plenary) throughout the 2 weeks, but who choose not to submit a paper for evaluation, or whose paper is not approved.

For students who want to obtain 10 ECTS credits, the course is approved on the basis of a final paper of approximately 15 – 20 pages (6000 - 8000 words).

- The deadline for summiting the paper is 15 September.
- To be approved, the paper should be of publishable quality, either as a stand-alone paper or as part of the methodological or theoretical discussion within a doctoral dissertation (e.g. as part of the synopsis).
- Students whose paper is not approved on the first submission will have the opportunity to revise and resubmit the paper.
- The deadline for resubmission is 15 October.

**Language of examination:** English

**Grading:** Grades are awarded as A or F, where A is approved and F is a fail.

**Reading list:**