



Quality Assurance Checklist (QUACK)

Dimension: Input data		
Criterion: Scientific & methodological quality		
Quality indicator	Checklist	Guidance material
Transparency	<p>Are all data sources referenced? Please provide which category (observation, simulation, etc) of data you used and the source.</p> <p>Example: Forcing data: Precipitation , Station data, 1 h, 24 stations, national weather service</p> <p>Simulation: GCM data, 50 km resolution; ensemble of five models; RCP 4.5 and 8.5, provided by C3S_422_Lot1_SMHI</p>	<p>Netcdf metadata standard for climate and forecast data: http://cfconventions.org/index.html</p>



	Do the metadata follow international standards?	There are also compliance checkers available: http://cfconventions.org/compliance-checker.html
Appropriateness	Are the used data appropriate for the case study in terms of spatial and temporal scale?	See publication by Baron et al. 2005 : "From GCM grid cell to agricultural plot: scale issues affecting modelling of climate impact" - pdf on request available
Completeness	Is the technical consistency checked (no outliers, no gaps in time series, etc.)?	Quality assurance of data: https://www.dkrz.de/up/services/data-distribution/data-publication/quality-assurance-of-data
	Do you have all available data sets considered?	Europe's 2016 indicator report: https://www.eea.europa.eu/publications/climate-change-impacts-and-vulnerability-2016

Dimension: Processing

Criterion: Scientific & methodological quality

Quality Indicator	Checklist	Guidance Material
Transparency	Are the processing steps (i.e. scripts) well documented and reproducible?	Software tool on good modelling practice: http://harmoniqua.wur.nl/public/Products/most.htm Example of good practice for documenting processing steps is using flow charts: For a guide about flow charts, see for e.g. https://creately.com/blog/diagrams/flowchart-guide-flowchart-tutorial/



		<p>Example on how to share and make data analysis directly accessible: Perez-Riverol et al. 2016: 'Ten Simple Rules for Taking Advantage of Git and GitHub' https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4945047/pdf/pcbi.1004947.pdf</p>
	<p>Are the applied methods well documented and follow scientific standards (i.e. peer reviewed)?</p>	<p>Metadata standards for climate impact indicators. Ruth Petrie et al. 2016: http://www.clipc.eu/media/clipc/org/documents/other/metadata_standards_for_climate_impact_indicators_v1.4.pdf</p>
<p>Appropriateness</p>	<p>Are the used methods, for instance bias-adjustment, appropriate for the case study?</p>	<p>Our FAQs and webinars http://climateservice-global.eu/wp-content/uploads/What-is-bias-correction.pdf</p>
<p>Accuracy/ Robustness</p>	<p>Are the uncertainties assessed systematically in a standard manner?</p>	<p>Statistical methods for the analysis of simulated and observed climate data - Applied in projects and institutions dealing with climate change impact and adaptation Hennemuth, et al. 2013 http://www.climate-service-center.de/imperia/md/content/csc/projekte/csc-report13_englisch_final-mit_umschlag.pdf</p> <p>IPCC AR5 guidance note on consistent treatment of uncertainties: A common approach across the working groups Mastrandrea, et al , 2010: https://www.ipcc-wg1.unibe.ch/guidancepaper/ar5_uncertainty-guidance-note.pdf</p>



<p>Accuracy/ Robustness</p>	<p>Is the case study based on different global or regional climate model simulations? In case that not all simulations of an ensemble are used, is the selection well explained and justified?</p>	<p>Our FAQs and webinars http://climateservice-global.eu/wp-content/uploads/How-to-use-different-RCPs.pdf http://climateservice-global.eu/wp-content/uploads/Value-spread-in-Ensembles.pdf</p> <p>IPCC: Good Practice Guidance Paper on Assessing and Combining Multi Model Climate Projections Knutti, et al 2010: http://www.ipcc.ch/pdf/supporting-material/expert-meeting-assessing-multi-model-projections-2010-01.pdf</p> <p>For regional indicators: Guidance for EURO-CORDEX climate projections data use(including validation,bias adjustment,robustness, etc.) http://www.euro-cordex.net/imperia/md/content/csc/cordex/euro-cordex-guidelines-version1.0-2017.08.pdf</p>
	<p>Is the showcase using climate emission scenarios i.e. a low, medium and high scenario?</p>	<p>Guidelines for Use of Climate Scenarios Developed from Regional Climate Model Experiments Mearns et al. 2003: www.ipcc-data.org/guidelines/dgm_no1_v1_10-2003.pdf</p>
<p>Validation</p>	<p>Is validation possible for the showcase? Is there a procedure in place for a validation against independent data?</p>	<p>Our FAQs and webinars http://climateservice-global.eu/wp-content/uploads/Soil-moisture-compared-to-EO-data.pdf</p>



		<p>For regional indicators: Guidance for EURO-CORDEX climate projections data use (including validation, bias adjustment, robustness, etc.) Published by the EURO-CORDEX community http://www.euro-cordex.net/imperia/md/content/csc/cordex/euro-cordex-guidelines-version1.0-2017.08.pdf</p>
<p>Reflectivity</p>	<p>Is the scientific consistency among multiple data sets and their findings well documented? (i.e. comparing your results to the hindcast peer reviewed studies)</p>	<p>Statistical methods for the analysis of simulated and observed climate data - Applied in projects and institutions dealing with climate change impact and adaptation Hennemuth, et al. 2013 http://www.climate-service-center.de/imperia/md/content/csc/projekte/csc-report13_englisch_final-mit_umschlag.pdf</p>
<p>Criterion: Practical relevance</p>		
<p>Suitability for target group</p>	<p>Is the relevance for the client assured?</p>	



Dimension: Output

Criterion: Scientific & methodological quality

Quality Indicator	Checklist	Guidance material
<p style="text-align: center; color: red;">Transparency</p>	<p>Are the produced results provided with metadata?</p>	<p>Guidance for uncertainty assessment and communication Arthur et al 2013 http://www.pbl.nl/sites/default/files/cms/publicaties/PBL_2013_Guidance-for-uncertainty-assessment-and-communication_712.pdf</p> <p>http://www.pbl.nl/sites/default/files/cms/publicaties/PBL_2013_Guide-for-uncertainty-communication_1339.pdf</p>
	<p>Are the limits of provided information disclosed?</p>	<p>The Uncertainty Handbook: A practical guide for climate change communicators Adam Corner, Stephan Lewandowsky, Mary Phillips, Olga Roberts https://climateoutreach.org/resources/uncertainty-handbook/</p>
<p style="text-align: center; color: red;">Consistency</p>	<p>About the visualization of your output: Do the graphics and tables of the presentation match the captions and explanations?</p>	



Reliability	Is the confidence of the data presented (e.g. the spread of the whole ensemble)?	Our FAQs and webinars http://climateservice-global.eu/wp-content/uploads/How-to-explore-confidence.pdf
Criterion: Practical relevance		
Lucidity/ Clarity	Is the presentation of your output clear and does it follow visualization standards?	Selection of practical advice on visualizing scientific data: http://blogs.nature.com/methagora/2013/07/data-visualization-points-of-view.html
	Do the pictures, and maps used match the explanation i.e. story?	
Rights of Use	Are the rights of dissemination clarified (i.e. open access)?	Ten Simple Rules for Better Figures': For example: Rougier, et al 2014: http://journals.plos.org/ploscompbiol/article/file?id=10.1371/journal.pcbi.1003833&type=printable
Usability	Is the output intuitively presented and freely accessible?	
Criterion: Review process		
Review by third party	Are the results of the showcases reviewed externally or internally? To what level the review process was taken.	



Dimension: Outcome		
Criterion: Satisfaction		
Quality Indicator	Checklist	Guidance material
Usefulness	Does the product help for problem solving of your client?	