MIDAS includes the descriptions of models in use by the Commission in support to the policy cycle. MIDAS is developed and managed by the **Competence Centre on Modelling** of the European Commission.

Find out more at https://ec.europa.eu/knowledge4policy/modelling_en
Contact: EU-MIDAS@ec.europa.eu

Factsheet

SWD/2022/190 final

Impact assessment accompanying the Proposal for a Regulation of the European Parliament and of the Council on standards of quality and safety for substances of human origin intended for human application and repealing Directives 2002/98/EC and 2004/23/EC

Supporting model(s)

SOCRATES

Impact assessment
SWD/2022/190 final

Fact sheet on model contributions

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Overview of model contributions to the impact assessment SWD/2022/190 final

Title
Impact assessment accompanying the Proposal for a Regulation of the European Parliament and of the Council on standards of quality and safety for substances of human origin intended for human application and repealing Directives 2002/98/EC and 2004/23/EC

Document ID
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Led by
SANTE

Model(s) used
SOCRATES

Additional information
-

SOCRATES

Full title
SOcial multi CRiteria AssessmenT of European policieS

Run for this impact assessment by
JRC.I.2

Contributed to
Baseline and assessment of policy options

Helped to assess the following impacts

The model was used to derive the ranking of the policy options, interpretation of the pairwise comparison, use of intervals, sensitivity analysis, equity analysis for a consistent and transparent policy decision.

Overview of models

SOCRATES

Overview

Acronym SOCRATES
Full title SOcial multi CRiteria AssessmenT of European policieS

Main purpose
SOCRATES is a new multiple criteria software tool, explicitly designed for ex-ante Impact Assessment (IA) problems. It implements the methodology Social Multi-Criteria Evaluation (SMCE), which has been explicitly designed for public policy.

Summary
Quantitative evidence plays an important role in many Impact Assessments (IAs), but also qualitative data such as stakeholder input, conclusions of evaluations, as well as scientific and expert advice are frequently used. This generates a multitude of criteria of varying nature, which should be consistently integrated and evaluated when comparing policy options. The most widespread multidimensional approach to ex-ante IAs is multi-criteria decision analysis (MCDA), which forms the basis for social multicriteria evaluation (SMCE), which has been explicitly designed for public policy. SMCE allows taking into account a wide range of assessment criteria, such as the impact on SMEs, the degree of protection of fundamental rights, consumer protection, etc. while all the multidimensional profiles of the problem remain in their original scales of measurement.

SOCRATES (**SO**cial multi **CR**iteria **A**ssessmenT of **E**uropean policie**S**) is a new multiple criteria software tool designed to implement SMCE. Developed by the Joint Research Centre, SOCRATES has been explicitly designed for ***ex-ante* Impact Assessment (IA) problems**. Overall, the objective of SOCRATES and the underlying SMCE methodology is not to substitute policy-makers through a mathematical model, but to improve their understanding of the main features of the problem at hand, such as key assumptions, degree of uncertainty, robustness of results and overall technical and social defensibility of options chosen.

While SMCE has already been applied in a multitude of policy problems since, its recent technical implementation SOCRATES is now applied to support EC impact assessments, starting with DG SANTE.

Keywords
Integrated Assessment, decision criteria, economic-environmental model, conflict, socio-economic, Public Policy, Multi-Criteria Evaluation, ex-ante Impact Assessment, Multiple-Criteria Analysis

Model category (thematic)
Other

Model home page
No information provided

Ownership & license

Ownership
EU ownership (European Commission)

Ownership details
The software has been developed in the context of the European Commission's Competence Centre on Modelling.

Licence type
Non-Free Software licence

Details

SOCRATES structure and approach

SOCRATES implements the methodology Social Multi-Criteria Evaluation (SMCE). In the following we therefore describe both in more detail:

SMCE

An SMCE framework is useful for dealing with the following question: how can the Commission integrate a plurality of technical aspects and social views into its ex-ante impact assessment in a coherent and transparent manner? SMCE allows taking into account a wide range of assessment criteria; for example, the impact on SMEs, the degree of protection of fundamental rights, consumer protection, etc. All the multidimensional profiles of the problem are shown in their original scales of measurement; this is the main difference with traditional cost-benefit analysis (CBA), which grounds on steps like monetizing all social, environmental, and human rights aspects. In this respect, CBA and SMCE are not conflictual but complementary: CBA can easily be a component of a SMCE framework, dealing with the economic dimension.

The implementation of a Social Multi-Criteria framework involves the following main steps:

1. Selection of the social actors relevant for the problem at hand.
2. Definition of social actors' values, desires and preferences.
3. Generation of evaluation criteria as a process of technical translation of social actors' needs, preferences and desires.
4. Construction of the multi-criteria impact matrix.
5. Construction of an equity impact matrix, illuminating all the distributional consequences of each single option in terms of stakeholder types.
6. Application of a mathematical procedure. This is normally done by using a software tool.
7. Sensitivity and robustness analysis.

The *impact matrix* presents in a structured way, the information on the various criterion scores, i.e. each element of the matrix represents the performance of each option according to each evaluation criterion. In general, in a multi-criterion problem, there is no "ideal" solution optimizing all the criteria at the same time, and therefore "compromise solutions" have to be found.

The importance of mathematical approaches in SMCE is their ability to allow a consistent aggregation of the diverse information. Otherwise, even if everybody would agree on the multidimensional nature of an IA study, the implementation in a real-world assessment exercise would be impossible. The standard objection might be that the aggregation of apples and oranges is impossible. Multi-criteria mathematics does answer to this objection in a definitive way. When using mathematical rules, consistency between the problem structuring and the ranking of policy options is guaranteed, this makes the overall IA study much more defensible.

In summary a SMCE approach can supply a methodological framework where the hierarchical structure of the option comparison step of a typical ex-ante IA (including dimensions, objectives and

evaluation criteria) is clarified as much as possible by means of well-established concepts in the decision theory literature. This might help in increasing the degree of homogeneity across IA studies.

SOCRATES

The application of SMCE is not particularly time consuming, since it formalises in a consistent and efficient way a process that often is already done in the current practice of IA (almost all IA studies present the results in the form of an impact matrix). Moreover, JRC has developed SOCRATES (**SO**cial multi-**CR**iteria **A**ssessmen**T** of **E**uropean policie**S**), to support SMCE, which makes all required computations very quick. Three main components constitute the core of SOCRATES: multi-criteria, equity and sensitivity analyses.

From a mathematical point of view, the information contained in the impact matrix useful for solving the so-called multi-criterion problem is:

- Intensity of preference (when quantitative criterion scores are present).
- Number of criteria in favour of a given alternative.
- Weight attached to each single criterion.
- Relationship of each single alternative with all the other alternatives.

Combinations of this information generate different aggregation conventions, i.e. manipulation rules of the available information to arrive at a preference structure. The aggregation of several criteria implies taking a position on the fundamental issue of compensability. Compensability is a very important concept when MCDA is applied to integrate various policy dimensions. For example, in evaluating a policy option that presents a very bad environmental impact and a very good economic impact, it is clear that allowing or not for compensability and to which degree is the key assumption.

An aggregation rule that is simple, non-compensatory and minimises the rank reversal phenomena is the kemeny rule. Its basic idea is that the maximum likelihood ranking of policy options is the ranking supported by the maximum number of criteria (or criterion weights) for each pair-wise comparison, summed over all pairs of options considered. There is agreement in the literature that the Kemeny method is “the correct method” for ranking options, and that the only drawback of this aggregation method is the difficulty in computing it when the number of options grows. A numerical algorithm solving this computational drawback in an efficient way has been developed recently at JRC and it has been implemented in SOCRATES.

Various authors have argued that the presence of qualitative information in evaluation problems concerning socio-economic issues is a rule, rather than an exception. Thus there is a clear need for methods that are able to take into account information of a "mixed" type (both qualitative and quantitative criterion scores). Moreover, ideally, this information should be precise, certain, exhaustive and unequivocal. Nevertheless, in reality, it is often necessary to use information which does not have those characteristics so that one has to face the uncertainty of a stochastic and/or fuzzy nature present in the data. Therefore, multi-criteria methods able to tackle consistently the widest types of mixed information should be considered as desirable ones in the IA framework.

From a mathematical point of view, SOCRATES deals with two main issues:

1. the problem of equivalence of the procedures used in order to standardize the mixed criterion scores;
2. the problem of comparison of fuzzy numbers typical of all fuzzy multi-criteria methods.

These two issues are dealt with a new semantic distance that is useful in the case of continuous, convex membership functions also allowing a definite integration.

Overall, the objective of SOCRATES is NOT substitution of policy-makers through a mathematical model, on the contrary, the objective is to improve their understanding of the main features of the problem at hand, such as key assumptions, degree of uncertainty, robustness of results and overall technical and social defensibility of options chosen. The philosopher Socrates said *"I cannot teach anybody anything. I can only make them think."* This is the main inspiring principle of the SOCRATES software too.

The SOCRATES software offers a measurement framework where the various criterion scores can assess impacts by using both quantitative (e.g. as result of simulation models) and qualitative (e.g. results of participatory techniques) information, and the mathematical aggregation rule guarantees consistency and transparency of results.

Three main components constitute the core of SOCRATES: multi-criteria, equity and sensitivity analyses. **Multi-criteria analysis** requires the definition of relevant dimensions, objectives and criteria. It uses weights as importance coefficients and clarify their role in the hierarchical structure. The impact matrix may include either quantitative (including also stochastic and/or fuzzy uncertainty) and qualitative (ordinal and/or linguistic) measurements of the performance of an alternative with respect to an evaluation criterion. It supplies a ranking of the alternatives according to the set of evaluation criteria (i.e. the technical compromise solution/s).

Equity analysis requires as input a set of social actors and their qualitative evaluation of the alternatives considered in the multi-criteria analysis. The equity analysis produces the following information:

- indications of the distance of the positions of the various social groups (i.e. possibilities of convergence of interests or coalition formations);
- ranking of the alternatives according to actors' impacts or preferences (social compromise solution).

The objective of **sensitivity analysis** is to check if the rankings provided are stable and to determine which of the input parameters influence more the model output. The whole information produced by local and global sensitivity analyses is synthesised into simple graphics.

Input and parametrization

SMCE proceeds on the basis of following main concepts: dimensions, objectives, criteria, weights, criterion scores, impact matrix and compromise solution.

- **Dimension** is the highest hierarchical level of analysis and indicates the scope of objectives, criteria and criterion scores. In IA studies, the general categories of economic, social and environmental impacts are dimensions.

- **Objectives** indicate the direction of change desired, e.g. growth has to be maximized, social exclusion has to be minimized, carbon dioxide emissions have to be reduced.
- A **criterion** is a function that associates alternative actions with a variable indicating its desirability.
- **Weights** are often used to represent the relative importance attached to dimensions, objectives and criteria. The idea behind this practice is very intuitive and easy, that is, to place the greatest number in the position corresponding to the most important factor.
- A **criterion score** is an assessment of the impact consistent with a given criterion with reference to a policy option. Criterion scores can be both qualitative or quantitative.
- The **impact matrix** presents in a structured way, the information on the various criterion scores, i.e. each element of the matrix represents the performance of each option according to each criterion.

In general, in a multi-criterion problem, there is no solution (ideal or utopia solution) optimizing all the criteria at the same time, and therefore **"compromise solutions"** have to be found.

A typical SOCRATES input requires the definition of policy options (called alternatives) dimensions, objectives and criteria. This information leads to the construction of an impact matrix, which may include crisp, stochastic or fuzzy measurements of the performance of an alternative with respect to an evaluation criterion. Qualitative information can be introduced too (in the form of linguistic or ordinal criterion scores). Weights as importance coefficients, may also be introduced. They can be attached to dimensions or criteria. Indifference and preference thresholds can also be introduced when needed. Generally a social conflict matrix is also constructed, where the impacts of each policy option on each social group are presented in a transparent way.

Main output

A typical SOCRATES output gives the following information:

- ranking of the alternatives according to the set of evaluation criteria (i.e. technical compromise solution/s);
- indications of the distance of the positions of the various social groups (i.e. possibilities of convergence of interests or coalition formations);
- ranking of the alternatives according to actors' impacts or preferences (i.e. social compromise solution/s).
- local and global sensitivity analyses of the results provided.

Spatial - temporal extent

The output has the following spatial-temporal resolution and extent:

Parameter	Description
Spatial Extent / Country Coverage	This will depend on the problem structure, the model itself is not limited to any spatial extent. SMCE as such can be applied at a European, National or regional level.
(Spatial) resolution	Other: This will depend on the problem structure, the model itself is not limited to any spatial resolution.

Temporal extent	Other: This will depend on the problem structure, the model itself is not limited to any temporal extent.
Temporal resolution	Other: This will depend on the problem structure, the model itself is not limited to any temporal resolution.

Quality & transparency

Quality

Question	Answer	Details
Models are by definition affected by uncertainties (in input data, input parameters, scenario definitions, etc.). Have the model uncertainties been quantified? Are uncertainties accounted for in your simulations?	yes	SMCE can help in dealing with three different types of uncertainties: epistemological (human representation of a given policy problem necessarily reflects perceptions, values and interests of those structuring the problem), scientific (the existence of different levels and scales at which a hierarchical system can be analyzed implies the unavoidable existence of non-equivalent descriptions of it both in space and time) and technical (Compensability versus non-compensability, relevant preference modelling of intensities of preference, mixed information on criterion scores, weights as trade-offs versus weights as importance coefficients, choice of a proper ranking algorithm). SOCRATES helps in dealing with all these uncertainties.
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	Yes	SOCRATES can deal with both social and technical sensitivity analysis. Sensitivity and robustness analysis looks at the sensitivity of results to the exclusion/inclusion of different criteria, criterion weights and dimensions. While such analysis may look very technical, in reality a social component is always present too. That is, inclusion/exclusion of a given dimension, or set of criteria, normally involves a long story of social, political and scientific controversy, and involves social values and social actors.
Have model results been published in peer-reviewed articles?	Yes	SMCE is a methodology widely used in many geographical contexts around the world. Many peer reviewed publications on SMCE exist both on the methodological and empirical aspects. SOCRATES is based on in house research developed at JRC, fully published in top international scientific journals.
Has the model formally undergone scientific review by a panel of external experts? (Please note that this does not refer to the cases when model results were validated by stakeholders)	No	
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	Not applicable	As a decision model it cannot be validated against observed data.

References related to external peer-review and publication in scientific journals:

- Munda, G. (2021). Qualitative reasoning or quantitative aggregation rules for impact assessment of policy options? A multiple criteria framework. Quality & Quantity. https://doi.org/10.1007/s11135-021-01267-8
- Azzini, I., & Munda, G. (2020). A new approach for identifying the Kemeny median ranking. European Journal of Operational Research, 281(2), 388–401. https://doi.org/10.1016/j.ejor.2019.08.033
- Munda, G. (1995). Multicriteria Evaluation in a Fuzzy Environment. Contributions to Economics. doi:10.1007/978-3-642-49997-5
- Munda, G. (2004). Social multi-criteria evaluation: Methodological foundations and operational consequences. European Journal of Operational Research, 158(3), 662–677. doi:10.1016/s0377-2217(03)00369-2
- Munda, G. (2008). Social Multi-Criteria Evaluation for a Sustainable Economy. Springer-Verlag. doi:10.1007/978-3-540-73703-2
- Munda, G. (2009). A conflict analysis approach for illuminating distributional issues in sustainability policy. European Journal of Operational Research, 194(1), 307–322. doi:10.1016/j.ejor.2007.11.061
- Munda G. and Nardo M. (2009) Non-compensatory/non-linear composite indicators for ranking countries: a defensible setting, Applied Economics Vol. 41, pp. 1513-1523. https://doi.org/10.1080/00036840601019364
- Munda, G. (2012). Intensity of preference and related uncertainty in non-compensatory aggregation rules. Theory and Decision, 73(4), 649–669. doi:10.1007/s11238-012-9317-4
- Munda, G. (2016). Beyond welfare economics: some methodological issues. Journal of Economic Methodology, 23(2), 185–202. doi:10.1080/1350178x.2016.1157199
- Saltelli A, Annoni P, Azzini I, Campolongo F, Ratto M, Tarantola S. Variance based sensitivity analysis of model output. Design and estimator for the total sensitivity index. COMPUTER PHYSICS COMMUNICATIONS 181 (2); 2010. p. 259-270. DOI:10.1016/j.cpc.2009.09.018

Transparency

Question	Answer	Details
To what extent do input data come from publicly available sources? (Note: this may include sources accessible upon subscription and/or payment)	Based on both publicly available and restricted-access sources	
Is the full model database as such available to external users? (The answer 'yes' comprises the cases when access to the database implies a specific procedure or a fee)	Yes	The software itself is public. The input data is dependent on the designed decision model and independent from SOCRATES

Have model results been presented in publicly available reports?	yes	
Have output datasets been made publicly available? (Note: this could also imply a specific procedure or a fee)	no	
Is there any user-friendly interface presenting model results – such as dashboards or interactive interfaces – that is accessible to the public?	yes	The software itself is available online and provides a user-friendly interface.
Is the model code open source?	no	
Can the code be accessed upon request?	yes	The code can be accessed on request by a scrutinising body. Please start a dialogue with the development team. The team can be contacted using the contact details on the CCMOD homepage.
Has the model been documented in a publicly available dedicated report or a manual? (Note: this excludes IA reports)	yes	
Is there a dedicated public website where information about the model is provided?	yes	

References related to model results:

- Munda, G. (2021). Qualitative reasoning or quantitative aggregation rules for impact assessment of policy options? A multiple criteria framework. Quality & Quantity. https://doi.org/10.1007/s11135-021-01267-8

- Azzini, I., & Munda, G. (2020). A new approach for identifying the Kemeny median ranking. European Journal of Operational Research, 281(2), 388–401. https://doi.org/10.1016/j.ejor.2019.08.033

References related to documentation:

- No references provided in MIDAS

The model's policy relevance and intended role in the policy cycle

The model is designed to contribute to the following policy areas

- Agriculture and rural development
- Climate action
- Maritime affairs and fisheries
- Foreign affairs and security policy
- Institutional affairs
- Education and training
- Economy, finance and the euro
- Taxation
- Employment and social affairs
- Energy
- Eu enlargement
- Environment
- Regional policy
- Transport
- Budget
- Competition
- Consumers
- Culture and media
- Customs
- International cooperation and development
- Digital economy and society
- Business and industry
- Food safety
- Fraud prevention
- Public health
- Humanitarian aid and civil protection
- Justice and fundamental rights
- Research and innovation
- Single market
- Sport
- Trade
- Banking and financial services
- Youth
- Home affairs
- European neighbourhood policy
- Migration and asylum
- Borders and security

The model is designed to contribute to the following phases of the policy cycle

- Formulation

The model's potential

SMCE, and with it its implementation SOCRATES, is a methodological framework for taking a plurality of impacts into account, e.g. socio-economic, environmental, cultural, etc. Indeed already today, most IA studies are based on a multi-criteria framework, but in a very broad sense. They use the general idea that an IA study is multidimensional in nature, but they are often based on a qualitative analysis of the various impacts. The importance of mathematical approaches in SMCE is their ability to allow a consistent aggregation of the diverse information.

In summary, why SMCE and why SOCRATES in IA studies?

- SMCE is a well-established methodology for impact assessments. It provides structured steps to build the impact matrix and rank all the feasible policy options. This second step is not present in many EC IA studies and this can be considered a weakness of the current practice. SOCRATES aims at tackling this weakness.
- By applying SMCE, it is possible to add consistency between the problem structuring and the selection of a desirable option, thus improving transparency too.
- By using SOCRATES, it is possible to assure repeatability of the calculation; which adds to the overall goal of transparency desired in the new BR COM.

Previous use of the model in ex-ante impact assessments of the European Commission

Use of the model in ex-ante impact assessments since July 2017.

In the Year	AnaFgas contributed to the Impact assessment called	Led by	By providing input to the	The model was run by	Details of the contribution
2022	Impact assessment accompanying the Proposal for a Regulation of the European Parliament and of the Council on standards of quality and safety for substances of human origin intended for human application and repealing Directives 2002/98/EC and 2004/23/EC	SANTE	Baseline and assessment of policy options	JRC.I.2	The model was used to derive the ranking of the policy options, interpretation of the pairwise comparison, use of intervals, sensitivity analysis, equity analysis for a consistent and transparent policy decision.

Bibliographic references

- Munda, G. Qualitative reasoning or quantitative aggregation rules for impact assessment of policy options? A multiple criteria framework. Qual Quant (2021). https://doi.org/10.1007/s11135-021-01267-8
- Azzini I. and Munda G. (2020) – A New Approach for Identifying the Kemeny Median Ranking, European Journal of Operational Research, Vol. 281, pp. 388-401 https://doi.org/10.1016/j.ejor.2019.08.033
- Cerreta, M., & Toro, P. D. (2010). Integrated spatial assessment for a creative decision-making process: a combined methodological approach to strategic environmental assessment. International Journal of Sustainable Development, 13(1/2), 17. doi:10.1504/ijsd.2010.035096
- Etxano Iker, Vilalba-Eguiluz Unai (2021) - Twenty-five years of social multi-criteria evaluation (SMCE) in the search for sustainability: Analysis of case studies. Ecological Economics, Volume 188, October 2021, 107-131 https://doi.org/10.1016/j.ecolecon.2021.107131
- Gamboa, G. (2006). Social multi-criteria evaluation of different development scenarios of the Aysén region, Chile. Ecological Economics, 59(1), 157–170. doi:10.1016/j.ecolecon.2005.10.014
- Gamboa, G., & Munda, G. (2007). The problem of windfarm location: A social multi-criteria evaluation framework. Energy Policy, 35(3), 1564–1583. doi:10.1016/j.enpol.2006.04.021
- Garmendia, E., & Stagl, S. (2010). Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. Ecological Economics, 69(8), 1712–1722. doi:10.1016/j.ecolecon.2010.03.027
- Martínez-Sastre, R., Ravera, F., González, J. A., López Santiago, C., Bidegain, I., & Munda, G. (2017). Mediterranean landscapes under change: Combining social multicriteria evaluation and the ecosystem services framework for land use planning. Land Use Policy, 67, 472–486. doi:10.1016/j.landusepol.2017.06.001
- Monterroso, I., Binimelis, R., & Rodríguez-Labajos, B. (2011). New methods for the analysis of invasion processes: Multi-criteria evaluation of the invasion of Hydrilla verticillata in Guatemala. Journal of Environmental Management, 92(3), 494–507. doi:10.1016/j.jenvman.2010.09.017
- Munda, G. (1995). Multicriteria Evaluation in a Fuzzy Environment. Contributions to Economics. doi:10.1007/978-3-642-49997-5

- Munda, G. (2004). Social multi-criteria evaluation: Methodological foundations and operational consequences. European Journal of Operational Research, 158(3), 662–677. doi:10.1016/s0377-2217(03)00369-2
- Munda, G. (2008). Social Multi-Criteria Evaluation for a Sustainable Economy. doi:10.1007/978-3-540-73703-2
- Munda G. and Nardo M. (2009) Non-compensatory/non-linear composite indicators for ranking countries: a defensible setting, Applied Economics Vol. 41, pp. 1513-1523. https://doi.org/10.1080/00036840601019364
- Munda, G. (2009). A conflict analysis approach for illuminating distributional issues in sustainability policy. European Journal of Operational Research, 194(1), 307–322. doi:10.1016/j.ejor.2007.11.061
- Munda, G. (2012). Intensity of preference and related uncertainty in non-compensatory aggregation rules. Theory and Decision, 73(4), 649–669. doi:10.1007/s11238-012-9317-4
- Munda, G. (2016). Beyond welfare economics: some methodological issues. Journal of Economic Methodology, 23(2), 185–202. doi:10.1080/1350178x.2016.1157199
- Munda, G., A social multi-criteria framework for ex-ante impact assessment: Operational Issues, EUR 28752 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-72293-6, doi:10.2760/909528, JRC107899.
- Munda, G., Dealing with Fairness in Public Policy Analysis: A Methodological Framework , EUR 28751 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-72292-9, doi:10.2760/75185, JRC107843.
- Munda, G., On the use of Cost-Benefit Analysis and Multi-Criteria Evaluation in ex-ante Impact Assessment, EUR 28768 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-73213-3, doi:10.2760/311199, JRC107900.
- Özkaynak, B. (2008). Globalisation and local resistance: Alternative city developmental scenarios on capital's global frontier—the case of Yalova, Turkey. Progress in Planning, 70(2), 45–97. doi:10.1016/j.progress.2008.04.002
- Saltelli A, Annoni P, Azzini I, Campolongo F, Ratto M, Tarantola S. Variance based sensitivity analysis of model output. Design and estimator for the total sensitivity index. COMPUTER PHYSICS COMMUNICATIONS 181 (2); 2010. p. 259-270. DOI:10.1016/j.cpc.2009.09.018
- Scolobig, A., Broto, V. C., & Zabala, A. (2008). Integrating Multiple Perspectives in Social Multicriteria Evaluation of Flood-Mitigation Alternatives: The Case of Malborghetto-Valbruna. Environment and Planning C: Government and Policy, 26(6), 1143–1161. doi:10.1068/c0765s

- Soma, K., & Vatn, A. (2009). Local democracy implications for coastal zone management—A case study in southern Norway. Land Use Policy, 26(3), 755–762. doi:10.1016/j.landusepol.2008.10.002

- Straton, A. T., Jackson, S., Marinoni, O., Proctor, W., & Woodward, E. (2010). Exploring and Evaluating Scenarios for a River Catchment in Northern Australia Using Scenario Development, Multi-criteria Analysis and a Deliberative Process as a Tool for Water Planning. Water Resources Management, 25(1), 141–164. doi:10.1007/s11269-010-9691-z

- Walter, M., Latorre Tomás, S., Munda, G., & Larrea, C. (2016). A social multi-criteria evaluation approach to assess extractive and non-extractive scenarios in Ecuador: Intag case study. Land Use Policy, 57, 444–458. doi:10.1016/j.landusepol.2016.05.030

- Zendehdel, K., Rademaker, M., De Baets, B., & Van Huylenbroeck, G. (2010). Environmental decision making with conflicting social groups: A case study of the Lar rangeland in Iran. Journal of Arid Environments, 74(3), 394–402. doi:10.1016/j.jaridenv.2009.09.011