

Policy Relevant Sustainability Research

Requirements Profiles for Research Funding Agencies,
Researchers and Policymakers Regarding Improving and
Ensuring Quality of Research – A Guide

Institute for
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ENVIRONMENTAL RESEARCH OF THE
FEDERAL MINISTRY OF THE ENVIRONMENT,
NATURE CONSERVATION AND NUCLEAR SAFETY

Project No. (FKZ) 3711 11 701

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Researchers and Policymakers Regarding Improving and
Ensuring Quality of Research – A Guide

by

Thomas Jahn

Institute for Social-Ecological Research (ISOE) GmbH, Frankfurt / Main

Florian Keil

keep it balanced, Berlin

in collaboration with

Ulrich Petschow

Institute for Ecological Economy Research (IÖW) GmbH, Berlin

Klaus Jacob

Environmental Policy Research Center, Freie Universität Berlin

On behalf of the Federal Environment Agency (Germany)

UMWELTBUNDESAMT

This publication is only available online. It can be downloaded from <http://www.uba.de/uba-info-medien/4394.html> along with a German version.

The contents of this publication do not necessarily reflect the official opinions.

Project execution: Institute for Social-Ecological Research (ISOE) GmbH (project management)
Hamburger Allee 45; 60486 Frankfurt am Main
Institute for Ecological Economy Research (IÖW) GmbH
Potsdamer Str. 105; 10785 Berlin
Environmental Policy Research Center, Freie Universität Berlin
Innestr. 22; 14195 Berlin

Technical supervision: Jörg Mayer-Ries and Florian Raecke
German Federal Ministry for the Environment, Nature Conservation and
Nuclear Safety, Department ZG III 1 „General and Strategic Aspects of
Environmental Policy, Environmental Protection and Sustainability
Strategies“
Kerstin Döscher
Federal Environment Agency, Central Steering

Layout: Harry Kleespies, ISOE

Publisher: Federal Environment Agency (Umweltbundesamt)
Wörlitzer Platz 1
06844 Dessau-Roßlau
Germany
Phone: +49-340-2103-0
Fax: +49-340-2103 2285
Email: info@umweltbundesamt.de
Internet: <http://www.umweltbundesamt.de>
<http://fuer-mensch-und-umwelt.de/>

Dessau-Roßlau, December 2012

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Note on the English Translation:

The actor-specific requirements profiles for a policy relevant sustainability research presented in this guide were developed in the context of the German science system. Some aspects addressed by the profiles or certain technical terms can thus not readily be transferred to other countries. However, the authors believe that for the most part the profiles can provide useful guidance for actors on the international level as well.

Tips on Using this Guide

Research aimed at helping to solve pressing societal problems must meet specific quality requirements: The knowledge it produces must not only be sound but also useable. This is particularly true of research that aims at bringing specific knowledge to bear on policy issues relating to sustainable development. This guide provides detailed actor-specific requirements profiles for this type of “policy relevant sustainability research.”

This guide is aimed at research funding agencies and contracting entities, researchers themselves and policymakers¹ who participate directly in the research process. It can be used both for cases where the research funding agency/contracting entity and the policymaker are different institutions or where they are identical. However, policy consulting by specialized agencies that do not perform original research is not addressed.

¹ In this guide “policymaker” refers to political decision makers or institutions at the municipal, regional or national level who deal with questions concerning sustainability policies.

The requirements profiles serve two functions. First of all, they should function as a guide for the three stakeholder groups, aiding them in their efforts to increase and ensure the quality of research processes and research outcomes. And, secondly, they should improve the reflexive communication among stakeholders regarding the means and the goals of research.

The principle of open-endedness must also be applied to policy relevant sustainability research. Orienting research in line with non-scientific quality requirements, however, harbors the risk of putting this principle in question. The requirements profiles presented here, therefore, should not be seen as demanding a standardization of research processes or as a “check-list” to be followed systematically. Instead, the extent to which they are used during the initiation, execution and implementation of research must be decided case-by-case.

Adhering to additional quality requirements involves costs, both in time and money, for everyone involved, but especially for researchers. Not all research projects can afford such costs. This guide, therefore, is above all aimed at policy relevant sustainability research projects with the following characteristics:

- Participation of at least two research institutions (or two departments within one institution) with different disciplinary orientations and one policymaker as partner;
- research personnel resources consisting of at least 24 person months and a total duration of two years or more;
- an expressed demand on the part of the research funding agency or contracting entity for research aimed at application or implementation;
- resources specifically earmarked by the research funding agency or contracting entity for the implementation of additional quality requirements.

In what follows, first the concept and empirical basis for the development of the requirements profiles are presented. Following that so called key requirements are characterized. The key requirements should allow for a wide applicability of the requirements profiles and also offer guidance to research projects that do not en-

tirely meet the characteristics introduced above. The complete catalogs of requirements for research funding agencies/contracting entities, researchers and policymakers is presented in the last section. Information on the research project which was used to develop this guide, along with acknowledgments, can be found at the end of the document.

The “Great Transition” into sustainable development presents a challenge for the whole of society. Knowledge-based policymaking is one important, but in no way the only, area of action for meeting this challenge. The focus here on policy relevant sustainability research is not meant to question this insight but, rather, to put it into practice. Science interfaces with different sectors of society. Making such interfaces more permeable for the transfer of knowledge means translating their particular features and functions into specific requirements for the actors involved. This guide performs this task for the interface between science and policymaking.

1 Introduction

“Sustainability Research” or “Sustainability Science” has become a common term, one found in the names of research programs, research institutions and specialist journals. But just like the term “sustainability” itself, “sustainability research” is not clearly defined. One finds included under it activities as diverse as, among others, investigating arctic ice cores for understanding climate change and devising concepts for sustainable municipal public transportation and traffic systems.

What is clear among this diversity is that sustainability research is concerned with problems that transcend disciplinary boundaries. Such problems are characterized by the fact that, in addition to raising complex scientific issues, they also represent a pressing need for societal action. This leads to quality requirements on research that go beyond the traditional scientific understanding: Sustainability research must not only provide *well-founded* knowledge but *usable* knowledge as well.

Until now, there have been no elaborated, commonly accepted, actor-specific requirements profiles for sustainability research. Such profiles are needed to support research funding agencies, researchers and stakeholders from civil society, business, administration, and politics in facilitating research aimed at providing transferable scientific knowledge that can increase our capability to deal with sustainability problems. This lack is no doubt part of the reason for the observed phenomenon of excellent research results failing to move cross the border between science and society.

This applies in particular to research aimed at providing advice on sustainable development policy issues. It is for this type of “policy relevant sustainability research” that the detailed actor-specific requirements profiles that follow have been developed. The goal is to provide guidance to research funding agencies/contracting entities, researchers and policymakers so that they can improve the quality of research and their communication with one another. To this end the profiles focus on the particular challenges arising in interdisciplinary and transdisciplinary research.

The scientific quality standards and criteria already in place provide for excellent research. What is now needed in the context of sustainable development are additional, equally accepted quality criteria that better foster research relevant for society and policymaking. Such criteria create procedural reliability and thus contribute to simplifying and disburdening research processes for all participants – something that non-binding requirements can only achieve to a limited degree.

This guide may be understood, then, as a first step in the development of generally accepted, enhanced quality criteria for sustainability research (see also page 12). It was designed specifically as a “learning document:” practical experience gained in applying it will contribute to both the continuous improvement of the requirements profiles and to the development of future projects aimed at developing quality criteria.²

² Comments and suggestions concerning this guide would be greatly appreciated. Please send them to: feedback-nf@uba.de.

2 Concept for Developing the Requirements Profiles

Definition of Sustainability Research

The starting point for developing actor-specific requirements profiles for a policy relevant sustainability research is the following general definition of sustainability research:

Sustainability research is directed at concrete problems in the context of sustainable development, without being limited by disciplinary boundaries and with the aim of producing and communicating methodically founded knowledge that increases society's ability to deal with such problems.

This definition is consistent with a widely shared basic understanding of sustainability research (or “sustainability science”) found in both the international academic discourse and the science policy discourse. Initially, with the help of this definition, nine requirements dimensions were identified that apply to any kind of sustainability research (see Table 1). These requirements dimensions are also consistent with a firmly established basic consensus found within the relevant international expert discourse (see page 27).

systemic	scale spanning	prospective
understanding of social-ecological systems, including feedback effects and temporal inertia	consideration of different spatial and social scales and of transition effects	consideration of alternative development paths, critical thresholds and surprises
context specific	integrative	method based
relation to concrete problems and their respective action and behavioral contexts	integration at epistemic, social-organizational, communicative and technical levels	understandable and transparent production, integration and evaluation of knowledge
critical reflexive	normative	impact oriented
uncertainty, lack of knowledge, cognitive boundaries, impact assessment, role understanding	maintaining the viability of societies, attention to current and future issues of justice	applicability and feasibility, increased capabilities for action, safeguarding knowledge

Table 1: General requirement dimensions for sustainability research.

General Approach to Developing the Requirements Profiles

For the purpose of this guide three areas are distinguished in which research can contribute to raising society's action capabilities with respect to sustainable development: "policy relevance," "societal relevance"³ and "scientific relevance." The nine requirements dimensions introduced above can be translated into concrete requirements profiles for the different actors within each of these three areas. For the area of policy relevant sustainability research this translation is provided in the following.

By distinguishing fundamentally among these three areas the broad spectrum of sustainability research can be covered. Thus, climate research into ice cores can be treated as sustainability research which is primarily aimed at new scientific knowledge. Research, on the other hand, into the spread of sustainable consumption patterns within given population groups is aimed more at social innovations. Finally, research that helps municipalities in formulating and evaluating climate protection strategies is, at its core, concerned with contributing to innovative policy-making.⁴

Research practice often displays close relationships between the three areas. So, for example, in most cases it is hardly possible to formulate a sensible and effective strategy for increasing municipal energy efficiency if the need for changes in consumption and use patterns is not addressed. Thus, the distinction made here between the three areas is not to be taken as a sharply defined classification. Rather, it should be seen as pointing to the insight that, depending on the main lines of research, specific requirements must be met by the various actors involved in order to achieve effective results – an insight drawn from the evaluation of numerous research projects (see page 10).

As shown in the example above, one can assume that many of the requirements proposed for the area "policy relevance" in the following can also be applied to the area of "societal relevance." But this cannot be as readily presupposed regarding the area of "scientific relevance." When working out individual requirements profiles for societally or scientifically relevant sustainability research – which are not covered in this guide – the question of range of application needs to be more closely investigated.

3 "Societal relevance" refers here to demands made on sustainability research in areas such as economics, health, law, engineering, consumption and civil society.

4 The report "World in Transition - A Social Contract for Sustainability" published by the German Advisory Council on Global Change (WBGU), where terms such as "transformation research" and "transformative research" may be found, is a first step towards systematizing this discussion. While the former term refers to studies of transitional processes within social-ecological systems, the latter refers to studies aimed at contributing to shaping and enabling these transitions.

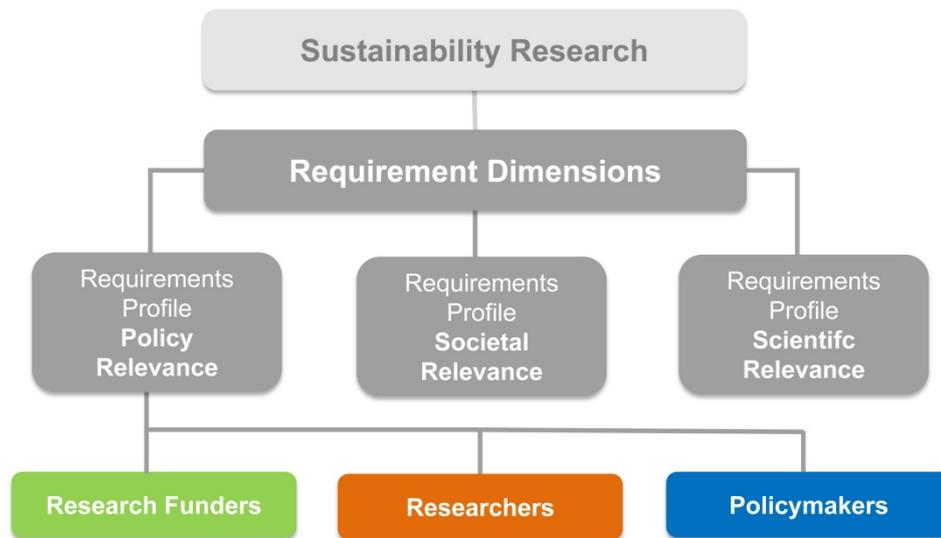


Figure 1: Diagram of the development of requirements for a policy relevant sustainability research. The diagram does not represent a structure of responsibilities for dealing with problems relating to sustainable development. Its function is to support the development of specific requirements for different types of sustainability research.

Function of the Requirements Profiles

The requirements profiles for policy relevant sustainability research presented here are directed towards funding agencies or contracting entities⁵ of such research, as well as researchers and policymakers. The requirements are meant to provide guidance for these stakeholders on how to increase and ensure the quality of research processes and results. Moreover, they should improve the reflexive communication among them regarding the means and goals of research.

⁵ In the development of the requirements profiles research funding has been used as the main model, but its application to contract research is clear. The profile, therefore, speaks to both funding agencies and contracting entities.

3 Empirical Basis for the Development of the Requirements Profiles

The requirements profiles were developed based on in-depth analyses of completed research projects addressing topics in the areas “Sustainable City” and “Risk and Precaution in New Technologies.” Within these two empirical case studies, which were conducted independently, six (for the former) and five (for the latter) projects were analyzed. The projects chosen for consideration were characterized by the fact that they had either a direct application to policymaking or involved policymakers in the research process.

The question that guided the analysis of the projects was what characterizes optimal research constellations that are capable of successful knowledge transfer, and where are barriers to such transfers most likely to arise. The results of these studies, along with examples of how the experience gained from the individual projects was used to develop the requirements profiles, will be presented in the final report of the research project underlying this guide (see page 28).⁶

⁶ The final project report will be available beginning in March 2013 at www.uba.de.

The requirements profiles developed in this manner were critically discussed at an expert meeting and in discussions with representatives of research funding agencies and contracting entities, researchers and policymakers regarding their practical applicability. The results of these discussions have been incorporated into this guide (see page 28).

In addition, existing studies on quality criteria for cross-disciplinary research were evaluated for the development of the requirements profiles. An overview of these studies can be found in the section “Selected Bibliography” (see page 27).

4 Tips on Using the Requirements Profiles

Target Groups of the Requirements Profiles

The requirements profiles for a policy relevant sustainability research presented in the following section are realized as individual catalogs with specific requirements for research funding agencies/contracting entities, researchers and policymakers. The requirements are aimed at both public and private research funding agencies/contracting entities (for example, state or federal government departments or foundations and associations).

Basically, two constellations of actors can be distinguished here. In one constellation funding agencies/contracting entities and policymakers are different institutions. This constellation mainly represents the model of research funding by actors who have no direct policy consulting needs of their own (for example, funding programs by research ministries, offices or councils on issues of sustainable development). In the other constellation research funding agencies/contracting entities and policymakers are identical (such as a government department that contracts for strategic advice to be used for its own policymaking).

The finished requirements profiles do not distinguish between these two constellations of actors. Instead, for the second constellation, the different requirements catalogs are applied independently of one another to the same actor.⁷

⁷ The requirements are not tailored to the special case of dedicated departmental research but can be applied usefully to such cases.

Structure of the Requirements Profiles

The requirements for the three groups of stakeholders were formulated independently of one another, which means, for example, that researchers can apply them even if research funding agencies/contracting entities do not. Ideally, all three groups of actors would apply the appropriate requirements.

The requirements catalogs are structured according to the nine requirement dimensions. In each dimension three temporal phases can be distinguished (for example application, execution and evaluation of a research project). In this way the importance of processes aimed at ensuring and improving research quality is underlined. Specific requirements are formulated for each of these three temporal phases. However, not every dimension is applied in all three phases. So, for example, the dimensions “systemic,” “scale spanning” and “prospective” are particularly relevant to the phases of the preparation of a funding measure or the application for a research project.

It should be noted that a requirement that refers to the realization of a quality assurance measure in a following phase is not repeated in that phase. If, for example, an applicant presents a procedure for assessing the impact of a proposed policy, then the subsequent implementation of the procedure will not be formulated as a requirement but simply assumed.

Range of the Requirements Profiles

The requirements for research funding agencies/contracting entities come into effect with the formulation of the research program or the call for proposals. The process of identifying topics – research's “agenda setting” – and of coordinating action with other funding agencies and policymakers is not directly addressed by the requirements. As our own empirical studies have shown, however, they can be used for these processes as well to support the actors involved.

The requirements profiles also do not cover the assessment of grant applications or proposals. However, individual requirements can be readily translated into evaluation criteria and it is thus recommended to use them in evaluation procedures. Given the diversity of such evaluation procedures – for example, peer-review, internal evaluation or evaluation by project management agencies – formulating appropriate requirements did not seem expedient.

Application of the Requirements Profile

The extent to which the requirements profiles will be applied during the initiation, execution and implementation of research must be decided on a case-by-case basis. In this sense, the catalogs presented in the following pages form a stock of resources from which the actors addressed can draw depending on their needs. Basically, the requirements profiles are designed so that all requirements can be usefully applied in research project contexts meeting the characteristics as defined in the section “Tips on Using this Guide”.⁸

The application of the requirements profiles is meant to ease the burden of the actors involved by providing a common basis for communication regarding the nature of effective quality assurance measures. In line with this the profiles can be used both in the planning and operational control of processes, as well as in the creation of products. As far as processes are concerned, the requirements profiles can be applied not only during the designated temporal phases but also during the preparation of the evaluation of entire research programs. In addition to its use in preparing calls for proposals, performance descriptions, grant applications and reports of results, the profiles can also be used to create and evaluate utilization plans.

⁸ Some of the requirements can be applied not only to sustainability research but to research in general. The guide is, therefore, understood as a basis for more broadly defined requirements profiles.

5 Requirements Profiles for a Policy Relevant Sustainability Research

The requirements profiles for a policy relevant sustainability research will be introduced in two steps in the following sections. First, core requirements are discussed. Then the comprehensive requirements catalogs are presented in a second step. The core requirements and the requirements catalogs are presented separately for research funding agencies/contracting entities, researchers and policymakers.

Core Requirements

Identifying nine core requirements for each of the three groups of stakeholders has two functions. The catalogs include a wide spectrum of requirements. Not all of these requirements are of equal importance for every possible case. The core requirements are thus designed, on the one hand, to enable wide applicability of the guide and to facilitate access to the comprehensive requirements catalogs. And, on the other hand, they should offer guidance to those research projects which do not meet the characteristics described in section “Tips on Using this Guide”.

Core requirements for research funding agencies/contracting entities	
Is the possibility of funding implementation projects following the current funding measure earmarked and are performance criteria for the granting of such projects defined? → <i>requirement dimension "impact oriented"</i>	
Is the applicant/contractor asked to justify which dimension or systemic aspect of the policy-making action field is not examined (in terms of dealing with complexity)? → <i>requirement dimension "systemic"</i>	
Are the essential levels of action and actors in the policymaking action field named in the research program or call for proposals? → <i>requirement dimension "scale spanning"</i>	
Does the research program or call for proposals provide for measures to promote a "learning research process" (for example, information events during the application phase, goal setting activities, review points, cross-cutting activities, monitoring research)? ⁹ → <i>requirement dimension "critical-reflexive"</i>	
Are funding possibilities for integration efforts considered and are applicants/contractors required to submit an elaborated integration concept? ¹⁰ → <i>requirement dimension "integrative"</i>	
Is a two-stage application procedure considered which supports the development of a common problem description, in particular one negotiated between applicants/contractors and policymakers, and are adequate resources made available for this? → <i>requirement dimension "integrative"</i>	
Is the applicant/contractor required to provide an estimate of the potential benefit of the research to policymaking and to science? → <i>requirement dimension "impact oriented"</i>	
Is the possibility of revising the goals of a funding measure in light of new scientific knowledge considered in the monitoring of the measure? → <i>requirement dimension "critical-reflexive"</i>	
Is the funding measure evaluated upon completion with regard to the possible improvement of future funding measures? → <i>requirement dimension "critical-reflexive"</i>	

9 Interdisciplinary and transdisciplinary cooperation demand a high willingness to learn on the part of all parties. Everyone must be open to new forms of knowledge, new communication cultures and different institutional interests. In a "learning research process" willingness to learn is not assumed; rather, such a learning research process is facilitated with appropriate measures.

10 An integration concept indicates which methods can best facilitate scientific cooperation among participating academic departments and scientific disciplines. It also shows how cooperation with non-scientific stakeholders, as well as a dialogue with society, should be organized.

Core requirements for researchers

During the making of the proposal are appropriate policymaking partners identified and is it clear whether the institutional and financial conditions enabling their active and continuous participation in the research process are provided for?

→ *requirement dimension "context specific"*

Is the concrete problem to be studied agreed upon with the policymakers (and possibly with the research funding agency/contracting entity as well) or does the project's implementation concept include a procedure for reaching such an agreement?

→ *requirement dimension "context specific"*

Does the proposal explain which dimensions or systemic relationships within the context of a policymaking action field will not be studied and how this should be dealt with in the course of the project (in terms of dealing with complexity)?

→ *requirement dimension "systemic"*

Does the proposal include an elaborated integration concept with defined integration goals, and are the costs of the integration efforts adequately accounted for in the resource planning?

→ *requirement dimension "integrative"*

Does the project's execution concept provide for measures that enable a learning research process or are the appropriate offers or guidelines provided by the research funding agency/contracting entity taken into account?

→ *requirement dimension "critical-reflexive"*

Is a strategy for the transfer of knowledge developed and presented in the proposal?

→ *requirement dimension "impact oriented"*

Does the project provide for a continuous transfer of knowledge among the participating disciplines and between the project team and the participating policymakers?

→ *requirement dimension "integrative"*

Are the project's outcomes temporarily and linguistically compatible with the needs and expectations of the policymakers and is this regularly checked during the course of the project?

→ *requirement dimension "impact oriented"*

Does the final report clearly present the potentials and limits of the practical and scientific knowledge gained in the project?

→ *requirement dimension "critical-reflexive"*

Core requirements for policymakers

Are own financial and human resources committed to ensuring ongoing involvement in the research project or is the need for appropriate additional resources indicated (to the funding agencies or researchers)?

→ *requirement dimension "integrative"*

Is the timely application for an implementation project considered or is an internal process to implement the results of the research launched?

→ *requirement dimension "impact oriented"*

Are the conditions for actually implementing the expected policy recommendations identified and communicated early enough to the researchers?

→ *requirement dimension "context specific"*

Are distinct success criteria for the project defined in consultation with the researchers?

→ *requirement dimension "impact oriented"*

Are the own targets for the in principle open-ended research process set broadly enough and can unexpected research results be communicated internally?

→ *requirement dimension "prospective"*

Are the options developed for implementing the policy recommendations regularly checked during the course of the project?

→ *requirement dimension "impact oriented"*

Are changes in one's own policy, institutional or temporal framework, as well as in one's own goals communicated at an early stage in the course of executing the project?

→ *requirement dimension "context specific"*

Are the researchers promptly informed about potential synergy effects or conflicts with the policymaker's own new policy objectives or those of others?

→ *requirement dimension "scale spanning"*

Is the knowledge generated adequately safeguarded and made available for the own policymaking practice (possibly in consultation or cooperation with the researchers)?

→ *requirement dimension "impact oriented"*

Requirements Catalogs

In the following section the comprehensive requirements catalogs for research funding agencies/contracting entities, researchers and policymakers are presented. The structure of the catalogs corresponds to the nine requirement dimensions of sustainability research (see Table 1). Within each dimension, three time phases are distinguished (see Section 4) and, where applicable, appropriate requirements assigned. The core requirements introduced above are indicated in the three catalogs below.

For research funding agencies/contracting entities and researchers the focus of the requirements is on the first phase (either preparing a funding measure/contract or a proposal for a research project). There are two reasons for this. On the one hand, this phase is particularly important: errors made while formulating a call for proposals or during the application process are difficult to correct at a later point – here a path gone down can only be abandoned with great difficulty. On the other hand, the following phases are to a greater extent more case specific, that is more dependent on the particular subject matter and goal of a given research process. In contrast to these two stakeholders, the requirements for policymakers are distributed more evenly across all three phases.

Research funding agencies/contracting entities		
systemic	scale spanning	prospective
I Preparing a funding measure/contract		
<p>Are the environmental, social and economic aspects of the policy action field considered?</p> <p>Is the applicant/contractor asked to justify which dimension or systemic aspect of the policymaking action field is not examined (in terms of dealing with complexity)?</p> <p>→ <i>core requirement</i></p>	<p>Are the essential levels of action and actors in the policymaking action field named in the re-search program or call for proposals? (e.g., municipal, regional, national or international/global)?</p> <p>→ <i>core requirement</i></p>	<p>Do the own goals support an open-ended research process?</p> <p>Are potential conflicts or synergies arising between one's own actions or those of others on the policymaking action field in question indicated?</p>
II Monitoring a funding measure/contract		
		<p>Are recent policy developments relevant to the policymaking action field in question identified and communicated to the researchers?</p>
context specific	integrative	method based
I Preparing a funding measure/contract		
<p>Are the societal and policymaking actors relevant to the policymaking action field in question identified?</p> <p>Are the knowledge or consulting requirements specific to the policymaking action field in question clearly formulated?</p> <p>Is there an estimate of the temporal development of the policymaking action field and is it matched to the duration of the funding measure/contract and to the foreseeable amount of re-search work to be carried out?</p> <p>Is the applicant/contractor asked to focus on the problem from a scientific perspective or to adapt to the consulting needs of the policymakers to be included?</p>	<p>Is the applicant/contractor required to include policymakers and are pointers given indicating the expected form of inclusion?</p> <p>Are funding possibilities for integration efforts considered and are applicants/contractors required to submit an elaborated integration concept?</p> <p>→ <i>core requirement</i></p> <p>Is a two-stage application procedure considered which supports the development of a common problem description, in particular one negotiated between applicants/contractors and policymakers, and are adequate resources made available for this?</p> <p>→ <i>core requirement</i></p>	<p>Are the applicants/contractors required to provide an overview of the relevant state of knowledge and the methods to be used?</p> <p>Is the possibility of developing a cross-disciplinary, problem specific set of methods provided for?</p> <p>Are the applicants/contractors asked to select an integrative research approach (e.g., interdisciplinary or transdisciplinary), or to name their own?</p>

II Monitoring a funding measure/contract		
Are changes in policymaking priorities and in the temporal development of the policymaking action field promptly communicated?	Are opportunities for networking with other projects covered by the funding measure/contract or with relevant policymakers supported?	
critical reflexive	normative	impact oriented
I Preparing a funding measure/contract		
<p>Does the research program or call for proposals provide for measures to promote a "learning research process" (for example, information events during the application phase, goal setting activities, review points, cross-cutting activities, monitoring research)?</p> <p>→ <i>core requirement</i></p> <p>Is the applicant/contractor required to make an initial assessment of the consequences of implementing the policy recommendations developed?</p> <p>Is the applicant/contractor required to determine the various roles researchers and policymakers will play during the project and to consider the potential for conflict among these roles?</p>	<p>Is one's own understanding of sustainability made explicit and applied to the policy making action field in question, and is reference made, where appropriate, to existing sustainability goals (e.g. in the context of a national sustainability strategy)?</p> <p>Is the applicant/contractor required to refer to an existing understanding of sustainability and to justify possible deviations from this?</p> <p>Is an own estimate of which kind of sustainability knowledge (system, orientation or transformation knowledge) should be produced by the funding measure/contract made?</p>	<p>Are the own expectations concerning the form and usefulness of the research results formulated and communicated?</p> <p>Is the applicant/contractor required to provide an estimate of the potential benefit of the research to policymaking and to science?</p> <p>→ <i>core requirement</i></p> <p>Are the applicants/contractors required to provide a knowledge transfer strategy?</p> <p>Is the possibility of funding implementation projects following the current funding measure earmarked and are performance criteria for the granting of such projects defined?</p> <p>→ <i>core requirement</i></p> <p>Are the policymakers required to declare their readiness in principle to implement the project results?</p>
II Monitoring a funding measure/contract		
<p>Are the measures funded to support a learning research process implemented?</p> <p>Is the possibility of revising the goals of a funding measure in light of new scientific knowledge considered in the monitoring of the measure?</p> <p>→ <i>core requirement</i></p>		<p>Are the policymaking partners supported (logistically, financially) during preparation of an implementation project?</p> <p>Are the specified success criteria for deciding on the financing of an implementation project vetted?</p>

III Evaluating a funding measure/contract		
<p>Are the researchers required to describe the limits of the research results or policy recommendations developed?</p> <p>Is the funding measure evaluated upon completion with regard to the possible improvement of future funding measures?</p> <p>→ <i>core requirement</i></p>		<p>Are the researchers required to describe the contribution of the research to achieving the goals set by the funding program?</p> <p>Are the policymakers supported in the realization of an implementation phase (logistically, symbolically)?</p> <p>Are the researchers required to safeguard the new knowledge produced during the project and make it accessible?</p>

Researchers		
systemic	scale spanning	prospective
I Applying for a research project		
<p>Is it shown which theoretical understanding of “system” (i.e., a concept of the interaction between society and environment) is in play and how systemic relations within the context of the policymaking action field are to be investigated?</p> <p>Does the proposal explain which dimensions or systemic relationships within the context of a policymaking action field will not be studied and how this should be dealt with in the course of the project (in terms of dealing with complexity)?</p> <p>→ <i>core requirement</i></p>	<p>Are adjacent policymaking action fields identified and is it shown how potential synergies or conflicts should be included and studied?</p>	<p>Is an explicit procedure established that helps to ensure the open-endedness of the research project in view of the policymaking goals of the funding measure/contract or of the policymakers?</p> <p>Is an approach developed with which to study the consequences of implementing the policy recommendations?</p>
II Executing a research project		
	<p>Is the extent to which the policy recommendations developed are compatible with relevant developments in other actions fields studied?</p>	
context specific	integrative	method based
I Applying for a research project		
<p>During the making of the proposal are appropriate policymaking partners identified and is it clear whether the institutional and financial conditions enabling their active and continuous participation in the research process are provided for?</p> <p>→ <i>core requirement</i></p> <p>Is the concrete problem to be studied agreed upon with the policymakers (and possibly with the research funding agency/contracting entity as well) or does the project's implementation concept include a procedure for reaching such an agreement?</p> <p>→ <i>core requirement</i></p>	<p>Are reasons provided justifying the composition of the project team regarding the scientific and technical expertise needed to work on the policymaking problem in question?</p> <p>Does the proposal include an elaborated integration concept with defined integration goals, and are the costs of the integration efforts adequately accounted for in the resource planning?</p> <p>→ <i>core requirement</i></p>	<p>Is an integrative research approach (e.g., interdisciplinary or transdisciplinary) selected and is it vetted for its suitability for dealing with the problem as described?</p> <p>Is the relevant existing pool of knowledge surveyed and are already existing methods for dealing with the problem as described identified?</p> <p>Is it shown to what extent it might be necessary to develop new problem specific methods for dealing with the problem as described?</p>

<p>Is the policy problem translated into a scientific research question?</p> <p>Are the social groups relevant to the policymaking action field identified and is it shown how their knowledge, as well as possible value and interest conflicts among them, are to be taken into account?</p> <p>Is the research concept aligned with the time line of the policy action plan such that, for example, short-term, medium-term and long-term goals have been distinguished?</p>	<p>Is it shown how the participating disciplines will work together to produce the knowledge needed and how they will work together with the policymaking partners?</p> <p>For two stage application processes: Is it explained in applying for the first stage how the policymaking partner should be involved in the research process and how a common problem description will be developed by the start of the second phase?</p>	<p>Is an orientation towards additional quality criteria, where present, referred to, or do the researchers establish their own quality criteria?</p>
<p>II Executing a research project</p>		
<p>Are the conditions for implementing the policy recommendations developed examined and are adjustments, if necessary, made to the product design?</p>	<p>Is cooperation within the project team and the involvement of the policymaking partner regularly reflected on and are adjustments made, when necessary, to the integration concept?</p> <p>Does the project provide for a continuous transfer of knowledge among the participating disciplines and between the project team and the policymakers? → <i>core requirement</i></p> <p>Are offers to exchange experiences with other projects under the same funding measure or with relevant policymakers taken advantage of?</p>	<p>Is an evaluation made of the knowledge produced following recognized methods or are ones developed specifically for the problem under study?</p> <p>Is an explicit translation of the scientific results produced into practical solutions to problems made?</p> <p>Is compliance with any additional quality criteria that may have been applied checked regularly?</p>
<p>critical reflective</p>	<p>normative</p>	<p>impact oriented</p>
<p>I Applying for a research project</p>		
<p>Does the project's execution concept provide for measures that enable a learning research process or are the appropriate offers or guidelines provided by the research funding agencies/contracting entities taken into account? → <i>core requirement</i></p>	<p>Has one's own understanding of sustainability been clearly presented and related to the policymaking problem in question?</p> <p>Have differences, where present, to the understanding of the research funding agency/contracting entity been justified?</p>	<p>Is a strategy for the transfer of knowledge developed and presented in the proposal? → <i>core requirement</i></p> <p>Have the project's scientific and practical knowledge goals been differentiated and has a corresponding weighting been carried out and justified?</p>

<p>Is a procedure provided for, in cooperation with the policymaking partner (and, if necessary, with the research funding agency/contracting entity), which permits, in the course of the project, a revision of the problem description in the light of new knowledge?</p> <p>Is the researchers' own role and that of the policymaking partner explicitly made conscious and presented clearly in the proposal?</p>	<p>Is it shown which kind of sustainability knowledge will be produced (systems, transformation or orientation knowledge) and are reasons given to justify any deviations from the research funding agency's/contracting entity's, or the policymaking partner's, assessment?</p>	<p>Is the expected contribution of the project to resolving the policymaking problem assessed?</p> <p>Do the researchers set (as far as possible in concert with the policymaking partners) their own success criteria for the project or are already existing success criteria used?</p> <p>Does the research design include resources that can be used to deal on short notice with incidental policy consulting needs?</p>
<p>II Executing a research project</p>		
<p>Are measures supporting a learning research process carried out and checked as to their effectiveness?</p> <p>Are the disciplinary or departmental premises, hypotheses, paradigms, etc. systematically disclosed?</p>		<p>Are the project's outcomes temporarily and linguistically compatible with the needs and expectations of the policymakers and is this regularly checked during the course of the project?</p> <p>→ <i>core requirement</i></p>
<p>III Evaluating a research project</p>		
<p>Does the final report clearly present the potentials and limits of the practical and scientific knowledge gained in the project?</p> <p>→ <i>core requirement</i></p> <p>Is the entire project evaluated in terms of the success or failure of the integration goals?</p>		<p>Is an assessment made of whether the practical knowledge goals are achieved and to what extent the results can be transferred to other policymaking actors or action fields?</p> <p>Is an assessment made of whether the scientific knowledge goals are achieved and generalized beyond the context of the problem studied?</p> <p>Is the system knowledge, transformation knowledge or orientation knowledge produced in the project worked up and saved in appropriate media and formats?</p>

Policymakers		
systemic	scale spanning	prospective
I Participating in the application for a research project		
	Are current policy projects (possibly at different policy levels or within different action fields) which stand in relation to the proposed project being communicated?	Are the own targets for the in principle open-ended research process set broadly enough and can unexpected research results be communicated internally? → <i>core requirement</i>
II Participating in the execution of a research project		
	Are the researchers promptly informed about potential synergy effects or conflicts with the policymaker's own new policy objectives or those of others? → <i>core requirement</i>	
context specific	integrative	method based
I Participating in the application for a research project		
Are the conditions for actually implementing the expected policy recommendations identified and communicated early enough to the researchers? → <i>core requirement</i> Are the own policy goals explicitly communicated to the researchers?	Are own financial and human resources committed to ensuring ongoing involvement in the research project or is the need for appropriate additional resources indicated (to the funding agencies or researchers)? → <i>core requirement</i> Is there active participation in the formulation of a common description of the problem?	Is the researchers' method-based procedure for producing, integrating and evaluating knowledge accepted?
II Participating in the execution of a research project		
Are changes in one's own policy, institutional or temporal framework, as well as in one's own goals communicated at an early stage in the course of executing the project? → <i>core requirement</i>	Is there active participation in the research process and are offers of such participation from the researchers acknowledged?	

critical reflective	normative	impact oriented
I Participating in the application for a research project		
<p>Is the own role reflected in the research project and, where necessary, explained to the researchers?</p> <p>Is the extent to which the project is compatible with the own structures and processes taken into account?</p>	<p>Is the own understanding of sustainability clearly communicated or is reference explicitly made to the sustainability understanding of the research funding agency/contracting entity or researchers?</p> <p>Are the own concrete sustainability goals, if any, communicated to policymaking action field?</p> <p>Is an assessment made of which kind of sustainability knowledge (system, transformation or orientation knowledge) is needed for the own policymaking?</p>	<p>Can a basic willingness to implement the expected project results be confirmed?</p> <p>Are distinct success criteria for the project defined in consultation with the researchers? → <i>core requirement</i></p> <p>Are the own expectations regarding the form and usefulness of the project results communicated to the researchers?</p>
II Participating in the execution of a research project		
<p>Are uncertainty, fluctuations and alternative solutions understood as part of the research process?</p> <p>Is there a willingness to revise the original project goals in light of new knowledge produced during the research process?</p>		<p>Are the options developed for implementing the policy recommendations regularly checked during the course of the project? → <i>core requirement</i></p> <p>Is the timely application for an implementation project considered or is an internal process to implement the results of the research launched? → <i>core requirement</i></p>
III Utilizing a research project		
<p>Are the costs of participating in the research process in relation to the impact on policymaking evaluated and are the results communicated to the research funding agency/contracting entity?</p>	<p>Are the own sustainability goals or sustainability understanding reviewed in light of the project results and, if needed, revised?</p>	<p>Is an assessment made as to whether the project results have had an impact on policymaking and is the outcome communicated to the researchers and the research funding agency/contracting entity?</p> <p>Is the knowledge generated adequately safeguarded and made available for the own policymaking practice (possibly in consultation or cooperation with the researchers)? → <i>core requirement</i></p>

6 Selected Literature

In addition to the empirical analysis of selected case studies drawn from the research areas “Sustainable City” and “Risk and Precaution in New Technologies” (see page 11) the following studies on quality criteria for cross-disciplinary research were evaluated:

- Bergmann, M., 2006. Transdisziplinäre Forschung erfolgreich fördern. Institut für sozial-ökologische Forschung (ISOE), Berlin, Juni 2006.
- Bergmann, M., Brohmann, B., Hofmann, E., et al., 2006. Quality Criteria of Transdisciplinary Research: A Guide for the Formative Evaluation of Research Projects. ISOE-Studentexte, No 13, Frankfurt am Main.
- Böcher, M., Krott, M., 2010. Umsetzung des Konzepts einer modernen Ressortforschung im Geschäftsbereich des BMU. Umweltbundesamt Dessau-Roßlau, UBA-Texte, 39/2010.
- Maasen, S., 2005. Interdisziplinarität und ihre Förderung – Interdisziplinäre Projekte im Nationalfonds, Expertise im Auftrag des Schweizerischen Nationalfonds. Wissenschaftsrat, 2008. Pilotstudie Forschungsrating Soziologie. Abschlussbericht der Bewertungsgruppe, Köln.
- Ziegler, R., Ott, K., 2011. The Quality of Sustainability Science – a philosophical perspective. *Sustainability: Science, Practice & Policy*, 7/1, 31–44.

The formulation of the working definition of “sustainability research”, as well as the derivation of the nine requirements dimensions (see page 8), is based on a review of the relevant scientific literature appearing during the last 12 years. The following list shows selected seminal articles:

- Bettencourt, L.M.A., Kaur, J., 2011. Evolution and structure of sustainability science. *PNAS*, 108/49, 19540–19545.
- Clark, W.C., Dickson, N.M., 2003. Sustainability science: The emerging research program. *PNAS*, 100/14, 8059–8061.
- Jahn, Th., 2012. Theorie(n) der Nachhaltigkeit? Überlegungen zum Grundverständnis einer „Nachhaltigkeitswissenschaft“. In: Enders, J., Remig, M. (Hrsg.): *Perspektiven Nachhaltiger Entwicklung. Theorien am Scheideweg*. Marburg.
- Jerneck, A., Olsson, L., Ness, B., et al., 2011. Structuring sustainability science. *Sustainability Science*, 6, 69–82.
- Kates, R.W., Clark, W.C., Corell, R., et al., 2001. Environment and Development – Sustainability Science. *Science*, 292, 641–642.
- Lubchenko, J., 1997. Entering the Century of the Environment: A New Social Contract for Science. *Science*, 279, 491–497.
- Reid, W.V., Chen, D., Goldfarb, L., Hackmann, H., et al., 2010. Earth System Science for Global Sustainability: Grand Challenges. *Science*, 330, 916–917.
- Swart, R., Raskin, P., Robinson, J., 2002. Critical Challenges for Sustainability Science. *Science*, 297, 1994.

Information about the Project

The results presented here are part of a research and development project (Research Code Number: 3711 11 701) funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the German Federal Environment Agency (UBA). The project was carried out by the Institute for Social-Ecological Research (ISOE, project management), the Institute for Ecological Economy Research and the Environmental Policy Research Center for of the Freie Universität Berlin (FFU) (project duration: 09/2011-01/2013).

The aim of the project was to develop concepts that can be used to increase the relevance of sustainability research for the design of environmental policy in Germany. In addition to the requirements profiles for a policy relevant sustainability research presented in this guide, recommendations, based on empirical studies, have been developed regarding how the coordination between different government departments with respect to funding such research can be optimized. The project's final report will be available starting March 2013 from the UBA.

Acknowledgments

A dialogue forum, "Good Sustainability Research for Effective Policy Advice," was set up as part of the project. In several rounds of talks the results presented in this guide were critically discussed and options for their implementation were explored. A special thanks go to the participants of the dialogue forum:

Dr. Jan Helmke (Institute for Advanced Sustainability Studies, IASS), Dr. Christian Hey (German Advisory Council on the Environment, SRU), Dr. Karl Eugen Huthmacher (Federal Ministry of Education and Research, BMBF), Dr. Jürgen Jakobs (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, BMU), Dr. Johanna Leissner (Fraunhofer-Gesellschaft, Brussels Office), Heinrich Nöthe (Federal Ministry of Transport, Building and Urban Development, BMVBS), Dr. Inge Paulini (German Advisory Council on Global Change, WBGU), Prof. Dr. Ernst Th. Rietschel (acatech – National Academy of Science and Engineering, past president of the Leibniz Association), Dr. Wolfgang Rohe (Mercator Foundation), Dr. Dagmar Simon (Social Science Research Center Berlin, WZB), Prof. Dr. Werner Wahmhoff (German Federal Foundation for the Environment, DBU).