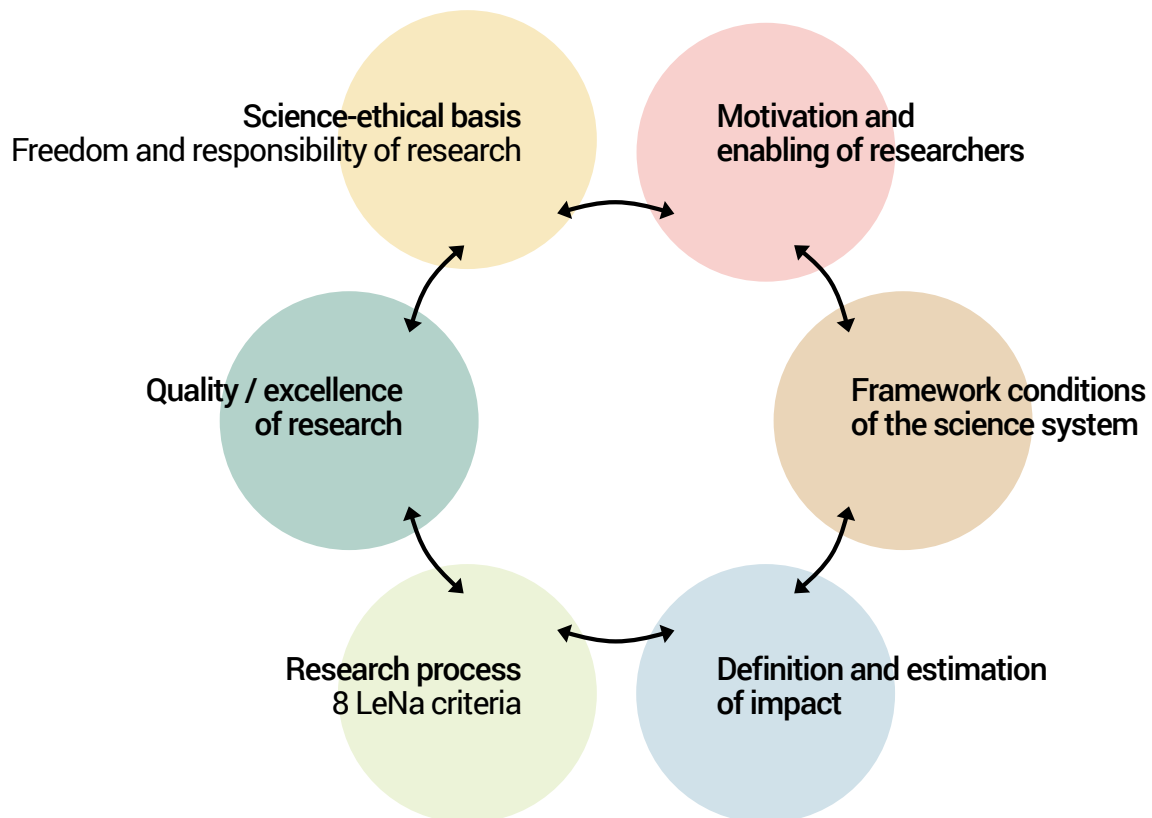




Excellent research with societal responsibility

Position paper of the LeNa Shape project consortium



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"Excellent research with societal responsibility"
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Summary

Science is faced with increasingly complex issues, combined with growing uncertainties in terms of knowledge and action. In the "dual role" attributed to it as both the cause and potential solver of problems, it is confronted with "fleeting" trust from society, but also with growing demands from society to make contributions to solving urgent problems as quickly as possible. Discussions within the scientific community about its "mission" and the challenges to be overcome, therefore, increasingly emphasize the need to strengthen the societal responsibility of science. This involves the question of how the science system can be steered in order to balance and realize the priorities between the freedom of science, its orientation towards competition and efficiency, its impact on society and its role in transformation processes.

The "LeNa Shape" project, funded by the German Federal Ministry of Education and Research (BMBF) in the Research for Sustainability (FONA) program, dealt with the question of how "**research with societal responsibility**" can succeed and what consequences this should have for the understanding and practice of the concept of excellence. Based on the work of the predecessor project "LeNa", which was also funded by the BMBF, in particular the framework for reflection comprising eight criteria, a holistic understanding of **excellent research with societal responsibility** and practice-oriented tools to support researchers were developed (see Figure 1 on the last page).

In principle, the success of this type of research requires further developments in six mutually influencing elements of the science system: the definition of ethical principles of science, the definition and assessment of quality (and thus excellence) of research, the design of the research process, the definition and assessment of the impact of research, the design of institutional framework conditions of the science system and the corresponding motivation and empowerment of researchers and other participants in the science system.

In this sense, successful research with societal responsibility includes areas of tension that need to be reflected upon and, if possible, "de-tensioned". Conflicts with guiding principles such as efficiency and competitiveness are an example of this. They could be mitigated by an adapted understanding of efficiency, in which an increased - and a priori efficiency-reducing - expenditure of resources is contrasted with an improvement in yield in the form of qualitatively improved research. The question of the extent to which the approach postulated here can be generalized for the diversity of different types of research, topics and disciplines or for different cultures and possibly different understandings of responsibility is another example. The aim must be to enable a degree of diversity - particularly with regard to the assessment of impacts and the application of different types of criteria for assessing the quality of research - that does justice to the postulate of societal responsibility as well as the diverse research landscape. The reference to possible risks of political appropriation of science that is more strongly oriented towards societal responsibility should be countered by the fact that science that is capable of reflecting on the duality of freedom and responsibility could be more likely to resist such a risk.

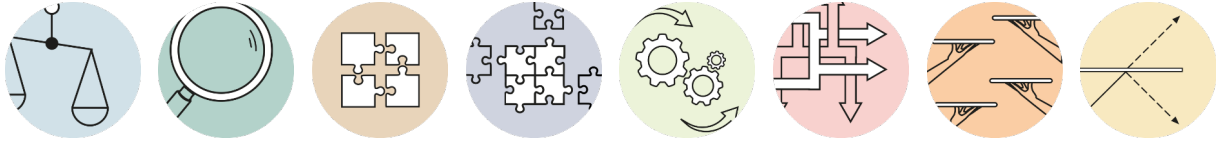


Figure 1: The eight LeNa criteria: Applied ethics, transparency, interdisciplinarity, transdisciplinarity, integrative approach, dealing with complexity and uncertainty, user orientation, reflection of impacts

In order to implement "excellent research with societal responsibility", changes to the framework conditions are of central importance for setting the course in the other elements of the science system. This requires content-related, structural and procedural adjustments in research planning and funding, but also in the management of research organizations. A wide range of aids and tools are needed to empower and support researchers in their reflection processes. Finally, processes of understanding are required for dealing with areas of tension and conflict with regard to adapting the concept of excellence. Some of the key steps required for this and the respective central stakeholder groups are listed in Table 1.

There are good reasons to consider that successful research with societal responsibility leads to a higher quality of research, greater social acceptability and acceptance of research and its results, thus to greater legitimacy of science-based support for transformation processes and ultimately to increased socially desirable effects. This goes hand in hand with a correspondingly further developed understanding of excellence and the demand to implement this in the science system.

| Necessary steps | Central stakeholder groups |
|--|--|
| <p>Adapt research planning and funding as well as evaluation and impact assessment of research</p> <ul style="list-style-type: none"> • Application of a concept of quality and thus excellence extended to include aspects of responsibility • Integrate reflection on societal responsibility into tenders (as a criterion, consideration of required resources) • Ensure that the "societal responsibility" criterion is taken into account in the review process; build up suitable pools of reviewers • Supplementing an ex-post evaluation view to take account of reflection on societal responsibility • Promotion of ex-ante impact assessments throughout the entire research funding process | <p>Funding institutions; Scientific organizations, Researchers</p> |
| <p>Integrating the requirements of reflection processes into the management of university and non-university research institutions</p> <ul style="list-style-type: none"> • Carry out strategy and mission statement processes • Criterion for personnel recruitment and assessment • Specialized career paths, availability of contact persons • Systematically empower and motivate employees through induction and further training | <p>Research organizations, Funding institutions, Employees</p> |
| <p>Action aids and tools to empower and support researchers</p> <ul style="list-style-type: none"> • develop well-founded ethical standards for "excellent research" and application aids, e.g. in the form of guidelines • Anchoring societal reflection processes in training by offering specific curricula • provide supporting tools for the application of the reflection criteria, e.g. the tools developed in "LeNa Shape" (explanatory videos, workshop concepts, interactive web companion, ...) • Enable researchers to assess impact: Training for (ex-ante) presentation of plausible impact relationships using qualitative impact narratives and support through guidelines, processes and structures | <p>Researchers, Research organizations</p> |
| <p>Establish communication processes to expand the concept of excellence to include societal responsibility</p> <ul style="list-style-type: none"> • Addressing the expansion of the existing concept of excellence in science policy and science organizations • Establish a discussion platform, e.g. in the form of a round table organized by the BMBF • Establish research-type-related and subject-specific characteristics of reflection processes in practice | <p>Science policy, research organization</p> |

Table 1:
Necessary steps for the implementation of "Excellent research with societal responsibility"



Excellent research with societal responsibility¹

Position paper of the LeNa Shape project consortium²

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¹ This position paper is the result of the BMBF-funded project "LeNa Shape: research with societal responsibility. Design, impact assessment, quality assurance".

² LeNa is an abbreviation for: Guideline to sustainability management, but is used as a brand for research with societal responsibility

1 Why this position paper?

The importance of science for our society is undisputed. This is associated with increasing expectations regarding the societal responsibility of science. This concerns the necessary reflection processes of scientists, the design of scientific processes, but also the expectation to develop valid solution options - both in times of current and impending crises and with a view to long-term challenges. The multi-layered demands of the guiding principle of sustainable development and the associated challenges play an important role here. While problems are becoming increasingly complex and knowledge and action uncertainties are growing, the urgency of solutions is also increasing.

It should be noted that the **demands on science are increasing**.

This development comes up against a science that is itself engaged in discussions about its **mission** and the **challenges** it faces. Various focal points can be identified:

- The image of science supported by the freedom of researchers, which defines criteria for high quality science in a self-organized process.
- The aim to increase the impact and efficiency of research and to intensify competition for resources with the help of suitable framework conditions and indicators.
- The formulation of a "third mission" in addition to the fields of action of research and teaching.
- The objectives associated with the concept of Responsible Research and Innovation (RRI), with which the research and development activities of companies are also to be placed in a social context at an early stage.
- The idea of science having a transformative effect, in which scientists are assigned an active role as transformation actors or take on this role themselves.

These different ideas lead to **negotiation processes** as to how the priorities between freedom of science, increased efficiency, competition and societal impact can be balanced and realized in the governance of the science system. This is particularly evident with regard to the question of how the excellence and scientific **output** of research institutions and researchers should be assessed. For example, there are calls for the dominant quantitative, publication-related criteria and indicators to be supplemented or further developed to include the presentation of the impact achieved and qualitative criteria. These discussions are an expression of the fact that the **societal responsibility of science is** increasingly being emphasized. This applies both to the provision of knowledge for the search for solutions to acute problems or the prevention of future problems, as well as in the debate on how and where a society should develop.

In contrast to these discussions, "excellent research with societal responsibility" relates in particular to the research **process**, i.e. **how** research is conducted, and requires researchers to reflect on how they can meet this requirement.

A **joint framework for reflection** by the three non-university research organizations Fraunhofer-Gesellschaft, Helmholtz Association and Leibniz Association has been available since 2016³. It offers researchers orientation and support for this reflection process based on eight criteria (see Figure 1). The need for such reflection applies in principle to **all scientific fields, types of research and disciplines**. Nevertheless, the intensity and consequences of the reflection process as well as the significance of the areas to be addressed differ depending on the context.

As part of the follow-up project "LeNa Shape", a holistic understanding of excellent research with societal responsibility and practice-oriented tools based on the framework for reflection were developed to support researchers. The researchers involved come from universities and the four non-university research organizations Fraunhofer-Gesellschaft, Helmholtz Association, Leibniz Association and Max Planck Society. The joint position paper presented here is based on the results of the project and condenses the resulting need for change. It is aimed at all stakeholders, especially in the publicly funded science system: scientists themselves, scientific organizations and institutions, funding bodies and science policy institutions. It is intended to provide suggestions for the further development of the science system and contribute to the necessary negotiation processes.

3 This was developed as part of the BMBF-funded project LeNa - Guidelines to sustainability management in non-university research institutions: <https://www.nachhaltig-forschen.de/en/publications/framework-for-reflection>

2 How can research with societal responsibility succeed?

The core message of this paper is that the implementation of excellent research with societal responsibility requires further developments in the sense of conditions for success in six mutually influencing elements of the science system (see Figure 2).

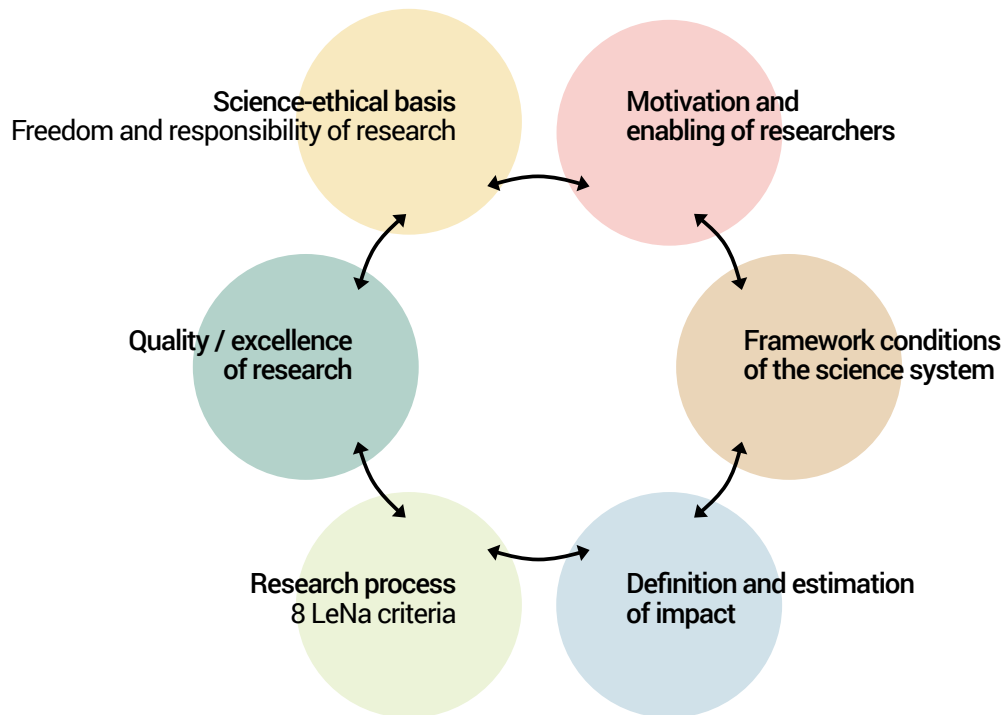


Figure 2: Elements of the science system to be developed further

These elements address **principles, goals, requirements and approaches** and are described in more detail in chapters 2.1 to 2.6. They are aimed at researchers, research organizations and the institutional level of the science system:

- **Principles of scientific ethics**

Freedom of science also requires the assumption of societal responsibility. Properly understood, they do not contradict each other and excellent science must understand and implement this as its very own task.

- **Quality and excellence of research**

In addition to the traditional criteria, the perception of societal responsibility and the fulfillment of societal expectations must also be included in the determination of excellent research. The transformative effect of sustainability-oriented research in particular is a central expectation of society.

- **Research process**

Reflecting on responsibility in the research process based on the eight LeNa criteria enables the implementation of excellent research with societal responsibility.

- **Definition and assessment of impact**

For those segments of research that aim to achieve a very specific impact, the question of how this can be assessed is particularly urgent. New approaches to this have been taken with the definition of the conditions for success. Reflections based on the "LeNa criteria" also increase the probability of implementation and thus the potential impact of research results in practice.

- **Framework conditions of the science system**

The perception of societal responsibility must be applied as a criterion for project-related and institutional research funding, as an incentive and selection criterion in the management of research organizations and in personnel decisions in the science system.

- **Motivation and empowerment of researchers**

Individuals in the research process must be systematically motivated and empowered to carry out the reflection processes. Appropriately designed educational curricula and offerings must be created or expanded.

2.1 Principles of scientific ethics

The ethical foundations of science are the result of historical experiences and debates both within the sciences and in society. They are based on principles such as intellectual freedom and independence, truthfulness and verifiability of research results, and at the same time on the principle of responsibility, based on human rights and sustainable development for the environment and future generations. Freedom of research means protection against interference such as censorship, paternalism or power-based influence on research processes and results. The same applies to teaching. However, freedom of research is not only negative 'freedom from' such interference, but at the same time autonomy of a positive 'freedom to' a responsibility-based decision for a certain topic and methodology of research.

- Responsibility in research in this sense, with reference to the ethical principles mentioned above, includes: the ability to set **goals** and justify them, to reflect on the **means of** achieving the goals and the potential **consequences** of the research, and to draw appropriate conclusions.
- The ideal of research that delivers universally valid results can therefore not be achieved by excluding questions of scientific ethics. Rather, what is required is a **methodologically reflected differentiation and consideration** of descriptive and normative aspects as well as **critical reflection** and transparent disclosure of the respective premises, axioms and framework conditions of research.

- **Freedom of research and societal responsibility are two sides of the same coin:** freedom in a comprehensive sense also includes the exercise of responsibility, and this presupposes freedom in the sense of autonomy. **Responsibility is therefore part of the implementation of freedom in research.**
- **All scientists** must be empowered to provide answers to ethical challenges. This requires **support for their reflective competence through training**, the dissemination of appropriate **guidelines** (see the "LeNa Framework for Reflection") and, last but not least, the provision of appropriate time and other **resources** by scientific and funding institutions.

Society's expectations of science, especially publicly funded research and teaching, are not encroachments that threaten freedom, but legitimate expectations. At the same time, the independence of research from influence by non-scientific interests (power, money, expectations) is held in high esteem, recognized and expected by society. The financial and structural conditions for research are also of central importance here, but not as a question of freedom, but of prioritization and allocation decisions. Although these are also made by the individual scientists, they are primarily made in the research and especially the funding institutions. Here, too, all those actors involved bear responsibility. Such decisions are also ethical questions that are embedded in society's perspectives.

The conditions that make research with societal responsibility possible and successful are based on scientific ethics and must be reflected upon in each specific situation and subject. Without an ethical foundation, a responsible research process is not possible. This has consequences for the idea of scientific quality and excellence:

- **Responsible excellence** also requires **reflection on fundamental ethical issues** in science. **Ethical reflection** as a cross-sectional competence is therefore a **necessary component of scientific excellence.**

The responsibility and freedom of science must be viewed **as a dialectical unity.** They can therefore be anchored in this mutual reference as the ethical conditions of the concept of excellence, which has become a guiding principle for the assessment of scientific quality.

- In the debate on excellence, there is a need for well-founded ethical standards that enable the **development of ethical perspectives on excellence** along clear criteria.
- The increasing importance of ethics in almost all areas of science requires specific **operationalizations in the sense of ethical guidelines.** The basis for this is the so-called "ethical matrix", which was further developed in the "LeNa Shape" project. It combines three dimensions that can and must be specified depending on the research topic and approach: 1. underlying ethical principles, 2. those potentially affected (people, groups and the environment), and 3. as a new element, all steps in the research process from the idea to implementation. The matrix thus supports the ability to conduct ethically responsible research in a practice-oriented manner.

2.2 Quality and excellence of research

Because responsibility based on scientific ethics and reflection is a central component of the understanding of excellent research, the following applies:

- the perception of societal **responsibility** must be used more systematically than before as a **criterion for assessing the quality** of research.

An understanding of quality expanded in this way must, on the one hand, become an essential control element within the science system in order to be able to assess people, projects, programmes or organizations more appropriately. On the other hand, it is a prerequisite for being able to demonstrate the extent to which science meets existing requirements and expectations from politics and society, to identify suitable options for dealing with problems or risks and their implementation conditions. This applies at least to the part of research financed by public funds.

With this demand, the position paper is part of a critical discourse that has been going on for several years in Germany and, above all, at European and international level on the question of how the quality of scientific achievements can be assessed more appropriately than in the past - especially if they are developed interdisciplinary or transdisciplinary.

To date, there are **no generally valid definitions or standards for the quality of research**. In practice, traditional standards dominate: on the one hand, the "Guidelines for Good Scientific Practice" of the German Research Foundation (DFG)⁴, which refer to organizational responsibilities, compliance with legal and ethical framework conditions, the appropriate application of methods and standards, access to and publication of results or confidentiality issues. On the other hand, the focus is on the science output of research, especially publications and their citation frequency, as well as efficiency aspects. The "return" in the sense of "impact", which is compared to the effort required for research, is increasingly also being placed on science as a societal requirement (see chapter 2.4), but is primarily measured in terms of the above-mentioned output elements.

Critical positions on current practice have been presented in the form of declarations, manifestos and voluntary commitments⁵. On the one hand, they address the assessment process, emphasizing criteria such as transparency, fairness, recognition of diversity and compliance with science integrity rules. On the other hand, criteria such as credibility (in the sense of thoroughness, verifiability, trustworthiness), delivery of relevant contributions (originality of the idea and the analysis process), communicability (in particular comprehensibility and traceability) and compliance with ethical and legal rules are emphasized.

4 <https://www.dfg.de/resource/blob/173732/4166759430af8dc2256f0fa54e009f03/kodex-gwp-data.pdf>

5 Leiden Manifesto: <https://www.nature.com/articles/520429a>

San Francisco Declaration: <https://sfdora.org/read/>

Hongkong Principles: <https://shorturl.at/hJMZ9>

Coalition for Advancing Research Assessment (CoARA): <https://shorturl.at/CHSTO>

The proposals in this debate contain innovative elements, but they are still too closely aligned with traditional standards. The issue of responsibility, which has accompanied science from the very beginning of its existence, still hardly plays a role in the quality discourse. For a long time, the concept of responsibility was primarily applied and discussed in relation to decisions on research topics and compliance with the "guidelines of good scientific practice". However, in an increasingly technologized and fragmented world and in the face of diverse crisis phenomena, science increasingly has to deal with highly complex topics. These are characterized by ambiguities as well as various types of knowledge and decision-making uncertainties, but at the same time are given a high degree of urgency.

This has led to science's responsibility also being understood as a responsibility towards society. Science should learn in exchange with societal actors, set priorities and question its motives and methods. More importance is therefore attached to topics such as transparency, robustness and uncertainty management. In addition, there is the expectation of producing "useful", i.e. problem-oriented results. With the considerable increase in the importance of sustainability issues, transdisciplinary elements are also becoming more important.

In practice, however, quality assessment does not take sufficient account of societal responsibility in view of changing research topics, processes (e.g. transdisciplinarity) and results (see also Chapters 2.3 and 2.4 below). The much discussed concept of Responsible Research and Innovation (RRI), which has been around for a number of years, has done little to change this. Although numerous guidelines and tools for implementation have emerged from EU-funded RRI projects, RRI has not yet been sufficiently systematically incorporated into the quality assessment discussion and practice.

For this reason, the **quality of the perception of societal responsibility must be placed equally ranked with the quality** of the science output for the necessary **re-accentuation of quality criteria**.

- A definition and measurement of quality that does justice to this **new accentuation** must therefore comprise **three elements**:
 - i) the **criteria of good scientific practice**;
 - ii) an orientation towards **traditional**, discipline-specific, academic and thematically limited quantitative criteria and indicators (publications, journal impact factors, citations, third-party funding, etc.);
 - iii) a **societal responsibility-oriented perspective** that includes responsibility-related criteria and thus also qualitative measures and assessments as well as the societal impact of research and a "responsible" use of quantitative indicators.

In principle, these three types of criteria should be applied to all types and topics of research when defining and measuring quality. This includes research type or discipline-specific priorities, i.e. a context-adapted differentiation of the relevance of the responsibility-related criteria.

- A **changed understanding of quality** in the sense described above must also be applied to **the concept of excellence**.

Excellence is understood here as the highest level of quality in science and research in general and thus **goes far beyond the** current practice and discussion of the **Excellence Initiative in relation to universities in Germany**.

2.3 Research process

The previous focus on determining the quality of research based on its products largely ignores the essential importance of the research process. However, it is here that the fundamental course is set for the processing of research questions and thus also for the nature of research results and products.

- **A more systematic consideration of responsibility** is therefore required **throughout the entire research process**, from topic identification, research design and methodology to implementation and communication of results.

The above-mentioned framework for reflection developed in the "LeNa" project provides orientation in this regard. In order to counter the aforementioned deficit, a holistic understanding of societal responsibility in relation to the research process, i.e. the "how" of research, was presented for the first time on the basis of the following eight criteria:

Applied ethics, integrative approach, interdisciplinarity, user orientation, reflection of impacts, transdisciplinarity, transparency, dealing with complexity and uncertainty.

The criteria describe how, with whom and for whom "research with societal responsibility" can be implemented. They are to be understood as a supplement to the guidelines for ensuring good scientific practice to include the responsibility dimension, and are the result of extensive literature research and intensive discussions in the participating institutions Fraunhofer-Gesellschaft, Helmholtz Association and Leibniz Association.

The individual criteria are not new, they represent established approaches that have been researched to varying degrees. In their **systematic and holistic application**, however, they allow an appropriate description and implementation of the responsibility dimension. To this end, all criteria must first be checked for their relevance from the beginning of the research process. Context-dependent prioritizations or irrelevancies of individual criteria that are to be understood a priori as equally weighted are possible, but must be justified. The current set of criteria is not to be understood as unchangeable, not least in view of the debates within and outside the scientific system. Rather, it is open to expansion to include topics that are at a comparable level of abstraction to the previous eight criteria. In this context, the topic of "diversity/inclusivity" was discussed within the project consortium.

The framework for reflection offers researchers the basis for reflecting on how responsibility can be exercised, both themselves and in dialog with society. The fact sheets in the framework for reflection provide practical assistance with information on the justification and description of the criteria, methodological tips for their implementation and selected examples of their application. Thus, they offer points of reference for an extended quality assessment: the degree or quality of application of the concepts and methods described for implementing the criteria or the reasons given for the (in)relevance of certain criteria can be used for this purpose.

The reflection process as a whole is suitable for strengthening awareness of the importance of societal responsibility and the motivation to exercise it in everyday research. It helps to ensure that the knowledge, requirements and needs of science and society are better aligned throughout the entire research process.

- In principle, this process should be carried out for **all types of research** - which are inadequately characterized by the terms basic and applied research - and by all scientific disciplines involved.

This lays the foundation for an institutionalized application of research strategy in scientific practice. Individual projects should be just as much an object as the organizational level, for example in strategy or agenda processes and in research planning.

A more appropriate approach to changing research topics and contexts is thus made possible by appropriately **linking the cognitive interest** - an intrinsic motivation for research - **and societal responsibility**.

The call for such a new adjustment of the research mode is being made at a time when "Mode 2" research - defined as primarily problem-oriented, inter- and transdisciplinary knowledge production - has been discussed and increasingly applied for years. With the term "Mode 3", the demand to better combine Mode 2 and Mode 1 - i.e. the traditional form of academic, disciplinary science - has entered the debate. A more appropriate consideration of the interrelationships between science and political, economic and civil society actors and structures is emphasized here, as well as increased resonance of science with regard to societal needs and a stronger transformative claim of science.

The reflection process described provides a suitable basis for such a link. Its systematic, context-adapted implementation based on the "LeNa criteria"

- **increases** the social **relevance** of research, its **ability to resonate** with social developments and expectations, and its **responsiveness**, i.e. its ability to find suitable solutions to problems that are prioritized by society, and
- also **increases** the **acceptability, legitimacy** and thus the **feasibility of** research and its results, and thus the potential for societal impact.

It is important that this process of reflection does not become a routine or a bureaucratic ticking off of a checklist. Rather, it should strengthen awareness of one's own research principles, premises, perspectives and consequences.

2.4 Definition and assessment of impact

The need for a research type- or discipline-specific focus is particularly evident with regard to the importance of impact assessment in the case of mission- and application-oriented research. Achieving an impact that goes beyond the academic sphere and contributes to sustainability-oriented solutions in society is an essential expectation of society today, especially for this research segment. Defining the contribution of research to societal change processes and their intended and unintended effects, e.g. on sustainability goals, requires an understanding of the impact mechanisms of research. This is accompanied by an increased impact **potential** of research. Accordingly, impact assessment is an increasingly important criterion at national and European level in the review of funding applications and the evaluation of research activities and organizations.

However, the organizational and methodological tools for such an impact assessment are still under development. The main challenges lie in the often long period between the research result and the potential impact (ex-ante problem), which is far beyond the project duration, as well as in the complexity of systemic impact relationships, which rarely allows a clear allocation of individual research results to specific impacts (attribution problem).

- More promising than the attempt at quantitative (ex-post) measurements of research impacts (attributions) would therefore appear to be forward-looking (ex-ante) representations of plausible causal relationships in the form of **qualitative impact narratives** that make the intended contributions of research to defined societal impacts comprehensible. This requires a methodological elaboration of and better ability to assess and plan impacts at the individual and institutional level as well as their anchoring in all phases of the research process.

Methodologically, an appropriate impact assessment of research must include a thematic and a procedural component. The **thematic component** includes a clear description of the changes that research results should bring about in society (e.g. in production, consumption, politics), which sustainability goals (such as the United Nations SDGs) these changes relate to and which possible side effects (trade-offs) may occur. The approach known as the "input-output-outcome-impact" model represents the methodology established here.

The **procedural component** of impact assessment, which needs to be supplemented, considers the impact mechanisms that are controlled by the **research** process. Questions of user orientation and the inclusion of societal actors in the research process, the consideration of ethical principles, dealing with complexity and uncertainty, but also the assessment of the consequences of research are among the factors that influence the probability, form and extent of impact. The "LeNa" framework for reflection with its criteria offers a set of tools that can be used to examine the research process in terms of societal impact. While the application of the criteria should initially increase the probability of impact in general, the factsheets can provide more concrete indications for an assessment of achievable impact. In this way, impact-related societal expectations can also be better taken into account.

However, it is also important to note that in an open and reflective society, which is aware that we cannot know which knowledge will provide the greatest possible benefit to society and when, research **without a directly intended contribution to** solving social problems is just as important as **explicitly** solution-oriented research.

However, this does not mean that the impact dimension can be completely ignored in research without a directly intended contribution to a solution. Even such research can lead to unintended - desired or undesired - effects. Here, too, ex-ante reflection on potential desired or undesired effects is therefore necessary.

- **Reflecting on the desired and potentially achievable positive and negative impacts** is an important condition for the success of research with societal responsibility. In the planning and initial phase of a project, this requires not only an understanding of impacts and the underlying processes, but also the ability and resources to involve various societal actors in the planning.
- The ability to **assess impact at the individual level** should be supported by appropriate training as well as guidelines and recommendations for action, so that researchers in their research organizations can increase the likelihood of making a positive contribution to solving society's challenges.
- Enabling **impact assessment at the organizational level involves** providing supporting structures and resources and using impact assessment in programmatic research planning.

Research is a dynamic, open process that is accompanied by uncertainties, especially when it is carried out in continuous interaction with society. Therefore, the reflection of impacts should be understood as a continuous process. In addition to the assessment of impacts during the planning process and during the project, impact assessment after the research has been completed (**ex-post approach**) plays a special role in two respects: firstly, in the case of research funded by taxpayers' money, a subsequent analysis of impacts is required for reasons of "accountability". For this purpose, external evaluation of the fulfillment of research funding objectives has become established in the science policy process. On the other hand, such an analysis is an important prerequisite for understanding and permanently improving the (positive) effects of research on society by the researchers themselves. Due to the attribution problem mentioned above, the focus here should also be on the contribution perspective based on more qualitative impact narratives.

2.5 Institutional framework conditions of the science system

Research with societal responsibility requires a willingness to change on the part of **all** those involved. The entire research system must support researchers in applying the framework for reflection, enable its applicability and exclude disadvantages resulting from its application. This requires an appropriate design of the framework conditions. Research organizations and institutions, funding institutions and policymakers are all called upon to do this.

In the adaptation of the concept of excellence called for in this paper, it should first be noted that the production of new scientific findings remains an important quality criterion for research.

- However, to ensure that research with societal responsibility and publications in peer-reviewed journals do not represent irreconcilable opposites, the framework conditions must be designed in such a way that the consideration of societal responsibility does not impair the possibility of traditionally measured publication success, and that the application of publication-related criteria does not disadvantage this type of research.

This results in requirements for funding institutions to create supportive framework conditions. Important starting points concern the resources and objectives of research in funding guidelines and calls for project-related and institutional research funding. These must provide space both for publication activities and for the necessary reflection processes. At the same time, they must explicitly include the implementation of reflection processes as a criterion for internally and externally funded research programs as well as for evaluations. Such changes have a twofold effect: on the one hand, they give researchers the space and legitimacy to address the issue of responsibility as part of their research activities. Secondly, they signal to research organizations and institutions the importance that is attached to the topic.

- In addition, the requirement of reflection processes in research projects must also be appropriately incorporated into the assessment of research projects and the evaluation of research results. This requires the development of a pool of experts who are also competent with regard to reflection processes, as well as the adaptation of evaluation processes and the criteria used.

The evaluation of the FONA program, for example, also shows that there is a trade-off between the usual incentive criteria and the orientation of research towards society's needs and impact, especially for careers in science. Here, too, an adaptation of the excellence model is necessary in order to avoid career disadvantages due to this trade-off.

At the same time, members of an organization are also guided by the values and norms of their organization. Changes are therefore also necessary in the research organizations themselves. The workshops held with researchers as part of the "LeNa Shape" project have shown this: Researchers lack clear support from management staff as well as contact persons in the institutes on the topic of socially responsible research. In addition, the implementation of such research requires targeted and comprehensive motivation of researchers (see chapter 2.6) as well as institution-specific medium to long-term strategies. This also requires anchoring the perception of societal responsibility in the governance mechanisms of the organization, similar to the traditional criteria for high/excellent quality of science.

The following starting points are essential for the further development of research organizations:

- Implementation of strategy and mission statement processes with regard to the perception of societal responsibility and corresponding communication to the workforce
- Inclusion of societal responsibility skills as a criterion in personnel recruitment
- Inclusion of the perception of societal responsibility as an incentive instrument at the operational level of personnel management (e.g. in payment)
- Targeted teaching of the relevant skills in the on-the-job training for new employees, in the promotion of junior staff and in further training
- Developing and offering university curricula that focus on teaching these skills and incorporating them into thematic degree programs.

Further development of all the framework conditions mentioned in the various areas is **necessary** in order to make research with societal responsibility attractive, feasible and successful - in terms of societal expectations as well as a modification of the concept of excellence and its application in the science system.

2.6 Motivation and empowerment of researchers

The results of the "LeNa" project clearly show that researchers from a wide range of research institutions identify a **considerable need for research with societal responsibility**. The consequences of not implementing this type of research are considered undesirable, and the researchers' motivation and intention to implement it are high. In addition to the obstacles to consistent implementation mentioned in section 2.5 in the form of a lack of time or unsuitable institutional framework conditions, **a lack of experience with and tools for carrying out the reflection processes** are also emphasized. Prior experience in dealing with the "LeNa criteria" or societal responsibility research sometimes differs significantly depending on the research organization, discipline and type of research conducted. While interdisciplinary research, for example, has gained in importance, experience with transdisciplinary research or explicitly integrative research approaches is still rather unknown or uncommon.

Various aids and tools have been developed in the project that support the empowerment of researchers and other actors in the scientific system to conduct socially responsible research. The inclusion of playful elements and the possibility of being able to set the focus of the application according to individual previous experience **strengthens the motivation for implementation in everyday research**.

All tools have been tested for their applicability and adapted as required. This "toolbox"⁶ is available for various applications and addressees, but is primarily aimed at researchers and project managers.

The toolbox includes the following elements:

- Explanatory videos on the eight "LeNa criteria", which clearly present the key aspects and provide an introduction in just a few minutes;
- a workshop concept that can be used digitally or in person and enables people with no previous experience to use the framework for reflection in just one day;
- Micro-learning units that take a closer look at individual criteria;
- an interactive web companion that enables the framework for reflection to be used individually, regardless of time and place;
- a print box containing background information and various application aids.

All tools are available **in German and English** and can be used according to personal preferences or time capacities, in any phase of the research process, by individuals or groups. The most important prerequisite for intensive use, apart from basic individual motivation and institutional support, is the willingness or ability to take up to two whole days (especially in the case of the workshop concept).

The tools structure the application process so precisely that this time can be used productively. They contain playful elements and offers that can be integrated into well-structured research processes and make the application simple and attractive at the same time. **It is important that the tools are used as widely as possible and that research organizations actively support this.** The publication of experiences with the use of the tools can also make an important contribution to their dissemination. Visible pioneers can motivate others to follow. In this way, further application experience can be gathered that can be used to further develop the tools. This may also include adapting or expanding the criteria to include aspects that are of particular importance to individual institutions or researchers.

A wide range of materials are now available to empower and motivate researchers. However, the greatest motivation to conduct excellent research with societal responsibility comes from the **recognition of the efforts of individuals** - through role models in the institutes, through consideration in the allocation of funding and through the facilitation of career paths.



Figure 3: Digital and analog tools, such as micro-learning units, web companion, menu card, criteria cube and printbox

3 Summary and outlook

Only by systematically implementing research with societal responsibility in all areas of the science system, the requirements of scientific excellence and societal responsibility can be better integrated into the research process. Systematic application of the "LeNa framework for reflection" and the tools presented in chapter 2.6 can provide substantial support for this. However, in the course of the comprehensive realization of the conditions for success required for this, areas of tension can arise or be intensified in the various areas of the science system. Conflicts with other science policy objectives, in particular research efficiency and (international) competitiveness, should be mentioned here first. The expected higher time and financial resource needs associated with the consideration of the criteria and the resulting a priori decrease in efficiency and competitiveness are often cited here.

Such conflicts can be countered by considering the prerequisites for the fulfillment of criteria from the outset in the application phase when planning the research design and methodology. In addition, well-founded references to the planned application of criteria could also result in competitive advantages compared to other projects or programs. Both require corresponding changes to the framework conditions (see section 2.5). In relation to the efficiency example cited, this would mean, for example, that the additional effort would have to be offset against a "yield" that also increases by strengthening the relevance, resonance and acceptability of research and its results.

At the same time, awareness of the need for change and the willingness to break new ground has grown in the scientific system. The acceptance that transdisciplinarity in research has gained in recent years at both national and international level, for example, is an indication of this. Against this background, a central task is to reveal existing, impending or feared conflicts in the implementation of "excellent research with societal responsibility", to reflect on their relevance and consequences and to find ways of dealing with them appropriately. In unavoidable conflict situations, this also requires decisions about context-related prioritization between different research policy models or about the corresponding allocation of resources. However, the implementation of research with societal responsibility should not be narrowed down to the question of the availability of additional resources, but should also take into account the possibilities of influence through changed structures and processes.

For the best possible and comprehensive implementation of research with societal responsibility, all actors in the science system must participate in the necessary reforms. These must include conceptual, organizational, institutional, resource-related and communicative aspects of design. In addition to the conflicts already mentioned, we see various areas of tension that need to be discussed and ways of "de-tensioned" sought:

- The example of impact assessment shows the different importance that individual "Lena criteria" can have in different contexts - e.g. in the segment of mission- and application-oriented research compared to basic research. This requires a localization of the individual scientific segments in this field of tension and a research- or discipline-specific differentiation of the general requirement for the reflection process, e.g. with regard to the respective importance of the criteria in this process.

- Even if the necessity of the reflection process is recognized for all science segments, it could be argued that this is an additional requirement external to science that is not part of scientific activity and therefore not part of excellence. However, because successful research with societal responsibility, as explained above, leads to higher quality of research, the consideration of societal responsibility should be integrated as a criterion in the understanding of excellence.
- It could be argued that taking societal responsibility into account jeopardizes the independence of science and encourages the political appropriation of science. On the contrary, however, we see that the risk of appropriation increases precisely when science closes itself off from reflecting on its societal responsibility and when decisions are made outside of science about the nature of science's societal responsibility. Science must therefore demand from society to be able to reflect on its societal responsibility and address societal expectations itself. Freedom and responsibility are closely interwoven here. Science should proactively claim this task for itself and not leave it to politics - and follow words with deeds in the sense of turning to processes of reflection.

One thing remains to be said:

Successful research with societal responsibility leads to higher quality of research, higher social acceptance and acceptability of research and its results, thus to higher legitimacy of science-based support for transformation processes and ultimately to an appropriately developed understanding of excellence.

This paper serves to introduce this central position into the current societal negotiation process on the future of the science system. It is intended to provide suggestions for the further development of the system and to help ensure that common understanding can lead to common action.

A position paper by employees of the following research institutions:



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