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Working Paper of the Institute for Innovation and Technology (iit) No. 63

Implementing sustainability and common good in innovation promotion

Designing instruments to promote innovation: a methodological approach

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Implementing sustainability and common good in innovation promotion. Designing instruments to promote innovation: a methodological approach

A look at the Sustainable Development Goals (The United Nations 2020) of the United Nations and the German Sustainability Strategy (Die Bundesregierung 2021) shows: Sustainability requires rethinking as well as structural changes. In most areas of public and social life, issues of sustainability and the common good are alreaday widely discussed. Less visible structures, such as public funding systems, often still lag behind the pace of current developments in the thematic field these systems might address.

This iit perspective presents a concept that links public funding of research and technology as well as other programmes and funding instruments more closely with the subject areas of sustainability and the common good. The aim is to provide a framework for public stakeholders involved in innovation funding that helps to render concerns for sustainability and the common good in research and innovation policy more audible. Additionally, this framework can demonstrate ways in which the new approach could get enriched by project and innovation funding systems.

In the course of this paper, the concepts of sustainability and common good will first be classified in the context of research and innovation policy. Afterwards, the common good matrix will be presented as a theoretical basis. In addition, a possible process for the design of public funding instruments will be described. Exemplary approaches for the concept presented here will be discussed and reflected. Finally, the outlook closes with recommendations for involved individuals and organisations of the public funding landscape.

1 Sustainability and common good as social objectives

"In order to achieve the goals of the German Sustainability Strategy and the 2030 Agenda[1], we must follow the path of a truly ambitious transformation that encompasses important areas such as energy, climate protection, the circular economy, housing, transport, food and agriculture"[2], is emphasized in the foreword accompanying the latest edition of the German Sustainability Strategy 2021[3], which since 2016 has referred to the Sustainable Development Goals (SDGs) of the United Nations (The United Nations 2020). According to the agreement of Germany's currently governing *traffic light coalition*, "sustainability by design […] is to become the standard for products"[4], citizen science is to take better account of civil society perspectives, and a course is now set "toward a social-ecological market economy and […] a decade of investment in the future."[5] These and other declarations of intent from politicians demonstrate the ambitious objectives with regard to social and ecological sustainability. In this context, also the inclusion of the common good plays a larger role than in past times. In respect of the sustainability goals, social innovations[6], which also focus on economic activity oriented toward the common good, are receiving more attention and weight. However, one may come across some simililarities when examinating the terms "sustain-

1 https://www.bmz.de/de/agenda-2030
2 Editorial Translation; quote in German original: „Um die Ziele der Deutschen Nachhaltigkeitsstrategie und der Agenda 20301 zu erreichen, müssen wir den Weg einer wirklich anspruchsvollen Transformation gehen, der wichtige Bereiche wie Energie, Klimaschutz, Kreislaufwirtschaft, Wohnen, Verkehr, Ernährung und Landwirtschaft umfasst (…)."
3 https://www.bundesregierung.de/resource/blob/998006/1873516/3d3b15cd92d0261e7a0bcdc8f43b7839/2021-03-10-dns-2021-finale-langfassung-nicht-barrie-%20refrei-data.pdf?download=1s.3.
4 Translation of the authors; quote in the german original: „Nachhaltigkeit by design […] zum Standard bei Produkten werden". https://www.bundesregierung.de/resource/blob/974430/1990812/04221173eef9a6720059cc353d759a2b/2021-12-10-koav2021-data.pdf?download=1
5 Editorial translation, German original: „(…) auf eine sozial-ökologische Marktwirtschaft und […] ein Jahrzehnt der Zukunftsinvestitionen (…)."
6 https://www.bmbf.de/bmbf/de/forschung/soziale-innovationen-und-zukunftsanalyse/soziale-innovationen-und-zukunftsanalyse_node.html

ability" and "common good" (cf. Weidner 2002, pp. 19–20) and both terms can be interpreted broadly, but are therefore also known and accepted. For this article, the understanding of sustainability in terms of the SDGs and Agenda 2023 will be understood as describing the common good. Both terms will be used integratively in the following, as the concepts are closely connected to each other. A specific assignment to the underlying discourses of the two concepts of "sustaiönability" and "common good" is not the focus of this paper.

The coalition agreement of the German government of 2021 states that "In Germany, […] with the further development of our sustainability strategy and in particular with education, research and innovations [this] transformation process […]"[7] is to be advanced. In this context, "the binding nature of sustainability strategies, goals and programmes in specific government action"[8] is to be increased. The question of liabilities has always been a core issue in controversial discussions on sustainability and common good in Germany. The task laying ahead is to discuss the framework and design of binding measures for greater common good and sustainability. New paths and perspectives are needed in order to not only be credible but also effective. This article addresses the question of the ways education, research and innovation can contribute to achieving these goals and its authors offer a methodological approach that can be implemented incrementally.

Today's research and development for products, processes and services can have a major impact on future consumption and behavior patterns. Accordingly, research and innovation policies offer a powerful lever to support this intended sustainable and public good-oriented transformation process. The question that must be addressed by politics, administration, business, research and education representatives is how research and innovation policy instruments can be specifically designed to effectively support the achievement of the ambitious goals.

2 Research and innovation policy for sustainability and the common good

Innovations, but also crises, are drivers for change in politics and society. While crises usually offer little scope for organisational and structural change processes, as in the case of the energy crisis, for example, innovations in our minds stand for desirable, intended change. Even if this promise is not always kept and innovations may cause crises at a later stage, our society understands innovation as a positive development. In this context, innovation funding can be an effective instrument for achieving sustainability goals – as long as the underlying funding system is also comprehensively aligned with sustainability (e. g. SDGs or German Sustainability Strategy) and/or the common good in terms of goals, processes and structures.

The German government supports research, development and science with a complex funding system and various innovation initiatives. These usually comprise a specific thematic funding focus, such as battery cell production, digital education or bioeconomy, which can consist of various elements, such as funding programmes, competitions and accompanying measures. In this context, the individual ministries are often accompanied by innovation agencies or project management agencies which support the technical and organisational implementation. With scientifically, technically and administratively diverse teams, these agencies perform a spectrum of tasks ranging from the development of funding programmes to advising those interested in funding, applicants and grant recipients, to the professional evaluation and monitoring of projects throughout all phases, and often also include the networking of actors and the monitoring of current developments in the field. Project executing agencies also make an important contribution, where necessary, by analyzing and evaluating complex factual contexts in order to open up viable approaches to solutions for current social challenges. In this context, the work of the project executing agencies aims at the orientation and implementation of new and effective funding measures and tools.

Against the backdrop of the current multiple crises and in addition to the increasing focus on innovation potential concerning areas of sustainability, the rules and processes of project funding must also be aligned with sustainability issues and brought under the roof of the SDG goals and the German Sustainability Strategy. Programme development, announcements, communication and implementation ending with evaluation and the establishment of accompanying measures that support innovation or the common good could then constitute a promising starting point.

Innovation in itself does not automatically promote common good and is still too often measured only in terms of isolated technical or functional changes in the sense of "faster, higher, further". The numerous other effects caused by the respective innovation or by the organisations and processes involved in its development, production and application, are still too often left out of consideration when it comes to promoting innovation. Sample questions are: Should funding be possible if CO_2 and other environmentally impacting substances are not explicitly

7 Editorial translation, German original: „In Deutschland […] mit der Weiterentwicklung unserer Nachhaltigkeitsstrategie und insbesondere mit Bildung, Forschung und Innovationen [dieser] Transformationsprozess […]."

8 https://www.bundesregierung.de/resource/blob/974430/1990812/04221173eef9a6720059cc353d759a2b/2021-12-10-koav2021-data.pdf?download=1

Figure 1: United Nations (UN) Sustainable Development Goals (SDGs) Source: https://sustainabledevelopment.un.org/sdgs

addressed and minimized in the design and process of the innovation? Should organisations be supported that treat suppliers and employees unfairly, hinder co-determination and organize monopolies? This would be absurd, taking into account the goals pursued with innovation funding and the good perception of innovation and innovation funding in politics and society to date. Politicians have so far set some initial framework conditions, e. g. in the research framework programmes of the European Commission (European Commission 2020). There, for example, gender action plans, references to individual social challenges or so-called dual-use exclusions are demanded. The aim here is to exclude the usability of civilian technologies or goods for military purposes. In Germany, like in some other countries, certified environmental management systems are sometimes expected of grant recipients. At the state level, requirements for dealing with sustainability issues are already very specific in some cases. For example, in the state of Schleswig-Holstein, all new grant guidelines must pass a sustainability check in a specially developed standardized procedure.[9]

In this paper, the team of authors proposes to establish a procedure for simultaneous, tending to holistic consideration of the most diverse public good and sustainability goals.

This already begins with the planning of funding objectives and topics and extends across all instruments of innovation funding. The aim is to show ways in which public good impact in its dimensions of human dignity, solidarity and justice, ecological sustainability, transparency and co-decision (cf. Fig. 2) can be realized in innovation projects, including social innovations and also in future value networks of products, services and systems. The paper is addressed to all actors involved and affected in the design of funding instruments and the implementation of innovation projects from politics, administration, project sponsors, business, science and society. It outlines an approach that shows relatively easy and at the same time technically appropriate ways of exploiting the existing potential for desirable change in the interest of the common good in innovation and funding policy. This methodical approach addresses

9 https://320grad.de/2022/04/20/nachhaltigkeitscheck-fuer-gesetze-und-verordnungen/

Value / Touch group	Human dignity	Solidarity and Justice	Ecological Sustainability	Transparency and Co-decision
A: Suppliers	**A1** Human dignity in the supply chain	**A2** Solidarity and fairness in the supply chain	**A3** Environmental sustainability in the supply chain	**A3** Transparency andco-decision in the supply chain
B: Owners & Financial partners	**B1** Ethical attitude in Dealing with funds	**B2** Social attitude in Dealing with funds	**B3** Social-ecological investments and Use of funds	**B3** Ownership and Co-decision
C: Employees	**C1** Human dignity at the Workplace	**C2** Formation of the Employment contracts	**C3** Promotion of ecological behavior of the employees	**C3** Internal co-decision and Transparency
D: Customers & Co-enterprises	**D1** Ethical customer relations	**D2** Cooperation and Solidarity with fellow companies	**D3** Ecological Impact due to use and disposal of products and services	**D3** Customer Participation and product transparency
E: Social Environment	**E1** Sense and social impact of the products and services	**E2** Contribution to the Community	**E2** Reduction of ecological effects	**E2** Transparency and social co-decision

Figure 2: The common good matrix as a holistic regulatory framework for the realisation of sustainability goals of the federal government (own representation based on International Federation for the Economy for the Common Good e. V. o. D.)

1. the actors who design funding instruments
2. the actors in research and development from science and from companies that implement innovation projects, and
3. the effects of these innovations in the steps of the value creation and utilisation cycle.

The following section describes the organisational and structural means by which innovation funding can increasingly support the common good and social sustainability.

3 Sustainability goals specifically: the common good matrix as a structuring framework

In addition to the goals to be achieved, the 2030 Agenda also refers to a methodological change of perspective. Partnerships and the sharing of responsibility among all groups of actors, i. e. the state, the private sector and civil society, are intended to strengthen sustainable development. The current revitalisation of the concept of the common good should also be considered in this context.[10]" From Aristotle to Thomas Aquinas to Adam Smith, there was consensus that economic theory and practice needed to be both legitimized and constrained by an overarching goal, such as the 'common good'"[11] (Dierksmeier 2016, p. 35). In the discourse around the functions of the "common good," the common good economy (German abbreviation: GWÖ for "Gemeinwohlökonomie") sees itself as a "civil society movement with political demands. It wants to contribute to a culture of good living in a peaceful and sustainable society in all areas of society."[12] (Bertelsmann Stiftung, ICLEI European Secretariat GmbH, International Federation for the Economy for the Common Good e. V. 2022, 17). The concept of GWÖ is based on the understanding of values such as cooperation and solidarity instead of competition and profit maximisation. Economic activity as a whole is to be more closely linked to social, ecological and democratic values.

One approach of GWÖ is the Common Good Matrix (Fig. 2), a planning and assessment tool for the consideration of underlying common good and sustainability goals. In this context, common good accounting (Blachfellner et al. 2017) is an assessment procedure for private individuals, communities, companies, and institutions to assess the extent to which they serve the common good. Ecological, social and other aspects are examined. The procedure thus differs fundamentally from conventional balance sheets or accounting processes, which usu-

10 See, for example, its central place in the New Leipzig Charter, adopted as part of the German EU Council Presidency in 2020.
11 Editorial translation, German original: „Von Aristoteles über Thomas von Aquin bis zu Adam Smith bestand Konsens darüber, dass die ökonomische Theorie und Praxis sowohl legitimiert als auch begrenzt werden müssten durch ein übergeordnetes Ziel wie etwa das ‚Gemeinwohl'."
12 Editorial translation, German original: „zivilgesellschaftliche Bewegung mit politischen Forderungen. Sie will in allen gesellschaftlichen Bereichen zu einer Kultur des guten Lebens in einer friedlichen und nachhaltigen Gesellschaft beitragen."

ally only consider economic value categories. With the central pillars of ecological sustainability, human dignity, solidarity and justice, as well as transparency and co-decision, the common good matrix therefore maps essential dimensions of sustainable innovations. The evaluation guidelines for measuring common good provide starting points with which actions and their effects can be evaluated – with regard not only to the environment, but also employees and capital owners as well as providers, taking into account customers and society. The common good matrix is increasingly used in the overall design and evaluation of tasks in complex organisations and sensitive fields of activity. These include, for example, companies and associations, educational institutions and municipalities (International Federation for the Economy for the Common Good e. V. 2022). The common good criteria are adapted to the situational contexts, specified and developed until they are design and evaluation standard. The common good criteria thus correlate with and specify the target categories of the United Nations SDGs (see Fig. 1). Required design elements and behaviors are mentioned on the action level and made assessable by means of verifiable indicators. With regard to the sustainability strategy of the German government, the common good matrix is a suitable process- and impact-oriented approach for aligning research, innovation and transfer programmes with the respective sustainability goals.

4 Pursuing sustainability goals in innovation funding: Design of project funding instruments

Innovation funding not only includes financial support for ideas and projects, but also other instruments that can be designed in order to achieve the desired sustainability and public good goals. The approach proposed here can be used to define the objectives, design and implement individual funding programmes and their accompanying measures, as well as to compare and prioritize different program topics, taking into account aspects of sustainability and the common good.

4.1 Identifying common good objectives for funding initiatives

At the level of specific innovation programs and initiatives, two steps can be distinguished: common good scoping for goal identification and common good programming for the design of the instruments that are effective in this regard. The common good scoping is the analytical starting point and serves to determine the objectives of the funding instruments in the given innovation field. Topics of funding programmess are examined beyond a general prioritisation in an interdisciplinary way for impact potentials forthe common good. The basis of the comprehensive examination is the application of the common good matrix in the form of a checklist that enables criteria to be projected onto the respective innovation field. A common good scope is formulated, which supplements the subject of innovation promotion with essential aspects from the common good matrix. Particular common good potentials and risks are named specifically for the innovation field and recorded in a scoping document. To facilitate the prioritisation of topics, the creation of an impact model can also prove helpful, in which intended impacts with possible directions for action can be presented in a systemic context and aligned with one another.

The process of common good scoping can and should be organized specifically for each programme as a co-creation between stakeholders from politics, administration, research and implementers of innovations as well as actors from the value network and from civil society such as consumers. Only by doing this political sustainability goals such as the SDGs can become a catalog of innovation-related fields of action and common good goals which relate to diverse aspects of the subsequent product development and life cycles. As a result, the catalogue combines approaches, goals and requirements for the implementation of common good-oriented promotion of innovations and serves as a reference during a possible funding period or the entire duration of a programme.

4.2 Prioritisation of funding topics

Different fields of innovation hold different levels of potential for increasing public welfare and contributing to the achievement of the joint sustainability goals. In terms of the efficiency of policy design, it may be advisable to prioritise fields with high impact potential more than those fields with lower potential. Possible prioritisation in this context is already part of public good scoping and is based on efficiency and effectiveness analyses. As part of the political planning of funding topics, an assessment can be made that qualitatively outlines, evaluates, and ranks the effort – i. e., the government intervention in a program – and effects on the common good and society. This can be done as part of the public good scoping process and/or as part of an ex ante evaluation.

The results of the common good scoping or an upstream evaluation can be incorporated into decision-making about prioritizing funding programmes and announcements, for example, to inform about funding topics and budget titles. The results could even be used to revise ancillary provisions and general requirements.

4.3 Implementation of funding initiatives: Designing the funding instruments

In the following step of public good programming, the results of scoping are used as input for the design of funding instruments: Announcements, guidelines, access conditions, evaluation criteria, reporting requirements, and accompanying meas-

ures can be designed accordingly. Starting points here are both the level of the innovation project itself and its impact as well as the actors and their procedures.

Criteria for eligibility to apply

Eligibility requirements for applicants to participate in selection or funding processes are formulated in funding announcements. These are very suitable for translating the community-based objectives and fields of action from scoping into funding objectives or conditions. Specifications or requirements for innovation projects to be funded and grant recipients in announcements serve as a guideline for applicants when submitting proposals. Under the heading "Grant recipients" (German: "Zuwendungsempfänger"), the groups of actors eligible to apply are dealt with and defined, particularly in terms of who may apply for funding and under what conditions. It is comparatively easy to request the existence of certifications at the level of the organisation or organisational units. These could refer to environmental, sustainability and labor standards from the ISO family, e. g. ISO Standard 14001, 45001, or the fulfillment of requirements on topics such as tariff compliance, supply chain law, recognized certifications on work-life balance or on fairness standards in certain consumer goods sectors, such as clothing or food.

However, since most certifications aim at a broad mass of organisations, they cover at best a minimum set of requirements. Alternatively or additionally, therefore, organisation-specific

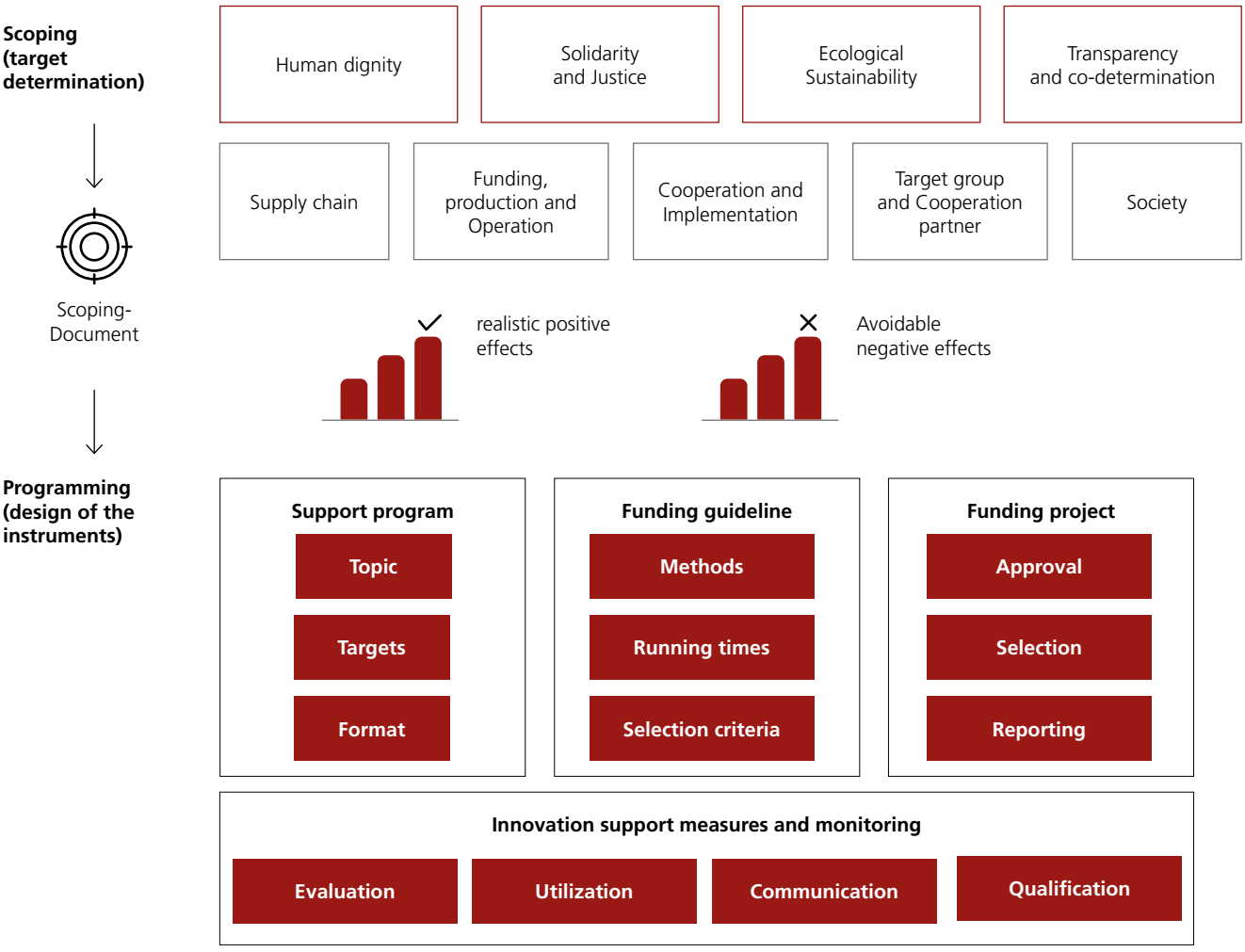

Figure 3: Overview of the aspects to be considered when defining the objectives of innovation or funding topics as well as the units to be designed corresponding to the public funding logic.

objectives such as impact areas, ambition levels and approaches, as well as their implementation quality, such as prioritisation and integration into structures and decision-making processes of those entitled to apply, can be added and formulated accordingly in the announcement. Such approaches, if systematically elaborated, allow economic and public good goals to be treated synergistically and as individual or target group-specific development paths.

Exclusively funding certified organisations excludes different numbers of funding stakeholders, depending on the topic area, and may be an undesirably severe restriction in certain cases. At the same time, it prioritizes or favors certain certification systems and providers. The existence of public welfare and sustainability goals in the organisations and suitable measures for their implementation therefore have greater potential impact here and should be taken into account when evaluating applicants.

Project evaluation and selection criteria

More specific and, at least from the point of view of the authors, significantly more effective than organisation-related general certifications are project- and innovation field-related requirements. On the one hand, they can be formulated as project approval criteria – i. e., in terms of the level of ambition, for example, via characteristics that applicants already bring with them and can demonstrate, and on the other hand, as project selection criteria – i. e., in terms of optimisation goals, for example, the way in which sustainability and public welfare goals are to be achieved. Consequential effects of innovations can also be addressed in this context. Examples of aspects of approval and selection criteria include environmental goals, transparency and fairness in supply chains, open source use and design, trustworthy and responsible artificial intelligence (AI), data sovereignty, diversity in research and development teams, and transparency in the operating model and investor structure. In addition, resource and material or energy balance changes are highly relevant in many technology fields. This may relate, for example, to the avoidance of toxic materials in the production process or in the subsequent product. If such balances are not yet available or are only in the development stage, the modeling of these balances can also be a useful selection criterion at the time of application and can be checked later as a reference point. Pay and working conditions under which work is carried out in the global division of labor in the value network can also be an impact aspect in the sense of the common good and thus represent admission criteria. This would also support the supply chain due diligence law[13] in its intended effect.

Requirements for projects may include, for example, analysis and optimisation along common good objectives, or may include obligations to avoid or reduce harmful effects or to comply with common good aspects.

The authors suggest that sustainability should be given a value that means that non-sustainable project ideas are no longer eligible for funding and, on the other hand, that particularly sustainable ideas are made eligible for funding even if, for example, the level of innovation is comparatively low or the prospect of economic success is low. The assessment of sustainability – as described above – in each case should be based on the specific objectives and funding topics. The signal to potential funding recipients should be that financial resources for projects are connected to sustainability and the common good.

Accompanying measures and accompanying research

Accompanying measures are a particularly effective means of generating common good impacts. Classic topics for accompanying research include technical standards, education and curriculum development, utilisation promotion, and communications work. Qualification initiatives for skilled workers and awareness raising in the value cycle can also be specifically upgraded with common good topics and implemented as part of accompanying measures. Furthermore, cooperative exchanges up to the initiation of partnership activities and agreements make sense. Here, for example, project cooperations that establish and implement joint reuse/recycle concepts, standards for product interfaces or modularity, fair sourcing of critical raw materials or industry agreements on occupational safety could me mentioned.

Cross-departmental or cross-territorial activity and collaboration with stakeholders at the level of global scientific, business, or legislative communities are also among the fields of action for accompanying measures, for example regarding environmental standards, import/export restrictions, data sovereignty standards, or monetary incentives for common good.

Evaluation, monitoring, reporting

Finally, evaluations and reporting obligations in all phases and at all levels of programme and project funding are good opportunities to inquire about sustainability and common good impacts and the quality of the system. They can also help to evaluate with appropriate metrics within the framework of systemic considerations and impact models. In the context of monitoring measures in the respective topic, there is also the possibility of supporting funded projects and actors with

13 Dt.: Lieferkettensorgfaltspflichtengesetz – LkSG, available at: https://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl121s2959.pdf#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl121s2959.pdf%27%5D__1672831561539

information and identified examples of application in the field of sustainability and common good orientation.

5 Examples and practice of public good orientation in innovation funding

5.1 Examples

There are already several examples of innovation funding addressing common good aspects. In individual cases, they also relate to more than just ecological or specific aspects of social sustainability. In the following four examples from current German practice of public innovation funding will demonstrate that the orientation towards promoting the common good proposed here can be started and rolled out in many contexts:

"Start-up Competition – Digital Innovations"

The German Federal Ministry for Economic Affairs and Climate Action (German: "Bundesministerium für Wirtschaft und Klimaschutz", BMWK) promotes the innovative digital technologies with application-oriented technology programmes, strategic individual projects and international cooperation projects, and it supports start-ups in this area with the "Start-up Competition – Digital Innovations" (Bundesministerium für Wirtschaft und Klimaschutz 2022b). Here, common good and sustainability criteria have been successively incorporated at several points for start-up motivation as well as in the evaluation and awarding of competition participants:

- In the evaluation of start-up ideas, the orientation of the projects participating in the competition to ecological and social sustainability is taken into account separately. In 2021, they were newly included in the circle of around 20 assessment criteria for the structured evaluation of digital start-ups.
- In the 2022 winter round of the "Start-up Competition – Digital Innovations," a special prize of 10,000 euros was awarded for the best concept of a start-up on a digital product or service in the field of environmental and climate protection.
- The podcast series "FE.MALE FOUNDERS" (Bundesministerium für Wirtschaft und Klimaschutz 2022a) of the start-up competition also motivates targeted start-up activities by women.

The topic of sustainability is widely included in e. g. business plans, start-ups and consulting, and digital innovations are already making a valuable and active contribution to sustainable development in various application domains (e. g., health, education, production, transport, and mobility). They help to make work processes more effective, use resources and energy more efficiently, and establish new and location-independent forms of work.

"Innovations in Higher Education through Artificial Intelligence and Big Data"

The digitisation of (higher) education and the use of artificial intelligence methods to improve teaching, learning and administrative processes holds potential that the German Federal Ministry of Education and Research (German: "Bundesministerium für Bildung und Forschung, BMBF) is currently highlighting in various funding programmes. In the programme "Innovations in Higher Education through Artificial Intelligence and Big Data" (Bundesministerium für Bildung und Forschung 2020b) of March 4, 2020, explicit reference was made to the ethical perspective of the use of such methods and technolgies. The implications of large-scale use of AI in education and the use of big data on students are discussed quite contradictory. Responsible implementation requires that common good-oriented issues be considered from beginning to end. In this context, it is precisely the increased inclusion of ethical and data protection aspects that offers further innovative opportunities for the participating projects. The consideration of "data economy" or the data minimisation requirement (Roßnagel et al. 2017) serves both data protection law and common good-oriented goals such as informational self-determination. At the same time, this aspect can also be profitably linked to goals of environmental sustainability. Student co-determination in the development of AI offerings also creates improved acceptance among stakeholders and improved advisory outcomes. With this in mind, a workshop was developed and implemented for the funded projects as an accompanying measure. The conception of the workshop "Ethics Committee 2.0" (Pentenrieder and Ritzmann 2021) was based on the dimensions of the common good matrix (see chapter 2) and used them for structuring (see figure 4).

The ethical or data protection challenges presented by the projects were thereby transferred into the logic of the common good and discussed under the perspectives contained therein. The joint discussion of the raised questions was based on the aspect of open exchange and, as a first step, creates permeability for this type of consideration in research and development projects. Solutions must be further developed in the respective project contexts and with the actors concerned (see Figure 3). The workshop format should be transformed into a recurring offer and can thus enable a long-term inclusion of public welfare within the research projects.

"STEP UP!" and complementary programmes

In June 2016, the German Federal Ministry for Economic Affairs and Energy (now BMWK) launched the STEP UP! funding programme (Bundesministerium für Wirtschaft und Klimaschutz 2022c) to provide support to companies in implementing investment measures to exploit the electricity efficiency potential of plants and processes. In this cross-sector and cross-technology funding programme, corporate applicants competed with-

in competitive rounds for a limited quota of funding. In addition to efficiency measures related to electricity, funding is also available for measures to save a wide range of energy sources, such as substitute fuels and biogas. In addition, the funding efficiency currency was introduced. It indicates how high the subsidy amount is in comparison to the energy or resource savings achieved in relation to the amount of CO_2 emitted. The evaluation criterion of funding efficiency ensures that primarily measures are funded that result in high CO_2 savings in the process. Since material resources also have a CO_2 footprint, resource-saving efficiency measures can also be taken into account. Complementary funding programmes have been set up for sensible but less impact-intensive projects, but also for consulting on comprehensive site- or company-related CO_2 emission reduction concepts and their measure planning, which also include cultural aspects. In terms of content, the transformation concepts are based on the two international standards of the Greenhouse Gas Protocol (Greenhouse Gas Protocol 2022) and ISO 14064-1.

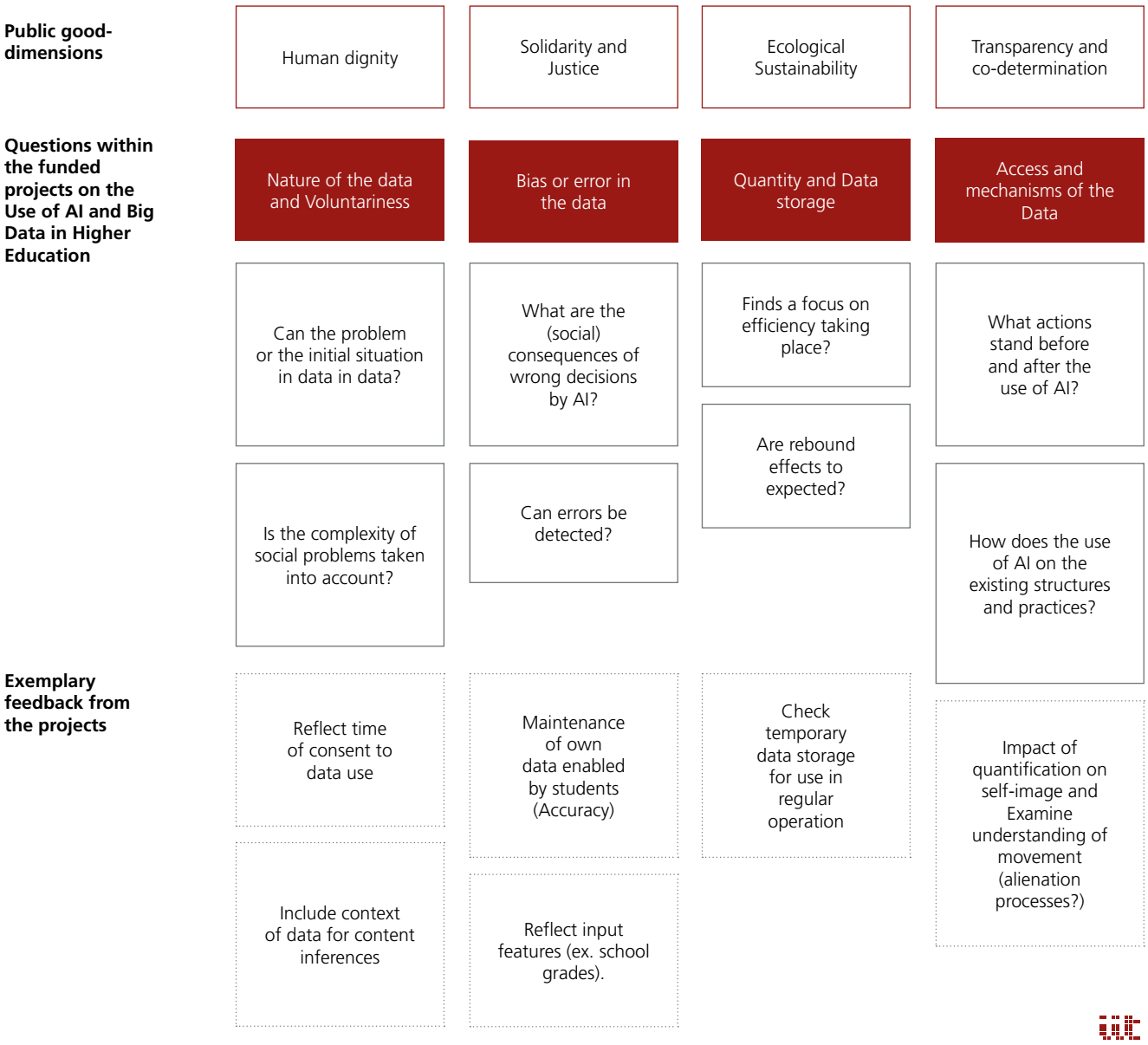

Figure 4: Structuring a workshop with higher education funding projects along the common good dimensions.

The German BMBF's innovation funding in the field of electronics

The BMBF's electronics funding comprises various national and international technology funding programmes, which are continuously developed thematically. While energy efficiency has long been a funding topic, especially on the technological side, which is crucial from a purely economic perspective, the quantification and comparison of environmental impacts has gained in importance in recent years.

An exemplary assessment of the project outlines submitted in 2021 as part of the European EUREKA cluster PENTA ("Pan-European partnership in micro- and Nano-electronic Technologies and Applications") (Bundesministerium für Bildung und Forschung 2021), revealed a very heterogeneous picture regarding the depth of sustainability efforts described: This counts for the project ideas submitted as well as the participating companies. Large corporations in particular have developed sustainability strategies (some of which are required by law) and/or are certified in this context (EMAS, ISO 14001). However, certification does not necessarily mean that a company is particularly sustainable. On the other hand, smaller companies are often very successful in social and also environmental sustainability issues – but are not widely communicated. The industry is also characterized by high pressure on prices and an internationally heterogeneous subsidy landscape.

In order to bring sustainability issues into focus, an innovation competition "Electronics for energy-saving information and communication electronics" (Bundesministerium für Bildung und Forschung 2020a) was launched in 2020 as part of the BMBF's Green ICT initiative. In an initial phase, ten projects produced a CO_2 potential analysis for the respective project idea from the range of topics in electronics research within nine months. This potential analysis was supported by the accompanying research of a leading research institute (Fraunhofer Institute for Reliability and Microintegration IZM) and subsequently served as a selection basis for the three winning projects, which are now being continued as collaborative projects for three years. Furthermore, an initiative project of the "Forschungsfabrik Mikroelektronik Deutschland" (Fraunhofer-Verbund Mikroelektronik 2022) started in August 2022 as a "Competence Center Green ICT", which bundles, in addition to technical benchmarking through eco-balanced testbeds, networking activities, further education programmes and consulting services on sustainability.

In addition to the Green ICT Initiative, there are efforts to increasingly align ongoing and new announcements with sustainability topics. The difficulty regarding technology funding is that at the time of project selection, it is generally not possible to estimate what the final product will look like. In this context, even the life cycle assessment of already developed products is so challenging due to the complexity of the supply chains in semiconductor manufacturing that only a few manufacturers are working on it. Nonetheless, there are several questions that can be used to assess the depth of implementation of planned developments in terms of sustainability, like the following:

- "Will the project save material or energy (and thus CO_2)? "
- "Do the planned developments aim to improve the eco-balance of a product?"
- "Does the project aim at a sustainable business model?
- Which role does sustainability play for the actors involved?

Fixed requirements for project funding, such as sustainability management as a funding prerequisite, would currently exclude (too) many funding recipients in the electronics industry. However, a sustainability criterion that evaluates the sustainability of a project idea can send a clear message that this criterion is relevant for project selection and thus raise awareness for the topic. The high leverage of high-tech industries can have a positive impact on large parts of the German, European and international economy and promote a change of mind in favour of common good and sustainability.

5.2 Drivers and barriers in practice

Cooperation between funding agencies, ministries and implementing service agencies (usually project executing agencies) is particularly suited to addressing and documenting common good-oriented issues and goals at a high technical level. Special ompetencies of the project executing agencies themselves, or indirectly available competencies of the respective practical or expert communities from science and industry, can be of use for the innovation programmes and operational process of decision-making. This applies, for example, to the design of programme announcements and ancillary provisions (see above), but also to administrative practices, review protocols, evaluation metrics, and other guidelines, such as the determination of monitoring criteria and evaluations. In some areas, such as for contracts, implementation conditions taking into account a whole range of public interest criteria do already exist (Bundesministerium der Justiz 2016). In addition, project-executing agencies can put their technically and administratively granted powers to good use in:

1. advising and selecting prospective beneficiaries,
2. the processing of inquiries and applications and at the level of projects in individual cases, and
3. the context of value network-related activities such as accompanying research.

In this context, many process steps offer impact potential for public welfare and sustainability goals. For example, the principle of economic efficiency and economy as well as criteria of the common good economy can be taken into account in project monitoring, especially in the verification of evidence. In view of the complexity of the legal bases, such as the Federal Budget Code (German: "Bundeshaushaltsordnung", BHO) and the Administrative Enforcement Act (German: "Verwaltungsvollstreckungsgesetz", VwVG), and their possible changes, it is recommended that such criteria be formulated accordingly at the programme level.

With regard to access regulations for applicants, obligations to provide proof of environmental or sustainability aspects have already proven their worth. One finding is that the clearer the requirements, the better the opportunity for project promoters to promote suitable approaches and to demand evidence of the implementation of sustainability criteria – and, eventually, to ensure their implementation. The same applies to public good criteria, e. g. in relation to organisational obligations on diversity, transparency, and participation.

Directed measures have proven effective for advising on the design and subsequent evaluation of projects, as demonstrated by the target group-integrating workshop format on common good aspects in "Innovations in Higher Education through Artificial Intelligence and Big Data" (see example above). Proactively addressing sustainability and public welfare aspects as early as the outline submission stage for innovation projects would also increase the efficiency of the projects that are later selected for funding, because very fundamental aspects that (must) be addressed in the applications are already incorporated into the project design.

The subsequent impact of the projects on sustainability and public good will be given greater significance by a mandatory information regarding their use: Advised business models for the marketing of expected project results have very great impact potential, the consideration of which has not yet been fully exploited. This affects all pillars of sustainability and the common good in all aspects of material and value cycles. The higher education example demonstrated: Looking at the context of technical AI-supported innovations allows the broadest view of common good impacts of technology projects and thus, also of the existing optimisation potentials. Product lifecycle CO_2 balances for the industrial exploitation of technical research and development projects also offer a wealth of starting points for environmental sustainability. Looking at utilisation in the early stages of project conception opens up possibilities for decisions that promote the common good.

In addition, the cooperation with grant recipients offers various starting points to promote motivation, action competence and public good-oriented actions of the project participants, e. g. with regard to certifications. The community of grantees is a suitable target group for the exchange of "good practice", as well as for further competence-enhancing measures on essential aspects of the common good. It can be well addressed in the context of accompanying research. This concerns, for example, methods for the presentation and determination of life cycle, CO_2 or other energy or material balances – or cooperation of stakeholders, e. g. for business models and/or technical or behavioral standards that promote the common good ("Code of Conduct").

Because this approach is in part new – and almost always additional – for many of those involved, there is often a lack of specific knowledge and competence to act. Joint competence development and the subsequent participatory shaping of public good orientation in the respective area of responsibility are perceived as helpful here – be it between grantees and project funders or between project funders and funding ministries. Trilateral cooperation can also lead to and substantiate results that influence further political action on the issues discussed here.

6 Outlook: What could happen now

Undeniably, there is pressure for action in almost all aspects of the SDGs and the common good to prolong the continuation of a livable society within planetary boundaries and to secure basic requirements for dignity, justice and quality of life (see chapter 1).

The focus of this paper is an approach that can comprehensively align publicly supported innovations with these challenges. It has also been shown that all those involved in innovation funding could actively pursue sustainability and common good issues - albeit with gradually differing impact potentials: common good scoping and the corresponding design of announcements, reporting obligations and accompanying measures offer great leverage at the level of implementing policy, which project funders can help to realize by involving experts. At the level of the selection of research topics, political programs and their implementation in ministries and authorities can intervene in a steering manner.

In the cycles in which a political selection of topics is made, announcements are formulated, and projects are approved and monitored, *any time*, i. e. always *now*, is the right time to make use of the given freedom and to let sustainability and common good orientation flow into daily actions and communication.

The examples have shown that this is possible in almost all phases of policy planning, program planning, program and project implementation. Design thinking loops in product and program development, the identification of impact models and metrics in all phases of evaluation, the selection and composition as well as the training of interdisciplinary experts' teams are among them, as well as interministerial cooperation in the formulation of frameworks, to name just a few. Pilot public benefit-oriented funding programmes or lines could make a significant contribution to establishing a proof-of-concept and underpinning the effectiveness of the approach presented here. Therefore, what is needed now is courage and a willingness to change on the part of the decision-makers who have a decisive influence on current funding practices.

Never before has an orientation toward sustainability and the common good been as socially and institutionally acceptable and desirable as it is today. The approach of the common good economy also includes the intention of making common good-oriented organisations more favorable in terms of taxation or other monetary measures. This would be a potentially very effective driver to pursue sustainability and public good issues even under often-conflicting considerations on profitability. Until such incentives are realised, the rediscovered focus on the attractiveness of jobs in times of a shortage of skilled workers can also help to pursue public good and short-term profitability objectives in equal measure.

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