

How to develop a Code of Ethics for real-world labs

Codes of ethics play an important role in the practice of professional organizations, companies, and academia. We describe the process of developing a Code of Ethics for Real-world Labs of Sustainability, a form of practice with particular ethical challenges.

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GAIA 33/4 (2024): 397–406

Abstract

Real-world lab (RwL) work is characterized by particular ethical challenges that arise from the participatory and, above all, transformative nature of this form of practice. In response to the demand from the German-speaking community, Real-world Labs of Sustainability, we have designed and implemented a transdisciplinary process to develop a code of ethics which should meet the requirements of the RwL community and, at the same time, be ethically reflective. In this paper, we describe and reflect on this process. It was initiated at the Karlsruhe Institute of Technology (KIT) in 2022, involving KIT-affiliated RwL practitioners and philosophers, and has subsequently been opened to a wider range of contributors. This article is also intended to present the full text of the draft Code of Ethics to a broader audience, and to encourage interested readers to give feedback on this draft. The feedback will be considered in a revision of the text and will thus lead the way towards the actual RwL Code of Ethics.

Keywords

code of ethics, ethics guidelines, living lab, real-world laboratory, Real-world Labs of Sustainability, research ethics, transdisciplinary research, transformative research

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<https://doi.org/10.14512/gaia.33.4.11>
Received February 9, 2024; revised version accepted November 4, 2024 (double-blind peer review).

Real-world labs (RwLs) are transdisciplinary research infrastructures that aim to contribute to a sustainability-oriented transformation of society (Parodi et al. 2023). Since their beginnings in the early 2010s, they have gained considerable importance due to their participatory approach in generating knowledge at the interface of science, civil society, and business (Beecroft and Parodi 2016, Schöpke et al. 2018, 2024). The laboratory aspect of RwLs can be seen as a specific feature, as it “emphasises – much more than in earlier approaches – the intervention character in the interaction between practice and science” (Wagner and Grunwald 2015, translated by the authors).

This hybrid character of aiming at scientific knowledge and societal transformation comes with specific ethical challenges. RwL scientists initiate, study, and support transformation processes and are themselves part of these processes – a situation that not only transcends conventional scientific practices and self-conceptions, but also raises questions about the justification of the transformation goals being pursued. Moreover, as a transdisciplinary practice, RwL work is also participatory and based on close cooperation with various non-scientific practice partners. These partners vary, sometimes considerably, in terms of their institutional embedding, their goals and interests, and their financial and time resources. In this context, questions surrounding the fair distribution of the burdens and benefits of joint work arise in more diverse and sometimes more pressing ways than in conventional research. Moreover, experiments in real world settings, as is the predominant research mode in RwLs, are also accompanied by different research ethics questions than experiments in ordinary laboratories, since they affect people (those involved in the project and others) in their “real” life contexts.

Against this background, the need for a code of ethics was identified by Real-world Labs of Sustainability¹, a community that networks relevant stakeholders, primarily in German-speaking countries. A project to develop such a code was launched at the Karlsruhe Institute of Technology (KIT) in 2022. Two KIT institutions with complementary expertise – the Academy for Responsible Research, Teaching, and Innovation (ARRTI), and the Karlsruhe Transformation Centre for Sustainability and Cultural

¹ www.reallabor-netzwerk.de

Change (KAT) – have since worked closely together to develop a draft Code of Ethics for the Real-world Labs of Sustainability community. ARRTI provided funding and staff with philosophical expertise. KAT provided RwL expertise and access to RwL practitioners and their experience, as well as workshop infrastructure. A project team of four researchers (the authors of this article), consisting of ARRTI and KAT employees, as well as an external partner with relevant expertise, was responsible for initiating and accompanying the transdisciplinary, multi-stage development process towards a Code of Ethics for RwLs (hereafter referred to as the Code).

Codes of ethics – characteristics, purposes, and challenges in drafting

Generally speaking, codes of ethics are collections of standards that apply to a specific professional group or organization (Marling 2021). Sometimes the term “code of conduct” is used interchangeably, sometimes differences between the two concepts are highlighted. In the latter case, codes of ethics focus specifically on *ethical* standards, whereas codes of conduct typically encompass standards of different types (e.g., legal, ethical, and others, such as norms relating to a dress code). Often the boundaries between the two terms are blurred.

Codes of ethics, in the strict sense, have been documented since the middle of the 19th century (Baker 1999).² “In the strict sense” means that not every text document that formulates ethical norms with reference to a specific group of people can be considered a code. According to Olson (1998) and the common understanding of the term, codes of ethics “are to be reflections of the morally permissible standards of conduct which members of a group make binding upon themselves”. The second half of the sentence is decisive: only when a group of people authoritatively defines the standards that apply to all group members can we speak of a code of ethics in the strict sense. Typical cases are codes of ethics of professional associations (e.g., engineers, psychologists, or scientists in general), as well as codes of commercial enterprises. The *Ethics Code Collection* database³, operated by the Center for the Study of Ethics in the Professions at the Illinois Institute of Technology, lists over 2,500 individual codes from around 1,500 different organizations, and claims to be the largest database of codes of ethics and guidelines in the world.

Based on the observation of over 500 codes from this database, Olson (1998) distinguishes three ideal-typical models of codes: the principles model, the relationship model, and the brief model. While the principles model focuses on fundamental principles and guidelines for their implementation, the relationship model organizes a code around the relationships between the members of the group concerned and other social groups, such as clients or the public. Besides these two “well-developed” types of code, brief codes consist of a small list of statements with little structure. Which model is suitable for a given group depends on whether the group primarily “identifies itself and its work with

BOX 1: Purposes of codes of ethics

- to increase ethical awareness, sensitivity, and judgement of all group members,
- to encourage discussion about ethical issues that can arise in practice,
- to offer ethical guidance,
- to improve ethical practice,
- to strengthen support for individual moral courage,
- to help to hone a group's sense of identity,
- to inform external organisations about what claims or requirements can be made of the group in question.

Based on Olson (1998) and CSJCA and NCCPE (2022), these purposes provided the background for the development of a Code of Ethics for Real-world Labs of Sustainability by a Karlsruhe Institute of Technology, DE, project team from 2022 to 2023.

the people involved” or “with concepts and principles of the occupation”. The question of which model we considered suitable for the Code is discussed below in the *Results* section.

Ideally, a code of ethics should address a number of purposes (box 1), as well as different application contexts, groups of people, etc. Therefore, when drafting a code, it is important to carefully balance how all the objectives can be achieved. “This presents an interesting challenge to the code’s authors who must write the code with enough information to be of use in the specifics of a situation while remaining general enough to be used for a wide variety of situations” (Olson 1998). So, what needs to be considered when drafting a code of ethics? Olson (1998) and Davis (1999, 2007) provide useful guidance in this regard: First, the community should be involved in the process as early and as often as possible, as this is the only way to ensure that the code will ultimately be adopted as its ethical standard. Second, for practical reasons, the drafting committee should comprise only a small number of people, including a single person responsible for producing a first draft. Only when this draft is prepared should the process be opened to a wider circle of people to be included in its review.

A fundamental challenge for the project team is to do justice to the advisory situation. After all, the aim is to write a draft text for an addressee whose own ethos is to be reflected in the text, but who at the same time expects advice on structural, content-related, and terminological issues. The associated normativity of the scientists involved in the writing process is unavoidable, but its consequences are limited by the fact that the final editing of the draft code, and the decision on its acceptance, lies with the addressee himself.

² “By 1847, the newly-formed American Medical Association adopted a Percivalean *Code of Ethics*, the first code of ethics adopted by any national professional society anywhere, and the first to be denominated a ‘code of ethics’” (Baker 1999, p. 3).

³ ethicscodescollection.org

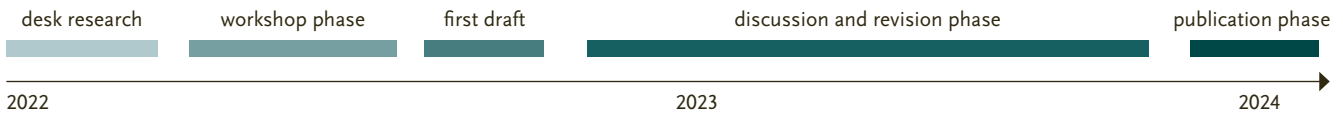


FIGURE 1: Timeline of the development process of the Code of Ethics for Real-world Labs of Sustainability written by a Karlsruhe Institute of Technology, DE, project team from 2022 to 2023. Strong bottom-up elements, focussing on the workshop phase in the first year of the project, should establish a close connection to the relevant real-world lab community and its ethical challenges in practice.

Our approach

The development process comprised strong bottom-up elements, consisting of workshops with RwL practitioners and reflective feedback rounds with further experts from the fields of RwLs, as well as research ethics (figure 1). In this context, the role of the project team was threefold. First, team members organized the workshops that offered RwL practitioners the opportunity to provide their input. Second, the project team processed the collected input through systematic analysis and critical discussion. Third,

one team member was responsible for writing the Code based on processed input and feedback from several feedback loops. Throughout the process, team members with a background in philosophy offered assistance in the identification of morally relevant questions and positions within the input collected during the workshops. They furthermore offered criteria to help determine the legitimacy of moral claims and direct attention to fallacy risks. Nevertheless, the writing process for the draft Code was based on the explicit or assumed wishes of the RwL network. Thereby, the input given by participants in the workshops, as well as the feedback given by members of the network's steering committee, formed the dominant base of justification.



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The key steps in the development process were as follows:

1 Determine demands and initiate process: The project began with a lack of ethical guidelines and considerations for RwLs, and the RwL community expressing a need for a corresponding code of ethics. An interdisciplinary team was formed to initiate the transdisciplinary process towards a Code.

2 Desk research: An analysis of the relevant literature on RwLs and a survey of pertinent codes of ethics using search engines and the *Ethics Code Collection* database were carried out with regard to two questions: “What are the specifics of RwLs from an ethical point of view?”, and “Which existing codes of ethics have relevance for RwLs?”. The results for both questions were then used to prepare the first workshop (step 3). Relevant existing codes also served as a reference when drafting the Code of Ethics for RwLs.

3 Workshop ARRTI/KAT (April 25, 2022, Karlsruhe, Germany): The first workshop brought together around 20 researchers from KAT (as representatives of the RwL community) and ARRTI. The main aim was to identify ethically relevant facets of RwL work from the perspective of practitioners, by means of structured group work and plenary discussions. The workshop also discussed expectations regarding the future Code and the development process. Following the workshop, the results were documented, structured, and prepared as input for the second workshop (step 4).

4 Workshop as part of the conference Nachhaltig wirken: Real-labore in der Transformation (June 2, 2022, Karlsruhe, Germany): This workshop was announced in the conference programme and attracted around 15 participants out of the conference attendees, including practitioners. The results of the first workshop in April 2022 were presented as a possible content and structural framework for the Code. Three workshop groups discussed and criticized one of the three areas of the possible structural framework (see *Results* section). The results were added to the documentation of the first workshop.

5 Reflection I – Presentation and discussion at ARRTI (July 12, 2022): After the two workshops in April and June of 2022 (steps 3 and 4) focused on the experiences and perspectives of RwL practitioners, this reflective activity served to subject the interim results to a critique from a philosophical perspective. The results from the previous workshops were presented and discussed in a plenary session with ARRTI members and points of criticism were documented.

6 Development of a first draft of the Code of Ethics: Based on the previous steps, a first draft of the Code was developed in the autumn of 2022. This five-page document consisted of a preamble and 15 paragraphs structured into three fields.

7 Reflection II – Intensive text reflection workshop at KAT (November 24, 2022): The purpose of this meeting was to obtain comprehensive feedback on the first draft from the two external experts (i.e., Antonietta Di Giulio and Rico Defila from the University of Basel, Switzerland), who have in-depth knowledge of RwL work due to their extensive experience in accompanying research. The feedback was recorded and was subsequently discussed with the wider project team.

8 Further consultations: Discussions within the project team, and further consultations with RwL practitioners without a strong connection to the Real-world Labs of Sustainability community, took place during 2023. This resulted in the decision to develop *Reflection Guidelines for Responsible Research and Innovation in Living Labs* for a broader audience in addition to the Code (see *Spotlights on relevant controversies* section, below).

9 Development of a second draft of the Code of Ethics: Until the summer of 2023, the first draft underwent a thorough revision. While the structure and length remained largely unchanged, in the second draft individual points were deleted or added, responsibilities in the Code were addressed, and linguistic corrections were made.

10 Feedback from the Real-world Labs of Sustainability network: In November 2023, the second draft was submitted to the RwL network’s coordination committee (14 people). Its extensive feedback was incorporated, and the resulting third draft was resubmitted for final approval by the network’s representatives in December 2023.

Results: The draft Code of Ethics

Firstly, the desk research phase revealed that, with the exception of a short chapter in a RwL handbook (Parodi and Seebacher 2023), there is practically no literature especially dedicated to the ethical specifics of RwLs. More literature can be found in the context of other RwL-related lab types, such as Urban Transition Labs or Living Labs (Galič 2019, Mollen 2023, Sainz de Salces 2012, Taylor 2021), as well as in the field of Citizen Science⁴. Additionally, scattered and often implicit references can be found in the reflexive literature on transformative research or RwL work (e.g., Defila and Di Giulio 2018, Horcea-Milcu et al. 2019). With regard to existing codes of ethics in other research contexts, there was a larger pool to draw from when developing the Code. The codes that relate to good scientific practice in general also apply to RwLs as their work is science-based. Of particular interest, however, are codes that relate specifically to participatory or transformative research. A list of the codes that were considered to be most relevant is shown in box 2.⁵

⁴ For an overview on the ethical guidelines in Citizen Science, see Jobin et al. (2020).

BOX 2: Relevant codes of ethics for real-world labs (RwLs)

The following existing codes of ethics were particularly relevant for the development of the Real-world Labs of Sustainability Code of Ethics by a project team from Karlsruhe Institute of Technology, DE. Through the course of the project, they were used to cross-check the results of the workshops with RwL practitioners.

- DFG (Deutsche Forschungsgemeinschaft) (2022): *Leitlinien zur Sicherung guter wissenschaftlicher Praxis – Kodex*
- ALLEA (All European Academies – European Federation of Academies of Sciences and Humanities) (2017): *The European code of conduct for research integrity*
- DGS (Deutsche Gesellschaft für Soziologie) and BDS (Berufsverband Deutscher Soziologinnen und Soziologen) (2017): *Ethik-Kodex*
- BDP (Berufsverband Deutscher Psychologinnen und Psychologen) and DGP (Deutsche Gesellschaft für Psychologie) (2016): *Berufsethische Richtlinien*
- CSJCA (Centre for Social Justice and Community Action) and NCCPE (National Coordinating Centre for Public Engagement) (2012): *Community-based participatory research – A guide to ethical principles and practice*
- University of Cambridge (2020): *Policy on the ethics of research involving human participants and personal data*
- Yale Center for Clinical Investigation (2009): *Principles and guidelines for community-university research partnerships*

Both the sparse scientific literature on the subject, as well as the relevant existing codes, were used through the course of the project to cross-check the results of the workshops with RwL practitioners. Cross-checking revealed that no key elements that a code of ethics should address, according to the literature, were missed in the bottom-up process. In addition, the existing codes played an important role as a reference point for the creation of the first draft and its revisions. Here, attention was paid to length, structure, language, and content details.

The ARRTI/KAT workshop in April 2022 (step 3) was the first and, in terms of the results, the most significant bottom-up element in the process. The results of the prior desk research were not presented to workshop participants to avoid influencing their input. Three opening questions for the group work were offered at the beginning of the workshop: “What do we stand for?”, “What is our relationship to other groups?”, and “What conflicts between people, principles, etc. do we know from practice?”. This ensured that a generally open process would deliver input on three fields of particular importance, namely the ethos of the group, the relationships towards other groups of people, and any conflicts in an ethically challenging field. Four multidisciplinary workshop groups developed a variety of points. In the subsequent analysis conducted by the project team, three categories were identified under which all points could be subsumed. Two categories proved to be particularly important: 1. Questions relating to the legitimacy of RwL practice (justification of the normative orientation, representativeness of the participants, conflicts of interest, etc.), and 2. questions relating to the interaction between the partners in RwLs (dealing with unequal distribution of power,

allocation of benefits and burdens, etc.). A third category played a smaller, but still important role: 3. Addressing questions of self-care for individuals in RwLs (being involved versus distancing oneself in a transformative practice, self-exploitation, etc.).

These three categories ultimately served to structure the Code. While the second and third categories explicitly address relationship issues (between-persons relationships of partners in the RwL and within-person relationships of individuals in the RwL), the first can be understood as addressing relationship issues between RwLs and the outside world (legitimacy of practice). In the third draft of the Code,⁶ the three fields are called “Real-world labs in society” (six paragraphs), “Partners in real-world labs” (six paragraphs), and “People in real-world labs” (three paragraphs), according to their importance. The Code can thus be assigned to the relationship model outlined above – which is consistent with the fact that working with people is at the heart of the RwL practice. Although the Code does not explicitly refer to ethical principles (in line with its model), it is clear that it implies various ethical principles (e.g., responsibility towards the project environment, fairness in the distribution of burdens and benefits, equal opportunities, data sovereignty, etc.). The preamble outlines the ethos of the RwL community (i.e., its commitment to sustainable development), the purposes the Code is intended to serve, its formal structure, and its character as a living document. The final draft version, approved by the network’s representatives, is included at the end of this article (pp. 404–406).

Spotlights on relevant controversies

Amongst the many topics that were vividly discussed during this project, there are two that we would like to explicate here in more detail. They were discussed repeatedly and had significant influence on the final draft of the Code.

The most prevalent controversy emerged around the scope of the Code. While it was self-evident that the Code should address and represent the members of the RwLs for Sustainability network, it was disputed whether it could also address and represent other RwL practitioners or practitioners from related formats, such as Living Labs or Social Labs. This question mirrored ongoing debates concerning different conceptions of RwLs. While the concept was first introduced by transformative sustainability researchers as a research format with an explicit and strong commitment to sustainability transformation as a central normative orientation (Schneidewind and Scheck 2013, Schneidewind and Singer-Brodowski 2015, Beecroft and Parodi 2016), the term RwL is used today for a broader range of practices. Some

5 There are a small number of other codes with a relevant focus particularly from other countries, as research in the *Ethics Code Collection* (see above) and with search engines has shown. However, the redundancies with the German/European codes proved to be immense, so that the addition of further codes would not have provided any added value.

6 The German version of the Code of Ethics for Real-world Labs of Sustainability can be found at www.reallabor-netzwerk.de/ethikkodex.php.

WANTED: YOUR FEEDBACK!

We kindly invite all readers to study the Code and submit their feedback by March 2025 on the Real-world Labs of Sustainability network's website:

www.reallabor-netzwerk.de/ethikkodex.php

Any constructive feedback is welcome, be it on scope, structure, language, or content. Please also indicate how you have been in contact with RwL work so far.

researchers use the term as a reference to its methodological core (transdisciplinary and participatory focus) alone, regardless of specific normative orientations; for some uses of the term, this is not even constitutive. Among the team members and experts involved in the discussion and reflection phase for the Code, some were in favor of exploring possibilities of one shared code for a broader range of practices, including broader under-

A challenge to the code's authors is to write the code with enough information to be of use in the specifics of a situation while remaining general enough to be used for a wide variety of situations.

standings of RwL, Living Labs, or Social Labs by opening up the question of normative orientation. Others emphasized the origin of the term RwL and wanted to position the Code accordingly. It was also emphasized that the Code must at least contain a reference to sustainability, as it addresses a community for which this reference is essential.

The second controversy concerns advice on self-care given by the Code. Input from workshop participants showed that matters of self-care for RwL practitioners were of concern to them. Yet, the question of how to address the matter in the Code was controversial during the discussion phase. Concerns were raised that concrete guidelines on how RwL practitioners should conduct themselves to ensure a mindful approach to life would exceed the authority of both those writing the Code and of RwLs in general. In a free society, such matters should be seen as a private concern and not be considered relevant within a code of ethics. Others argued that, since self-care relates to general questions on how to lead a good life (eudemonistic ethics), and since these questions are inextricably linked to the question of dealing with others, a code of ethics should pay attention to such matters. They argued that a code of ethics cannot be adequately understood as a set of rules of conduct for third parties, but rather as an expression of the group's self-conception.

After reflection it was concluded that, in order to serve the specific needs and characteristics of the Real-world Labs of Sustainability community, and at the same time account for the variety in practices called RwL, the final result of the project would

be two documents: a *Code of Ethics for Real-world Labs of Sustainability (Code)*, and an additional *Reflection Guidelines for Responsible Research and Innovation in Living Labs (Guidelines)*⁷.

The *Code* understands the term RwL in the sense of sustainability-orientated RwLs and addresses those practitioners, outlining the ethos of this community. The *Guidelines* also address those who endorse broader understandings of the term RwL. They contain guiding questions that are supposed to help all RwL practitioners to systematically reflect upon ethical challenges they encounter and to independently develop approaches to address them. Those guiding questions are structured along the following chapters: "Ethically relevant fields of action and reflection in Living Labs", "General principles of responsible Living Lab work" and "Role-specific dependencies and responsibilities in Living Labs".

While the *Code* is shorter and more general in how it addresses RwLs for Sustainability, the *Guidelines* are more general in whom they address, but more detailed in their explanations and offer more support in concrete situations.

Next steps

As mentioned above, this draft Code has been approved by the coordination committee of the Real-world Labs of Sustainability network. However, so that the Code can claim to represent "the morally permissible standards of conduct which members of a group make binding upon themselves" (Olson 1998), a broader participation of the RwL community is required. This has been realized throughout 2024 by the network inviting all of its members (more than 300) to participate in a feedback process on the draft Code, which can be viewed on the network's website. All feedback is collected centrally by the network and will lead to a revision. The resulting document will then, for the first time, no longer be just a draft, but the mainly German speaking RwL community's "Code of Ethics".

In addition to the participation of the network members, a wider circle of people with relevant backgrounds will be integrated into a further feedback process – particularly the readers of this article. We therefore kindly invite you to study the Code and submit your feedback by March 2025 on the RwLs of Sustainability network's website⁸. Any constructive feedback is welcome, be it on scope, structure, language, or content.

⁷ The *Reflection Guidelines for Responsible Research and Innovation in Living Labs* are available for download (in German):

www.arri.kit.edu/downloads/ReflectionGuidelines_LivingLabs_Sept2024.pdf.

⁸ www.reallabor-netzwerk.de/ethikkodex.php

Acknowledgements: We would like to thank two anonymous reviewers for their helpful comments.

Funding: This work received no external funding.

Competing interests: The authors declare no competing interests.

Authors' contributions: MD, ED, RH, OP: conceptualization, transdisciplinary design, and reflection; MD, ED: manuscript drafting; MD, ED, RH, OP: manuscript review and editing.

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Code of Ethics for Real-world Labs of Sustainability – final draft^a

Preamble

Sustainable development is a concept that is intended to point the way to securing a dignified life in the long term and worldwide – because this is not guaranteed in many places and is further threatened by the climate crisis, loss of biodiversity, and other symptoms of our current economic system. Over decades, research has created valuable knowledge about sustainability problems and possible solutions. Now we need to move from knowledge to action in a much more effective way and realize the necessary change processes.

Real-world labs have been developed in the context of transformative sustainability research. They see themselves as places of societal, organizational, and individual transformation. Depending on the context, partners from science, civil society, business, administration, and politics work together to research, develop, and test sustainable solutions. The participants are not left on the outside, but are actually part of the change. In addition to research and transformation goals, real-world labs also pursue educational purposes. In this way, new transformation approaches should become transferable to other regional contexts and the conditions for successful transformation should be communicable to a wider audience.

Due to its transdisciplinary and, in particular, transformative character, real-world lab work raises different ethical questions for those involved than traditional research. This is where this Code of Ethics comes in. Within the real-world lab community, it should serve as a key point of reference for the self-understanding about the common ethical stance, raise people's awareness of ethically relevant facets of their own work, provide assistance in challenging situations, and thus contribute to a reflective practice in general. It should clearly show those outside the community what demands and expectations can be placed on real-world lab work. Last but not least, it should also serve as an element of sound teaching and the promotion of young talent for real-world labs. At the same time, the code must be seen in the context of general ethical

guidelines of good scientific practice – in particular in accordance with the guidelines of the German Research Foundation (Deutsche Forschungsgemeinschaft) and the European Federation of Academies of Science and Humanities.

The 15 topics of the Code of Ethics are divided into three sections: The section “Real-world labs in society” deals with the external relationships of real-world labs, which may be material (e. g., appropriate forms of publication) and immaterial (e. g., legitimization of one's own commitment). The section “Partners in real-world labs”, by contrast, addresses the internal relationships within real-world labs, i. e., how partners interact with each other. The section “People in real-world labs” finally focuses on the challenges that each individual participant of a real-world lab has to face.

The Code of Ethics relies on the continuous reflection of its contents in the context of real-world lab practice. As a living document, it is subject to regular revision by the Real-world Labs of Sustainability network. This network is the central point of contact for feedback from members of the real-world lab community. In addition to this Code of Ethics, the “Reflection Guidelines for Responsible Research and Innovation in Living Labs” help participants in real-world labs to find answers to the respective challenges in specific situations by using key questions.

As of January 2024

^a KIT project group *Code of Ethics for Real-world Labs* (Rafaela Hillerbrand, Oliver Parodi, Marc Dusseldorp, Elisabeth Does), lead author: Marc Dusseldorp.

We would like to thank the members of the KIT Academy for Responsible Research, Teaching, and Innovation (ARRTI) and of the Karlsruhe Transformation Center for Sustainability and Cultural Change (KAT) as well as the coordinating group of the Real-world Labs of Sustainability network and all the other people involved from the real-world lab community for their valuable input, without which this draft for the Code of Ethics could not have been prepared.

REAL-WORLD LABS IN SOCIETY

1 Commitment to sustainability

Real-world labs are committed to a social, organizational, technical, as well as individual transformation toward sustainability. Following the debates about the Brundtland report, they understand sustainability as a way to permanently provide the minimum conditions for a dignified life worldwide. This includes the preservation of natural resources on the one hand, and economic and societal development to meet the basic needs of all people and create a just order on the other hand. Participants in real-world labs are open to constructive discussions of different interpretations of the concept of sustainability on this basis. At the same time, they are keen to ensure that the outlined core meaning of sustainability is acknowledged and to counteract the weakening of the concept.

2 Real-world labs as social actors

Real-world labs appear as stakeholders who want to make a scientifically sound contribution to the transformation of society. All participants, especially those in leading positions, are aware of the fact that the hybrid orientation of real-world labs between science and society is sometimes considered as not legitimized and therefore problematic, and reflect on the relevant criticism. They make sure that their actions in the

political field are legitimate (e. g., by making implicit evaluations transparent). In doing so, they are aware that even scientifically well-founded approaches are fallible. They promote a culture of learning, of transparency, and open-mindedness toward criticism and revision. The real-world lab management is responsible for providing time and forums for reflection in the work process.

3 Selection of partners

The selection of practice and research partners has a significant impact on real-world lab work – and thus also on its success in terms of research, transformation, and education. Therefore, those who are responsible in real-world labs take particular care in this matter. The crucial factor for the selection of partners is which personnel and institutional constellation seems to be appropriate and fruitful for the goals of the real-world lab in the respective context. In some cases, representativeness can play an important role in the selection, but is not an end in itself. Real-world labs follow an inclusive approach and pay particular attention to attracting marginalized voices for participation. At the same time, they are aware that particular interests can contradict an orientation toward the common good.

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4 Responsibility toward the project environment

Real-world lab work often also affects people beyond the circle of those directly involved in the lab who are not (or cannot be) asked for their permission. In general, this can result in unintended, negative consequences as well. Against this background, one of the preconditions for responsible real-world lab work is a considerate and far-sighted approach that anticipates possible impacts on the broader project environment and avoids the harming of third parties. In addition, those who participate in real-world labs consider it unacceptable to instrumentalize people for the purposes of real-world lab work – especially since they are a social platform for people from whom they also sometimes demand something due to their own goals. Therefore, being transparent about these own goals is essential.

5 Legitimization through (and of) scientific nature

Real-world labs are also a research tool. Accordingly, they follow the general guidelines of good scientific practice as well as specialized guidelines as long as they do not reject their basic transformative orientation. In this context, they also contact the relevant bodies at their respective institutions if necessary. At the same time, the real-world lab management in particular reflects on the fact that scientific goals may conflict (e.g., for reasons of resources) with the transformative goals set in certain contexts and may therefore require legitimization. Being based on science can in turn help to legitimize the transformative approach of real-world lab work – because science attempts to ground beliefs on an intersubjectively verifiable basis as far as this is methodologically possible.

6 Publication of results in line with the target group

Real-world labs publish the results of their work in a way that is appropriate for their target group. On the one hand, this refers to the scientific public, but on the other hand also to the broader public which is equally important for the transformative success of real-world lab work. All participants in the real-world lab reflect on the conditions under which the relevant target groups can be reached and pay particular attention to any marginalized groups that may need to be addressed. Scientific results should – as far as possible – be published open access. Given that published results can also have a negative impact on certain groups of people, all participants discuss openly which content should be shared in what way.

PARTNERS IN REAL-WORLD LABS

7 Creating good relationships

Mutual understanding, good relationships, and trust within the real-world lab team are the basic principles of cooperation. Therefore, the participants attach great importance to treating each other respectfully and, in particular, to developing and maintaining a culture of mutual listening. They are aware of the particular challenge of building trusting relationships that arises from the nature of real-world lab work and communicate their expectations and fears transparently. The (mostly scientific) employees who also make their living from real-world lab work have a special responsibility here. Partners in real-world labs see the collaboration in heterogeneous teams as an opportunity to learn from each other. The real-world lab management is responsible for providing time in the work process for identifying and reflecting on this learning potential.

8 Balance of power and vulnerable parties

Individuals and stakeholder groups involved in real-world labs differ significantly in terms of their status, financial resources, and function within the real-world lab. They are aware of the existing imbalance of power,

communicate openly about it, and are willing to balance power as much as possible and reasonable. This is achieved in particular by involving all partners in crucial decisions on the design of the work processes – from the beginning to the interpretation of research results and their significance for practice. Using a clear language that can be understood by everyone is the basis for dealing with each other as equal partners. The discourse leader ensures that all the participants, regardless of their previous education, can actively contribute to the discourses in the real-world lab. Special attention is paid to vulnerable people here.

9 Fair distribution of burdens and benefits

Real-world lab work comes with different types of burdens (e.g., working time, materials, financial resources) and benefits (e.g., products, data, publications, recognition). The participants aim to share them appropriately and, if necessary, to create a balance. To this end, the expected burdens and benefits should be discussed at the beginning, if possible, and appropriate agreements should be made regarding the sharing of tasks, data access, copyrights, etc. If the situation changes over time, those involved take the time to adapt their agreement. In the discussion of fair distribution, particular attention is paid to the fact that certain practice partners as well as volunteers from the scientific community are not involved in the real-world lab as part of their professional activities, but rather in their free time.

10 Conflicts and moderation

Individuals and stakeholder groups in real-world labs come from different biographical and institutional backgrounds and bring a variety of interests to the mix. This can result in conflicts – although, or even because, all those involved see their participation as a commitment to a common good cause. Therefore, the persons in charge of the real-world lab take precautions on how to deal with conflicts within the real-world lab team. In particular, they provide internal moderation and mediation skills where possible or keep in touch with external services to ensure that needs for conflict resolution can be promptly addressed. They are aware that conflict prevention and a constructive approach to conflicts are essential for good relationships, a successful balance of power, and an effective division of tasks in the real-world lab.

11 Confidentiality, data protection, anonymity

Working on transformation processes often involves personal data that requires confidentiality – especially in districts with sometimes close social relationships between those involved and the surroundings. The participants in real-world labs are aware of this and are extremely sensitive when handling confidential data. They know and comply with the relevant legal requirements and stay in contact with the responsible bodies at their respective institutions. In the real-world lab work, they comprehensively inform people whose data is collected and used about the type and purpose of data use and link the latter to the consent of those affected. Social media are only used in a way that complies with these standards. Moreover, those responsible in real-world labs guarantee that the anonymity of the persons involved is protected wherever necessary.

12 Further training and empowerment of practice partners

In real-world labs, further training does not only apply to those working in science, but also to non-scientific practice partners. While the former may require further training in inter- and transdisciplinary research or science communication, the latter must also be able to participate adequately in the (science-based) real-world lab processes. All participants reflect on their individual training needs and communicate them to the people in charge. These, in turn, arrange for the attendance of appropri-

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ate formal or informal training courses, being aware that this is the only way for the participants to be able to contribute competently and successfully to the diverse real-world lab work in the long term.

PEOPLE IN REAL-WORLD LABS

13 Role conflicts

Participants in real-world labs can take on different roles and act, for example, as organizers, researchers, or initiators. They aim to make their respective role transparent, since ambiguities can lead to irritation – especially because of the related constellations of power. People working in real-world labs are also often confronted with internal role conflicts, for example, if they see themselves as activists for a good cause and are at the same time committed to science. They integrate both sides, on the one hand by measuring their commitment against the corrective of scientific facts and changing it if necessary, and on the other hand by orienting their research along questions that are relevant to the desired transformation. Furthermore, opportunities have to be created within the real-world lab for participants to reflect on their roles and potential role conflicts and deal with them constructively. This can be done in the form of collegial advice (interview), but preferably in the form of external supervision.

14 Boundaries between professional and private life

Real-world lab work often takes place outside normal office hours. At the same time, it is characterized by the participants' strong personal identification with their work in the real-world lab. Both factors make it particularly difficult to draw the line between professional and private life. Those involved in real-world labs are aware of this tendency to blur the boundaries between work and private life and the associated risks. They reflect on their own needs regarding the separation of work and free time and communicate these within the real-world lab team. The persons in charge of the real-world labs establish the framework conditions for project work in such a way that the desired boundaries can be drawn as far as possible.

15 Self-exploitation and self-care

Real-world lab work is often a commitment with heart and soul, combined with high moral standards regarding a person's own actions as well as high expectations of actual change, which also includes taking care of other people. This can provide a breeding ground for overload and self-exploitation. In view of this, participants in real-world labs follow a reflective and empathetic approach to themselves. In particular, they learn to listen to themselves and thus become aware of their own needs, their capabilities, and their limits – knowing that the ability to empathize with oneself is closely linked to being able to perceive other people authentically in the context of the real-world lab and beyond.



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