White Paper

Real-World Laboratories in the Service of Science, Industry, Government/Public Administration, and Society

Potential and Prospects under the Real-World Labs Act
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1 Introduction

Real-world labs are gaining central importance in a time of profound societal, technological, and ecological changes. They make it possible to test new solutions under real-world conditions and thereby generate valuable knowledge for sustainable transformation and innovation. This white paper is aimed at all four stakeholder groups of the Quadruple Helix-science, industry, government/public administration, and society-to develop real-world labs as shared spaces for learning and shaping the future.

The aim of the white paper is to provide guidance and clarify what distinguishes real-world labs and how they differ from other innovation or participatory formats. At the same time, this publication seeks to encourage active participation in real-world labs: first among government and policymakers, then among academia, businesses, and societal groups and individuals.

Real-world labs contribute to key Sustainable Development Goals (SDGs): They foster innovation and infrastructure (Goal 9), strengthen transparent and effective institutions (Goal 16), and support knowledge exchange and cooperation in science, technology, and innovation (Goal 17). Resource e iciency plays a dual role in this context: real-world labs should themselves be designed to conserve resources while simultaneously developing solutions that advance sustainability in the economy, public administration, and everyday life.

As practice oriented “test environments,” real-world labs combine experimentation, participation, and regulation. They create spaces where new technologies, business models, and administrative processes can be tested and jointly evaluated under real-world conditions. In doing so, they foster societal acceptance and enable regulatory learning.

The topic is currently receiving political momentum from the planned Real-World Labs Act in Germany, which is currently going through the parliamentary process. These developments underscore the importance of real-world labs as a forward-looking form of policymaking, knowledge exchange, and collaborative innovation. This white paper therefore aims to provide a scientifically grounded foundation, offer guidance, and invite all stakeholder groups to actively help shape real-world labs as a driving force for sustainable, participatory, and resilient solutions for the future.

> Real-world labs are time-limited testing environments in which novel technologies or processes are developed under real-world conditions and with regulatory exemptions through the collaboration of science, industry, government/public administration, and society.

2 The Real-World Lab Concept-Definition, History, and Delimitation

The term "real-world laboratory" was first coined in the context of sustainability research within the social sciences, with a strong focus on transdisciplinarity and transformation. In this process, the concept of the laboratory primarily established in the fields of natural sciences and technology, where experiments, investigations, and measurements are conducted under controlled conditions in a defined space was transferred to innovative and transformation-oriented approaches from the socio-political discourse.

Beginning around 2012, discussions began on how real-world laboratories and real-world experiments should be organized and resourced against the backdrop of the Grand Challenges of the European Research Strategy (climate change, energy transition, sustainable mobility, affordable healthcare, sustainable economic management / new models of prosperity). Through transdisciplinary processes and with the involvement of civil society, the aim was to address these challenges in a sustainable manner (Schneidewind, 2012).

Over the past 10 to 15 years, in various scientific contexts and within the framework of diverse research programs with specific focuses, interpretations of the term "real-world laboratory" have emerged that sometimes differ significantly from one another. Notable examples of definitions are included in Table 1.

Table 1 Overview of previous definitions of the term "real-world laboratory"

Source	Description of the definition	Key aspects / charateristics
Schneidewind, 2014	A real-world laboratory refers to a socialcontext in which researchers conductinterventions in the form of "real-world experiments" to learn about social dynamics and processes. The idea of the real-world laborato-ry applies the scientific concept of a laboratory tothe analysis of social and political processes.	Application of the laboratory concept to social and political processes Close connections to field and action research
Ministry of Science, Research, and the Arts Baden-Württemberg (MWK BaWü, 2018)	Together with stakeholders from civil society, politics, and business, scientists work on future-proof and sustainable solutions in an open-en-ded process.	Co-design of science and practice Transdisciplinarity Civil society orientation Laboratory-like character
Beecroft, 2018	Real-world labs are institutions at the intersection of science and practice. They provide a framework for pursuing research, practical, and educational goals	Transformativeness and design Socially legitimate, ethically sound goals Design principles for contextual, spatial, and temporal framing Experimental and reflective working methods
Parodi, 2021	A real-world laboratory refers to a transdisciplinary research and development institution that conducts sustainability experiments within a spatially defined social context and initiates transformation processes.	Research orientation Transformativeness Normativity and sustainability Transdisciplinarity and participation Civil society orientation Model character Long-term orientation Laboratory character and experimental space Education
Federal Ministry for Economic Affairs and Energy (BMWi, 2019)	Real-world labs are test environments limited in time and space where innovative technologies or business models real-world conditions.	Utilization of legal leeway Regulatory interest in knowledge
BMWE Innovation Portal (BMWE, 2025)	Real-world laboratories (English: "regulatory sandboxes") enable innovations to be tested for a limited period under real-world conditions and with regulatory oversight.	Facilitating the transfer of innovations into practice Contributing to faster scaling Regulatory learning
Federal Ministry for Economic Affairs and Climate Action (BMWK, 2024)	Draft bill "Real-World Lab Act": Section 2(1): "...real-world labs are time-limited trials of innovative technologies, products, services, or approaches that are conducted under conditions as close to real-world conditions as possible and with the participation of the relevant compe-tent authority by stakeholders from business, science, government, or civil society"	Time-limited Testing of innovations Government involvement Quadruple helix approach

The definitions provided by Schneidewind, the Baden-Württemberg Ministry of Science, Research, and the Arts, as well as by Beecroft and Parodi, reveal a strong focus on transformative processes, transdisciplinarity, sustainability, and a civil society engagement. In addition, real-world labs establish long-term infrastructures for the co-design of science and practice as well as the co-production of knowledge by actors from science, business, administration/politics, and society (Beecroft, 2018; MWK BaWü, 2018; Parodi, 2021; Schneidewind, 2014).

The focus of the definitions, as presented in the context of the Federal Ministry for Economic Affairs and Energy (BMWi, 2019) and in 2025 on the Reallabore Innovation Portal (BMWE, 2025), is strongly oriented toward improved framework conditions for innovation. These are to be tested under real-world conditions for a limited period of time with official oversight and by utilizing legal leeway (BMWE, 2025; BMWi, 2019). On its English-language website, the BMWE uses the term "regulatory sandboxes" (BMWE, 2025) and is thereby also in line with the explanations in the OECD`s Regulatory Sandbox Toolkit. On the importance of regulatory exemptions for promoting innovation in Reference is made to technology fields such as blockchain, FinTech, and artificial intelligence (OECD, 2025).

- Real-world labs differ significantly from related formats such as real-world experiments, living labs, pilot projects, or innovation labs. Originally, real-world labs were conceived as long-term, transdisciplinary, and transformative research spaces in which science and society work together on real-world challenges. The goal is not only the short-term development of individual innovations but also the promotion of systemic societal change and the joint production of knowledge. For real-world labs with this orientation, the term "Real World Lab (RwL)" has become established in Englishlanguage publications (Bernert, 2024; Kellhammer, 2025; Rogga, 2018).
- The real-world experiment does not constitute a separate category of format, but rather a specific research method within real-world labs. It refers to scientifically grounded, transdisciplinary experiments designed to intervene specifically in real-world contexts and trigger transformation. It differs from classical experiments, which are usually conducted without societal participation or a transformative objective (Parodi, 2024).
- Living Labs, on the other hand, are user-centered innovation environments in which new products, services, or social infrastructures are developed and tested in real-world settings. They are based on co-creation between citizens, academia, industry, and government. Their focus is on market- and innovation-oriented outcomes, not on long-term societal change. Living Labs can therefore function as part of a real-world laboratory, but their objectives are narrower and more strongly oriented toward technical and economic innovation (Enoll, 2025; Schäpke, 2017).
- Pilot projects are primarily designed to test the technical, economic, or organizational feasibility of new technologies under conditions that closely resemble real-world scenarios. They are short-term in nature and do not include any transdisciplinary or transformative components..
- Innovation labs, primarily known as Gov Labs in the public sector, represent a special form of realworld laboratories. These are often designed as dedicated spaces or organizational units separate from everyday operations (Schuurman, 2017). While they address real-world problems, the actual work does not necessarily take place in the real-world environment, but rather in a controlled "laboratory" setting.

A detailed examination of the various approaches and formats suggests that the potential of the real-world lab format can be most effectively realized when it is established as a long-term institution following the Quadruple Helix approach. The development and testing of innovations in the context of complex societal challenges should follow epistemic practice, particularly by leveraging regulatory exemptions.

Following this approach, the real-world lab concept of the 4transfer innovation network is based on an in-depth critical examination of relevant literature as well as on the analysis of the specific challenges faced by the network partners in developing and implementing innovations. The detailed 4transfer definition is therefore:

- Real-world labs are long-term, experimental research and development environments in which new ideas, technologies, and processes are tested under real-world conditions over a defined period of time. Following the Quadruple Helix approach, they serve as a platform for collaboration and joint learning between science, industry, Administration / Politics and Society. The goal is to develop and test innovative solutions to complex societal challenges with the help of exceptions, such as experimental clauses.

Results are critically evaluated, and learning spaces are opened up for all stakeholder groups (Blei et al., 2025). The definition is subject to continuous reflection and is continually adapted to the current state of research and practice.

4transfer - Brief Definition

Real-world laboratories are time-limited testing environments in which novel technologies or processes are developed under real-world conditions and with regulatory exemptions through the interaction of science, industry, government/ publicadministration, and society

3 Governance and Framework Conditions of Real-World Labs

For real-world labs to function effectively as experimental spaces, they require clear legal, administrative, and institutional frameworks. Real-World Laboratories constantly operate within the tension between innovation dynamics and existing legal systems-systems that are often not designed for new technologies or business models. The following overview of the European and national legal foundations, current developments such as the planned Real-World Labs Act, and the role of various stakeholder groups makes it clear: Real-world labs are not merely legal constructs, but part of a comprehensive governance approach that connects science, business, administration/politics, and society in transformative processes.

3.1 Legal and Political Context

EU Legislation

Real-world labs must be compatible with EU law, as this forms the overarching legal framework. While EU directives allow for national exceptions and pilot projects (e.g., in energy or transport regulation), EU regulations offer little leeway for deviations, as they apply directly (BMWK, 2023).

However, the EU itself also promotes experimental approaches, for example through regulatory sandboxes in the digital single market (e.g., FinTech, AI) as well as through funding programs such as Horizon Europe. Real-world labs are considered an important contribution to the implementation of the EU Digital Strategy and the Green Deal (European Commission, 2023).

Legislation in Germany

Real-world labs in Germany have so far faced several legal challenges. A central problem lies in legal uncertainty: for many innovative projects, there is no clear legal basis, which poses a significant obstacle, particularly for startups and small businesses (BMWK, 2025).

In addition, approval procedures are characterized by significant barriers because responsibilities across federal, state, and municipal levels are not uniformly regulated. Data protection issues (e.g., in AI or mobility projects) also prove challenging, as existing regulations are not always practical. Another obstacle is the lack of coordination between authorities, which leads to protracted procedures and uncertain interpretation of existing regulations (BMWK, 2024).

The planned Real-World Lab Act aims to create an innovation-friendly and legally secure framework for testing new technologies and business models. It is intended to allow temporary deviations from existing standards to facilitate regulatory learning before laws are permanently amended. It also follows the approach of involving science, industry, government, and society. The law was adopted by the Federal Cabinet on May 19, 2025, and introduced in the Bundestag on May 23, 2025. It was referred to the Committee on Digitalization and State Modernization as the lead committee (Bundestag, 2025). The aim of the law is to improve regulatory learning. The draft framework law is also to be supplemented with a variety of experimental clauses in sector-specific laws (see infobox for definition) during the ongoing parliamentary process. Since May 2025, the review of such clauses has been mandatory in all legislative proposals of the Federal Government. A digital review tool has been available since April 2025 to support this process (BMWK, 2025).

Experimentation Clause

"An experimental clause is a legal provision that authorizes the administration, for a limited period of time, to deviate from certain provisions of applicable law in the course of its activities in order to test new approaches and gain insights from them. Based on the experience gained, the tested procedures are to be permanently standardized at a latercdate, and the relevant provisions revised or new laws enacted." (IT Planning Council 2017, cited in Maaß 2001)

The BMWE (prior to May 2025: BMWK) played a leading role in developing the draft Real-World Lab Act. Further development of the law at the federal level into a comprehensive Federal Experimentation Act is planned for the future. Of particular practical relevance are the working aids developed by the Federal Ministry, such as the brochure "Recht flexibel", which provides concrete wording guidance for experimentation clauses (BMWK, 2024). In addition, the Ministry launched the Real-World Labs Innovation Portal, which has served as a central hub for information, advice, and networking since May 2025 (BMWK, 2025). Experimental clauses are systematically compiled in the Real-World Lab Innovation Portal and can be accessed by filtering by level (EU, federal, state), legal area, and topic (Real-World Lab Innovation Portal, 2025).

State and Municipal Levels

Parallel to federal developments, several German federal states are planning or are already implementing legislation establishing deviation competences that may serve as legal foundations for Real-World Laboratories. So-called municipal freedom acts and regulatory exemption acts represent comparatively new instruments of experimental legislation. These laws enable municipali es and lower administrative authorities to deviate from state regulations under defined conditions in order to test innovative solutions or optimize bureaucratic processes. The legal basis for such experimental spaces is provided by specific state laws that both strengthen the administration's capacity to act and ensure compliance with overarching legal principles. Since 2021, the German state of Brandenburg has operated under a new Standard Testing Act (Brandenburg State Government, 2023). Baden-Württemberg adopted a Municipal Regulatory Exemption Act in 2025 (Ministry of the Interior, Digitalizaon, and Municipalities of Baden-Württemberg, 2025), while the Free State of S axony has been planning a Municipal Freedom Act since 2025 (Saxon State Government, 2025).

In addition, so-called model municipalities (Initiative for an Effective State, 2025) may function as sites of experimentation in public administration. These municipalities test innovative administrative and governance approaches in order to develop new forms of administrative action and generate learning processes transferable to other municipalities.

3.2 Relation to the “Quadruple Helix” Approach

Real-world laboratories play a central role in the Quadruple Helix approach, as they func on as interfaces between science, industry, government/public administration, and society. They enable transdisciplinary and transformative collaboration in which all four stakeholder groups are ac vely involved in the research and innovation process. This is achieved through the co-design, co-production, and co-evaluation of knowledge, thereby integrating both scientific and practical perspectives. Reallabs, as experimental spaces, address real-world societal challenges. They contribute to sustainable transformation by generating not only knowledge but also practical impetus for societal change (Schäpke et al., 2017; Wagner et al., 2022).

Science

The scientific community is often criticized for failing to involve external partners, which leads to the development of solutions that are disconnected from practical applications. However, the challenges posed by technological developments are becoming increasingly complex and require transdisciplinary approaches. Real-world laboratories provide the necessary experimental spaces in which real-world challenges can be transformed into innovative solutions. Knowledge and technology transfer, as an integral part of the research process, is by no means a one-way street from research to practice, but is designed to be recursive: insights, experiences, and perspectives from practice continuously feed back into scientific work, thereby contributing to the further development of research questions and methods. A central element in real-world labs is co-creation with practitioners. In participatory formats such as Design Thinking or future workshops, the knowledge, experiences, and needs of various stakeholders are brought together to jointly develop new solutions. This collaborative form of knowledge production promotes the democratization of knowledge, in which citizens are not merely passive recipients but active co-creators of innovations. Science communication can stimulate discussions and foster trust in scientific work (Carayannis & Campbell, 2009; Schäpke et al., 2017; Wagner et al., 2022).

Industry

Real-world labs provide a structured framework for collaboration between both established companies and startups with universities, governments, and civil society, which maximizes synergies among the actors and enhances innovation capacity. Especially for companies whose economic innovations also face societal resistance, this cooperation can contribute to increased social acceptance and legitimacy. The opportunity to jointly develop and test new technologies, products, and business models—including through open innovation approaches—strengthens adaptability to complex challenges. Real-world labs offer direct experience under real-world conditions without immediately being subject to full legal requirements. This creates room for innovation that might otherwise be blocked by existing regulations. Furthermore, the insights gained from testing can be incorporated into the further development of laws and standards, which creates more innovationfriendly conditions in the long term. By allowing innovations to be tested prior to full regulatory approval, companies can bring their products and services to market faster and secure competitive advantages (Carayannis et al., 2017; Park & Stek, 2022; Schütz et al., 2019)..

Government / Public Administration

From the perspective of public administration, the Quadruple Helix approach offers significant potential for effectively shaping innovation and transformation processes. Real-world labs serve as central learning spaces for intersectoral cooperation and enable agile governance, in which government, business, academia, and civil society jointly develop solutions. The administration acts not only as a regulatory body but as an equal partner in the co-construction of solutions. The integration of digital technologies such as big data, artificial intelligence, and predictive analytics can increase transparency and efficiency, while citizen dialogues and new participation formats strengthen administrative innovation. Real-world labs serve as a “transfer interfaces” between civil society input and political implementation by combining practical testing with strategic administrative action. Supplemented by innovative financing instruments such as social impact bonds and the integration of blended learning formats into the innovation context, knowledge and technology transfer can be specifically promoted, and adaptive governance structures created that meet the complex challenges of a dynamic society (Andriienko, 2025; Boguslavska & Golub, 2025).

Society

A central advantage of real-world laboratories is their ability to create new forms of knowledge production. They combine traditional scientific methods with real-world experimentation in order to foster both scientific and societal learning processes. This enables deeper reflection and the adaptation of solutions to specific local needs and conditions. Scientific processes need not necessarily be elitist and difficult to access. Citizens are shifted from the role of passive consumers to that of active shapers. Through the collaboration of various actors and the joint development of solutions, real-world labs contribute to strengthening social cohesion. They create platforms for dialogue and cooperation that foster trust between different social groups. The diverse formats of science communication and civic education integrate society through accessible language and storytelling (Schäpke et al., 2017; Shin et al., 2023).

Figure 1 Practical Guide to Real-World Labs-Flowchart for Implementing Real-World Labs (based on the Federal Ministry for Economic Affairs and Energy (BMWi, 2019), the Federal Ministry for Economic Affairsand Climate Action (BMWK, 2023), and Jeník & Duff (2020))

4 Success Factors and Recommendations for Real-World Labs within the Quadruple Helix Framework

Section 4 consolidates key findings on success factors and process requirements for real-world labs and systematically synthesizes them. Building on a comprehensive, literature-based understanding of real-world labs as transdisciplinary, learning-oriented innovation spaces, the section first presents fundamental principles, structures, and process logics considered crucial for their effectiveness and sustainability. Building upon this foundation, differentiated success factors for the participating stakeholder groups from science, industry, government/public administration, and society are identified in order to make their specific roles, expectations, and contributions visible. Additionally, the importance of networks as a supporting infrastructure for knowledge transfer, cooperation, and sustainability is examined. The aim of this section is not only to provide a conceptual framework for real-world laboratories but also to offer practical guidance for their strategic design and successful implementation.

4.1 Overarching Success Factors and Processes

Real-world labs incorporate innovative approaches to transdisciplinary research and societal transformation. In line with this fundamental principle, the Real-World Lab Service of the 4transfer consortium developed a "Real-World Lab Practice Guide" that serves as a step-by-step guide to support the preparation, implementation, and follow-up of real-world labs. It is based primarily on content discussed in publications by the Federal Ministry for Economic Affairs and Energy (BMWi, 2019) and the Federal Ministry for Economic Affairs and Climate Action (BMWK, 2023), as well as Jeník & Duff (2020).

The "Real-World Labs Practice Guide" presents real-world labs as structured instruments of transdisciplinary research and innovation-oriented policymaking. The goal is to combine scientific knowledge acquisition with practical testing under real-world conditions, thereby providing evidencebased support for societal, technological, and regulatory innovations. To this end, it offers a systematic, phase-oriented framework for the design, implementation, and evaluation of real-world laboratories.

At the center is a four-phase process model, which is illustrated in Figure 1. In the preparation and planning phase, goals are formulated precisely and measurably (according to the SMART logic), relevant stakeholders are identified and integrated into appropriate governance and network structures, and temporal, human, and financial resources are planned. In addition, potential funding opportunities are examined. The legal analysis constitutes a separate phase in which relevant legal frameworks, regulatory barriers, possibilities for experimental or exemption regulations, liability issues, and state aid law aspects are systematically evaluated.

Building on this, threshold questions serve to critically assess whether a real-world laboratory is a necessary and proportionate tool, particularly when compared to alternative regulatory adjustments or purely theoretical studies. Finally, during the design and implementation phase, the duration, spatial scope, and organizational responsibilities are determined, suitable indicators and data sources for evaluation are defined, and procedures for utilizing and disseminating the results are developed. A central concern here is ensuring that the insights gained are systematically made available for use by scientific actors as well as by administration, policymakers, and practitioners in the (business) sector.

In summary, the following points reflect key principles, requirements, and success factors discussed in the literature on real-world laboratories and related concepts:

Mindset: Collaboration and Co-Creation

Real-world laboratories are based on collaborative approaches characterized by openness, mutual respect, and co-creation. These principles foster the integration of diverse forms of knowledge and perspectives and are essential for transformative research. (Lee et al., 2012; Wanner et al., 2018).

Collaborative Infrastructure

Suitable physical and digital spaces, tools, and formats are necessary to enable collaboration between science, practice, and society. Such infrastructures support the iterative development and implementation of solutions. (Wanner et al., 2018).

Professional process design

Clear role allocations, iterative workflows, and the ability to adapt to new insights are decisive factors. Facilitation and process management play a central role in effectively organizing collaboration (Hakkarainen & Hyysalo, 2016).

IP and Legal Certainty

Clarifying intellectual property rights and legal frameworks are important aspects for sustainable collaboration-including within the context of real-world laboratories (Gradstein & Justman, 2019).

Long-term perspective

Real-world labs require a strategic framework that goes beyond project-based approaches to enable institutional learning and sustainability (Wanner et al., 2018).

Transfer orientation

Results should not only be documented but also actively incorporated into decision-making processes and public discourse. This promotes the societal impact and sustainability of the findings (Rădulescu et al., 2020).

Dialogic science communication

Transparency, mutual learning, and shared narratives are central elements for strengthening communication between science and society (Parodi, 2021).

Intermediary actors

Roles such as transformation managers or communication facilitators are essential for ensuring the connection between different systems and actors (Hakkarainen & Hyysalo, 2016).

A comprehensive overview of the practical guide in the form of a checklist is provided in the appendix.

4.2 Individual success factors according to the Quadruple Helix approach

The implementation of collaborative innovation processes in real-world laboratories is often challenging. Although such approaches offer considerable potential for societally relevant solutions, the participating stakeholder groups-science, industry, government / public administration, and society-frequently pursue different objectives and operate according to partially incompatible logics of action.

Successful collaboration therefore requires a high degree of mutual understanding, openness, andreciprocal learning. Clear shared objectives, a willingness to adopt di erent perspectives, and structures capable of professionally supporting such processes are indispensable.

Success Factors in Science

Successful real-world labs require a willingness to adopt transdisciplinary and participatory methods, as well as the integration of transfer and communication goals into research designs. Researchers must reflect on their role in societal change and provide professional support structures. Real-world testing and piloting environments with scientific support enable mutual knowledge transfer between research and practice and foster the development of complex, sustainable solutions through consensus among stakeholders. Furthermore, financial investment and a willingness to take risks are crucial for success.

Policy Recommendations

- Strengthen the recognition of transdisciplinary and transfer-oriented achievements in evaluation systems.
- Design science communication to be dialogic and co-creative.
- Establish real-world laboratories as strategic research formats and anchor them institutionally.
- Involve transfer intermediaries and innovation networks at an early stage.

Success Factors: Industry

All stakeholders should be open to collaborative development processes with agile goal-setting and demonstrate a willingness to integrate societal perspectives into innovation processes. Companies are given the opportunity to test technologies, processes, and innovations that have not yet been approved in real-world economic applications. This allows for the development of rapid and practical solutions through the participation of experts from science and administration as well as representatives of society. These commercially viable technological and process innovations serve as a gateway for companies to enter new markets. The goal is to consider the direct transferability of innovations from science to the economy from the very start of the real-world lab and to incorporate practical expertise. Real-world labs serve to generally strengthen the economy´s innovation potential and offer business partners access to innovative ideas and scientific insights. This allows them to follow new research trends and enter emerging fields.

Policy Recommendations

- When planning projects, consider the possibility of real-world labs from the very beginning and involve the administration early on.
- Integrate real-world labs into innovation and sustainability strategies.
- Actively seek out and foster collaborations with the scientific community and civil society.
- Define clear and shared goals at the start of the project to ensure a well-aligned partnership.
- Try to regularly shift perspectives: In many areas, companies have different structures, working methods, and values than universities and government/political bodies. The key here is to find common ground to foster successful collaboration.

Success Factors for Government / Public Administration

Real-world laboratories require willingness on the part of government and public administration to engage in experimental approaches and enable new processes. Decisive factors include coordination across departmental boundaries, political backing for bold innovations, and the ability to react quickly (such as in traffic trials), supported by data collection and transparency. An open culture of learning from mistakes, the use of existing leeway, and experiments in a protected environment promote learning. Experimental clauses and early administrative involvement facilitate the introduction of innovative technologies and provide impetus for legal adjustments. In this way, real-world labs strengthen internal innovation processes and collaboration with society.

Policy Recommendations

- Use real-world labs strategically as tools for learning and innovation.
- Strengthen competencies for co-governance and participatory approaches.
- Examine whether comparable real-world laboratories already exist in other municipalities or administrative contexts.
- Systematically integrate findings from real-world laboratories into regular governance systems and policymaking.
- Recognize that experimentation clauses alone do not constitute real-world laboratories; clear criteria are necessary.

Success Factors: Society

Real-world labs should offer low-threshold access to information and participation and recognize civic engagement. Inclusive participation of diverse social groups strengthens acceptance of innovations. They also promote the incorporation of citizens´ ideas for everyday issues and provide learning and creative spaces for citizens and civil society.

Policy Recommendations

- Enable participation on equal footing: early, transparent, and continuous.
- Develop formats for collaborative knowledge production and dissemination.
- Treat experiential knowledge from society as an equally valuable resource.
- Recognize that societal acceptance is often the decisive factor determining whether ideas become innovations.

4.3 Networks as a Success Factor

For stakeholders who wish to initiate, support, or further develop real-world labs, the Real-World Labs Innovation Portal of the Federal Ministry for Economic Affairs and Energy serves as a central hub. Particularly helpful is the integrated interactive map (Real-World Labs Innovation Portal, 2025), which displays ongoing real-world labs across Germany along with their key focus areas. Here, initial project ideas can be identified and potential partners for new initiatives can be found. In addition, the Innovation Portal´s member portal offers a platform for cross-regional exchange. Through expert groups, forums, and advisory contexts, interested parties nationwide can network, share experiences, and gain new insights for their own real-world laboratory work.

The Network of Real-World Laboratories for Sustainability serves as a central platform for promoting transdisciplinary, experimental research and transformation spaces in the context of sustainable development. It connects projects, research institutions, civil society actors, municipalities, and companies to systematically exchange knowledge, methods, and practical experience regarding realworld laboratories. The goal is to strengthen the real-world lab approach as a tool for transformative sustainability research and to support collaborative solution development for complex societal challenges. Through events, publications, and coordinated statements, the network contributes to the professionalization and scientific advancement of the field. Overall, it functions as an infrastructural hub for promoting cooperative, practice-oriented, and scientifically grounded transformation processes.

The importance of such formats is also growing at the European level. The European Network of Living Labs (ENoLL) connects living labs from across Europe and supports the exchange of methods, best practices, and research findings.

While these European and national initiatives provide valuable networks and information, the Reallabor Service of the 4transfer Innovation Network serves as a regional point of contact in Saxony. It offers direct support in the design, implementation, and sustainability of real-world labs in a regional context-including individual consulting, matching stakeholders, and support during evaluation. The clear distinction: While the BMWE portal provides supraregional information and networking, the Real-World Lab Service operates in a practical and location-specific manner.

Network(s)

Networks only realize their full potential through a clear legal framework. It is therefore conceivable that Saxony could in the future create a legal framework in the form of a Saxon Real-World Lab Act. In addition to the consistent use of existing networks and cooperation, this could serve as a key lever in the future to make innovation processes in Saxony more efficient and impact-oriented.

5 Transparency Notice and Contact

5.1 Funding Note

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7 Appendix - Real-World Laboratory Practice Guide

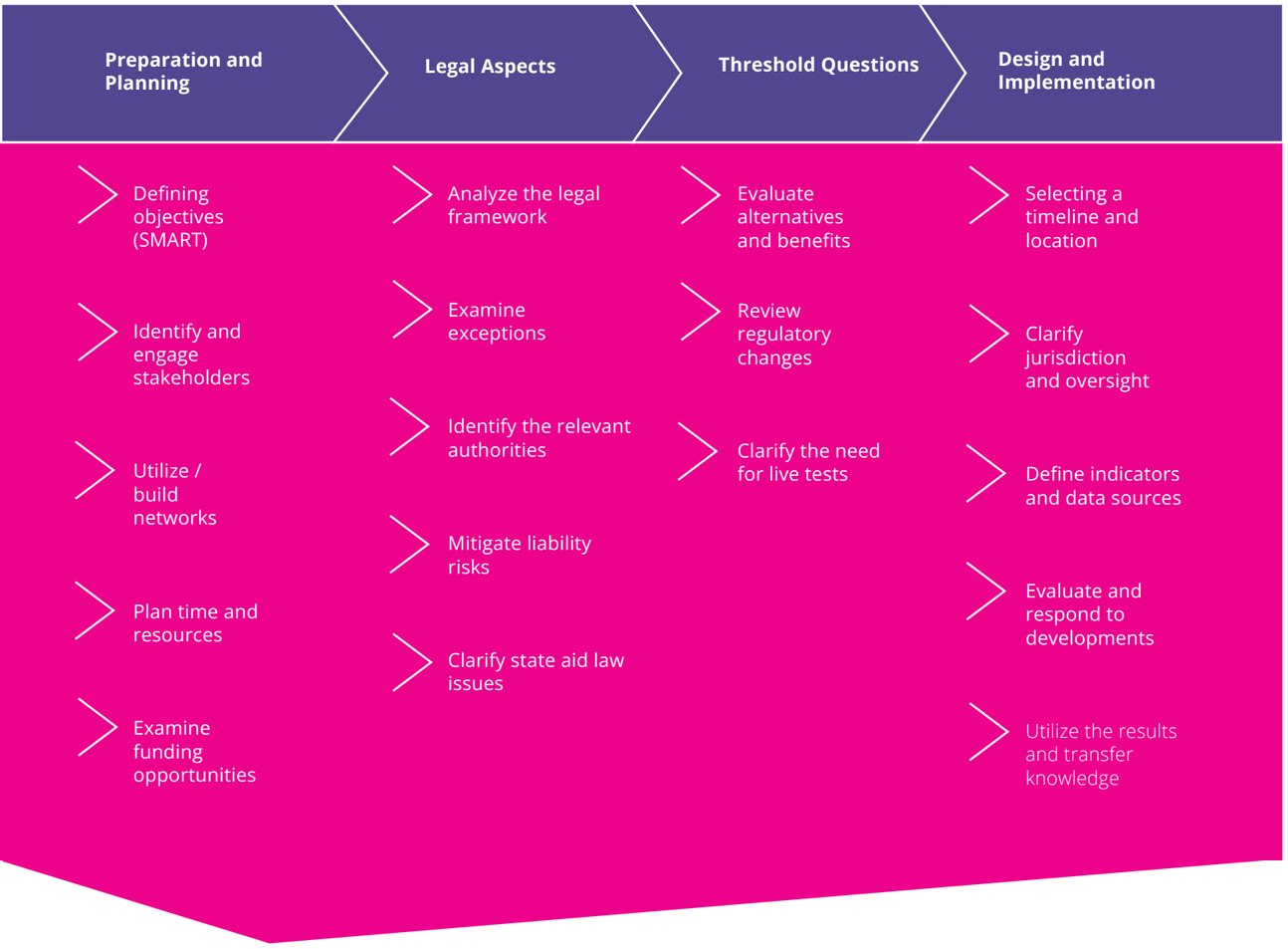

Figure 2 Flowchart for the implementation of real-world labs (based on the Federal Ministry for Economic Affairs and Energy (BMWi, 2019), the Federal Ministry for Economic Affairs and Climate Action (BMWK, 2023), and Jeník & Duff (2020))

During the (1) preparation and planning phase, the following points must be considered:

Formulating and making goals measurable

- What are the key objectives of the real-world lab?
- What is the focus of the research?
- How can the achievement of objectives be made measurable?

Involve stakeholders in a targeted manner

- Which stakeholders are responsible for implementation, oversight, and management? (Key stakeholders)
- Which stakeholders will actively participate in the implementation?
- Which stakeholders should participate on an ad hoc basis to improve the conditions?
- Which stakeholders in the real-world lab´s environment could influence the real-world lab?
- What interests exist in relation to the real-world lab?

Utilizing and shaping networks

- Are there already existing networks that can be engaged and utilized for the real-world lab?
- How can the relevant stakeholders be brought together in a network?
- How should collaboration within the network be structured?
- Can network structures be transferred from other regions or projects?

Planning time and resources

- Within what timeframes should the real-world lab be prepared, planned, and implemented?
- What resources must be allocated for the individual steps?

Check funding opportunities

- Are there opportunities to utilize public funding?

Regarding the (2) **legal aspects**, the following should be considered:

Identify legal hurdles

- Which areas of law and specific legal provisions are relevant for implementation?
- Which legal regulations facilitate or hinder the introduction of the innovation

Identify possible exemptions

- What experimental clauses or other options for exemptions exist?

Identify the path to an exemption

- What requirements must be met to utilize the exemptions?
- Which authorities are responsible for granting them?
- Where is there experience with the practical application of these regulations?
- Which authority has already granted an exemption in other cases?

Mitigating liability risks

- What liability risks might exist for participants, users, and observers?
- Who would be liable for these risks?
- How can these risks be mitigated?

Comply with state aid law

- Should the real-world laboratory be supported by public funds?
- Is the funding in compliance with state aid law?

Under (3) Threshold Questions, the following points must be critically examined:

Evaluate alternatives

- Does the innovation promise significant new benefits?
- If so, can the innovation be enabled through simple regulatory changes?
- Are live tests necessary?

Finally, under (4) Design and Implementation, the timeline, location, and data analysis must be clarified.

Selecting an appropriate duration and location

- What timeframe is required to achieve the goals of the real-world lab?
- Which region/county/city is suitable for answering the research questions?
- What geographical scope is required?

Clarify responsibilities for supervision and evaluation

- What is the need for supervision and management? Who will assume this role?
- Who will be responsible for evaluating the real-world lab?
- How should we respond to (critical) developments in the real-world lab?

Define indicators and data sources for evaluation

- Which indicators are suitable for measuring the achievement of the real-world lab´s objectives, particularly with regard to the research interests of the participating partners?
- What data is already available or can be used?
- What data should be collected as part of the evaluation?
- What reporting obligations does this entail for the real-world lab´s stakeholders?
- Which methodological approaches are suitable?

Targeted use of results

- How will the evaluation results be handled?
- How can we ensure that policymakers can learn from the real-world lab?

Space for your own ideas on Real-World Labs

four transfer

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