Erfolgskontrollbericht zum Projekt

Globally and LOCally-sustainable food-water-energy innovation in Urban Living Labs (GLOCULL)

Nexus Experiments to Foster Urban Sustainability Transformation (NEXEX)

FKZ: 01UV1801

Konsortium

Nr.	Rolle	Organisation	Land/ Förderorganisation	Kontaktperson
1	Projekt-Koordination/ Hauptantragsteller	Maastricht University (UM) - ICIS	Niederlande/ NWO	Ron Cörvers
2	Co-Antragssteller	Leuphana University (LEU) - IETSR	Deutschland/ BMBF	Daniel Lang
3	Co-Antragssteller	Lund University (LU) - LUCSUS	Schweden/ SEA	Barry Ness
4	Co-Antragssteller	University of Natural Resources and Life Sciences (BOKU)	Österreich/ FFG	Andreas Muhar
5	Co-Antragssteller	Arizona State University (ASU) – SFIS	USA/ NSF	Nigel Forrest
6	Co-Antragssteller	University of São Paulo (USP) – EHD	Brasilien/ FAPESP	Gabriela Di Giulio
7	Kooperationspartner	Stellenbosch University (SU) - CST	Südafrika/ START (USA)	John van Breda
8	Projektpartner	Brygghuset Finn (BF)	Schweden (SEA)	Joacim Larsen
9	Projektpartner	NIKKO Photovoltaik (NP)	Österreich (FFG	Erik Sehnal
10	Projektpartner	City of Tempe (CT)	USA/ NSF	Kay Braden
11	Projektpartner	City of Phoenix (CP)	USA/ NSF	Mark Hartmann
12	Projektpartner	Local First Arizona (LA)	USA/ NSF	Kimber Lanning

Laufzeit: März 2018 – Mai 2022

Projektverantwortliche an der Leuphana: Prof. Dr. Daniel J. Lang (Institut für Ethik und Transdisziplinäre Nachhaltigkeitsforschung) &
Prof. Dr. Henrik von Wehrden (Institut für Ökologie)

1 Beitrag des Ergebnisses zu den förderpolitischen Zielen

Das Ziel der Sustainable Urbanisation Global Initiative (SUGI)/Food-Water-Energy Nexus war es, neue und innovative Lösungen für den Nexus Food-Water-Energy (FWE) in urbanen Kontexten zu entwickeln, um den Zugang zu diesen Lebensgrundlagen zu ermöglichen und Lebensqualität zu steigern. Innerhalb der Ausschreibung standen drei Themen im Zentrum, zu welchen das Verbundprojekt GLOCULL sowie das spezifische Vorhaben GLOCULL-NEXEX jeweils Beiträge geleistet hat:

Das Themenfeld 1 *Robustes Wissen, Indikatoren und Bewertung* wurde z.B. im Arbeitspaket 3, mit der integrativen Analyse der Interaktionen von lokalen und globalen Strukturen im Bereich des FWE-Nexus sowie den Arbeitspaketen 5 und 6 durch die Durchführung und vergleichende Analyse der Urban Living Labs ULL, aufgegriffen. Wie im Abschlussbericht dargestellt, wurden auch auf lokaler Ebene in Lüneburg, im Rahmen der Realexperimente, Beiträge zu einem Robusten Wissen, v.a. in den Bereichen Energie und Ernährung sowie im Experiment zu transparenten Lieferketten zu verschiedenen Nexus-Aspekten, erarbeitet.

Wie geplant wurden zum Themenfeld 2 *Multi-Level Governance und Management des FWE-Nexus* u.a. in Arbeitspaket 4 Beiträge geleistet, durch die Entwicklung von partizipativen Bewertungsansätzen im Rahmen des Tool-Kits, die ein wechselseitiges Lernen und den Kapazitätsaufbau unterstützen. Weitere Beiträge erfolgten in den Arbeitspaketen 5 und 6, durch die Erprobung und Evaluation von Experimenten in ULL, als ein möglicher Governance-Ansatz am FWE-Nexus sowie durch deren vergleichende Analyse. Auch hier wurden im Rahmen von GLOCULL-NEXES Erkenntnisse zu Governance- und Managementfragen auf lokaler Ebene in Lüneburg gewonnen und an Akteure weitergegeben.

Beiträge zu Themenfeld 3 *Strategien und Lösungen, um mögliche Risiken und Trade Offs an der Schnittstelle zwischen dem FWE-Nexus und Nachhaltiger Urbanisierung zu adressieren* wurden u.a. in Arbeitspaket 6, durch die vergleichende Analyse der Realexperimente im Hinblick auf diese Fragestellung geleistet. Das Hauptaugenmerk von GLOCULL lag jedoch auf den Themenfeldern 1 und 2.

Im Projekt GLOCULL sind neben den verschiedenen inhaltlichen Erkenntnissen v.a. auch die methodologischen Entwicklungen hervorzuheben, die in zukünftigen ULL-/Reallabor-Vorhaben genutzt werden können und somit zu Themenfeld 1 wie auch zu Themenfeld 2 beitragen.

2 Ergebnisse

2.1 Wissenschaftlich-technische Ergebnisse

Wie im Abschlussbericht dargestellt, fanden die Arbeiten im Projekt GLOCULL-NEXEX auf zwei Ebenen statt. Zum einen lokal in Lüneburg, in der Umsetzung von Realexperimenten im Sinne des ULL-Ansatzes und zum anderen international durch die Bearbeitung von generellen Fragen zu Methodologie, Impacterfassung und Wirkungsweisen von ULL in der Zusammenarbeit mit allen Partner*innen des wissenschaftlichen Konsortiums. Im Rahmen des Gesamtprojektes war die Leuphana Universität Lüneburg hauptverantwortlich für das Arbeitspaket 5 zur Durchführung und Dokumentation der ULL Arbeiten an den verschiedenen Standorten.

Auf lokaler Ebene konnten zwei kleinere Experimente und ein größeres Experiment mit lokalen Partner*innwn realisiert werden. Im Sinne eines Co-Designs wurden die Experimente in einem Prozess jeweils gemeinsam mit den Akteur*innen entwickelt, geplant und durchgeführt. V.a. das größere Experiment hat hierbei das Zusammenwirken verschiedener Aspekte des FWE aufgegriffen, wohingegen die beiden kleineren Experimente eher einen spezifischen Fokus auf Energie- resp. Ernährungsfragen hatten (vgl. Sachbericht Kapitel 2.1.1). Die Experimente haben zu einem Mehrwehrt für die lokalen Akteur*innen geführt, zu direktem wissenschaftlichen Erkenntnisgewinn beigetragen (z.B. bzgl. der Wirkung

von erfahrungsbasierten Marketingtools) und wichtige Beiträge für die übergeordneten Arbeiten im Gesamtkonsortium geleistet (z.B. im Rahmen der Entwicklung des Case Reporting Schemes).

Auf übergeordneter Ebene konnten trotz der Corona-Pandemie alle geplanten Meilensteine generell erreicht werden. Wie im Abschlussbericht (Kapitel 1.3 und 2.1.2) dargestellt, hat die Leuphana Universität zu allen Arbeitspaketen Beiträge geleistet. Vor allem die Entwicklung des Case Reporting Schemes, zur einheitlichen Beschreibung und Evaluation der ULL und der darin eingebetteten Experimente sowie die Beiträge zur vergleichenden Analyse der verschiedenen ULL wurden hierbei stark von der Leuphana geprägt und vorangetrieben. Zu diesen Aspekten sind aktuell verschiedene Publikationen in Arbeit, die noch in diesem Jahr bzw. Anfang nächsten Jahres zur Veröffentlichung eingereicht werden sollen.

2.2 Nebenergebnisse

Ein in der Planung nicht vorhergesehenes Nebenergebnis des Projekts im Zusammenhang mit der Corona Pandemie, resultiert aus einer qualitativen Analyse, die federführend von der Leuphana durchgeführt wurde. In elf halbstrukturierten Tiefeninterviews wurden Forschende aus den jeweiligen GLOCULL-ULLs sowie weitere Akteure aus dem SUGI Umfeld zu den Auswirkungen der Pandemie auf die jeweiligen ULL Arbeiten befragt. Hieraus konnten Erkenntnisse im Hinblick auf Herausforderungen und Chancen im Rahmen der ULL-/Reallaborforschung in Krisensituationen und unter großer Unsicherheit gewonnen werden. Ein weiteres Nebenergebnis war das Gewinnen neuer Partner*innen bzw. die Vertiefung der Partnerschaft mit bestehenden Partnern, was teilweise in einer langfristigen Zusammenarbeit über den konkreten Projektkontext hinaus mündete. Zudem konnten verschiedene studentische Abschlussarbeiten im Projekt realisiert werden, was zum einen das Projekt sehr bereichert und den Studierenden zum anderen eine sehr gewinnbringende Lernerfahrung ermöglicht hat.

2.3 Gesammelte Erfahrungen

Die von Anfang an geplante enge Verknüpfung mit dem bestehenden Reallabor Lüneburg 2030+ hat sich als sehr hilfreich erwiesen. Dies verdeutlicht, wie wichtig die langfristige Anlage von transdisziplinären Kooperationsstrukturen und der Vertrauensaufbau mit Akteur*innen vor Ort ist. Eine derartige Einbettung von Projekten in bestehende Strukturen kann ggf. ein Ansatz sein, um mit dem häufig wahrgenommenen Dilemma zwischen den Rahmenbedingungen einer projektbasierten Förderung - mit einem begrenzten Förderzeitraum sowie häufig definierten Projektzielen - und Grundprinzipien transdisziplinärer sowie transformativer Forschungsansätze - wie Langfristigkeit, gemeinsame Problemdefinition und Projektentwicklung oder geteilte Problemwahrnehmung - die teilweise schwer mit vordefinierten Projektlogiken zu fassen sind, umgegangen werden kann. Weitere wichtige Erfahrungen haben sich auch im Zusammenhang mit den Auswirkungen der Corona Pandemie ergeben. Diese hat sowohl die wissenschaftliche Zusammenarbeit zwischen den internationalen Partnerinstitutionen als auch die Kooperation mit den lokalen Akteuren stark beeinträchtigt. Hierbei wurde auf internationaler Ebene deutlich, dass bestimmte Aspekte virtuell besprochen und weiterentwickelt werden können. Für die effektive und kreative Zusammenarbeit zwischen den Partner*innen spielen Treffen in Präsenz jedoch nach wie vor eine sehr wichtige Rolle. Die transdisziplinäre Zusammenarbeit auf lokaler Ebene war durch die Corona Pandemie fast über die gesamte Projektlaufzeit hinweg von sehr vielen Unsicherheiten geprägt, was zeitweise sowohl für das wissenschaftliche Projektteam als auch für die Partner*innen aus der Praxis enorm belastend war und viele Anpassungen in der Planung verlangte. Hier war die große Offenheit und Flexibilität sowohl vom Projektträger als auch von Seiten des BMBF äußerst hilfreich. Da auch ohne die Einflüsse der Corona Pandemie Reallabor- bzw. ULL-Forschung mit zahlreichen Unsicherheiten verbunden ist, kann aus diesen Erfahrungen sicherlich auch für die Ausgestaltung weiterer Fördervorhaben gelernt werden, um diesen Forschungsmodus noch gewinnbringender in Wert zu setzen.

3 Fortschreibung des Verwertungsplans

- *Erfindungen und Schutzrechte:* Im Rahmen des Projekts sind keine Erfindungen entstanden und es wurden keine Schutzrechte angemeldet bzw. erteilt. Entsprechende Verwertungen der Projektergebnisse sind auch in Zukunft nicht geplant.

- *Wirtschaftliche Erfolgsaussichten:* In den Realexperimenten wurde intensiv mit lokalen Kleinstunternehmen zusammengearbeitet (vgl. Abschlussbericht). Hier konnten und können Erkenntnisse aufgegriffen werden, die das nachhaltige Wirtschaften am FWE-Nexus und darüber hinaus stärken. Die Unternehmer*innen sind auch mit weiteren lokalen und regionalen Akteur*innen in engem Austausch, was zu einer weiteren Verbreitung und Weiterentwicklung der erarbeiteten Ergebnisse beiträgt.

- Wissenschaftliche Erfolgsaussichten: Wissenschaftlich werden Beiträge zum aktuellen Diskurs v.a. im Bereich der ULL-/Reallaborforschung, durch die Publikation der Forschungsergebnisse des Projekts in wissenschaftlichen Fachzeitschriften erwartet. Leider hat sich die Erstellung der Publikationen durch die Pandemie, aber auch durch die Elternzeit des zentralen Projektmitarbeiters direkt im Anschluss an die Projektlaufzeit verzögert. Da die meisten Publikationen jedoch als Teil der Dissertation des Mitarbeiters geplant sind, werden diese Zeitnah entstehen. Insgesamt sind 4 Publikationen geplant, von welchen zwei bereits in einer Version vorliegen, die ein Einreichen bis spätestens Ende des Jahres äußerst wahrscheinlich machen. Für zwei weitere Publikationen steht das Grundgerüst und die Analysen sind durchgeführt, was auch hier ein Einreichen Anfang des kommenden Jahres ermöglichen sollte.

- *Wissenschaftliche und wirtschaftliche Anschlussfähigkeit*: Wie im letzten Zwischenbericht beschrieben, konnten bestimmte Projektideen, die im Rahmen von GLOCULL entstanden sind, aber nicht im Kontext des Projekts verwirklicht werden konnten, im Projekt TRANSFORM aufgegriffen und weiterentwickelt werden. Dies ist v.a. im Sinne des verantwortungsvollen Umgangs mit den Beiträgen der Partner*innen aus der Praxis sehr erfreulich. U.a. bzgl. den Erkenntnissen aus dem Experiment zu transparenten Lieferketten, können diese Erkenntnisse auch von anderen KMU genutzt und weiterentwickelt werden. Hier besteht im Projekt TRANSFORM ebenfalls ein großes Potential, die Erkenntnisse zu transferieren und zu skalieren, da dies eines der Kernanliegen von TRANSFORM ist. Diesbezüglich, aber auch generell, ist das entwickelte Case-Reporting-Scheme so angelegt, dass es in weiteren Projekten genutzt werden kann und soll, und zur Analyse von einem wachsenden Pool an Berichten von ULL und Realexperimenten, im Hinblick auf Fragen von Skalierbarkeit und Transferierbarkeit von Nachhaltigkeitslösungen beitragen wird. Zudem können auf dieser Grundlage langfristig wichtige methodologische Erkenntnisse weit über den Projektzeitraum hinaus generiert werden.

4 Arbeiten, die zu keiner Lösung geführt haben

Wie im Schlussbericht beschrieben, konnten zwei geplante Experimente mit Kleinstunternehmer*innen nur in geringem Umfang oder gar nicht durchgeführt werden. Dies lag v.a. an den zeitlichen Verzögerungen durch die Corona-Pandemie sowie Veränderungen bei den Planungen der beteiligten Akteure. In der ursprünglichen Antragstellung waren auch Experimente zum Themenbereich „Gestaltung von öffentlichen Räumen in einem Netzwerk von urbanen Ökosystemen“ geplant. Diese ist aus zwei Gründen nicht erfolgt: Zum einen wurden entsprechende Fragestellungen verstärkt im Projekt Lüneburg 2030+ bearbeitet und zum anderen führten auch hier Veränderungen durch die Corona-Pandemie zu neuen Konstellationen, welche zu einem Fokus auf Aspekte des lokalen Wirtschaftens bei den Experimenten geführt haben.

5 Präsentationsmöglichkeit für mögliche Nutzer*innen

Die Ergebnisse der lokalen Fallstudien wurden bei verschiedenen Anlässen Akteuren vor Ort vorgestellt. Z.B. wurde die erfahrungbasierten Marketingtools, welche im Zusammenhang mit dem Experiment zu transparenten Lieferketten entstanden sind, von den Kund*innen des Projektpartners mit großem Interesse aufgenommen. Durch die stark transdisziplinäre Arbeitsweise waren auch bereits bei der Entstehung der Ergebnisse zahlreiche Akteure mit einbezogen und somit im Rahmen der Entstehung der Ergebnisse involviert (z.B. Aktion im Rahmen des Projektes Grüne Salzsau). Der wissenschaftlichen Community wurde u.a. das Case Reporting Scheme auf verschiedenen Konferenzen vorgestellt, zuletzt auf der Earth System Governance Conference 2022 in Toronto. Auch inhaltliche Erkenntnisse wurden im Rahmen von Konferenzen präsentiert und mit der Community diskutiert, beispielsweise bei der Environmental Justice Conference 2021 im Lassalle Institut in der Schweiz.

6 Einhaltung der Ausgaben und Zeitplanung

Durch die Corona-Pandemie waren verschiedene Anpassungen in der Arbeits-, Zeit- und Kostenplanung notwendig, die vom Projektträger mit dem Änderungsbescheid vom 12.12.2018 und dem Bescheid zur Kostenneutralen Verlängerung vom 08.09.2020 jeweils bewilligt wurden. Die angepassten Planungen sind in den jeweiligen Anträgen dokumentiert und konnten entsprechend eingehalten werden. Eine weitere Umwidmung von Mitteln wurde bereits am 29. April 2021 beantragt. Wie vom Projektträger vorgeschlagen, wurde dieser Antrag mit dem abschließenden Verwendungsnachweis vom 26. Oktober 2022 nochmals eingereicht.

Case Reporting Scheme

Dimension	Level	References	General Description
Setting	Context	Forrest	What are the general contextual factors that significantly influence the overall purpose of the lab or the specific design, outputs, or outcomes of the experiments the lab conducts?
Spatial and temporal scope	Lab	McCrory/Wanner/Voytenko/Schäpke/Forrest/Caniglia/Lang	What is the spatial and temporal scope of the lab?
Process			What is the lab's procedural design?
Organization			How is the lab organizationally structured?
Sustainability			What is the lab's general sustainability orientation?
Outputs	Experiment	Luederitz	What changes were generated, inside or outside the lab, as a direct result of the experiment?
Outcomes			What impacts have the experiments' activities on the broad sustainability of society both within and beyond the immediate scope of the lab?
Processes			What were the processes of the experiment?
Inputs			What elements - physical, financial, social, emotional or other - were invested, used, applied, or otherwise put into experiments?

Reporting procedure

The reporting scheme presented here is designed to capture the work of Collaborative Labs in real-world settings and the sustainability-oriented experiments conducted by these labs. Its main purpose is to structure the reporting on these collaborative activities in order to provide more comprehensive understanding of the development and the impacts of sustainability solutions in such settings.

Through a coherent reporting process we aim to 1) support researchers and practitioners to explore their own projects based established frameworks and 2) generate a growing knowledge base on sustainability-oriented experiments enabling transfer of lab approaches and experiments across contexts.

The reporting scheme is structured following a basic logic model of context, laboratory and experiment/s (see figure above).

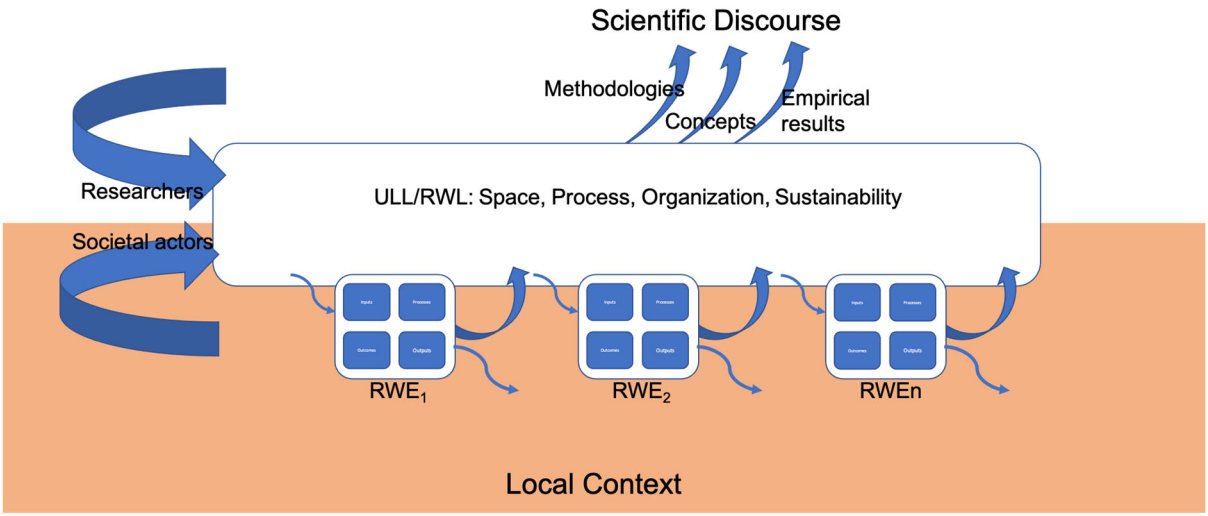
Moreover, we want to share our understanding of the reporting process:

1. **Use the data you have.** Collaborative lab research in real-world contexts is highly context dependent and the data collected varies across different labs. We do not expect researchers to collect new data for filling the reporting scheme. Instead, we encourage the users to use the data they have available as a result of the collaborative research process, such as meeting minutes, interviews conducted along the process, and other sources. To ensure some degree of comparability between case reports, we suggest to clearly state data sources where possible and indicate if answers are based on the researcher's perspectives and experiences.

2. **Specify to your needs.** The Case Reporting Scheme is designed to be generic in order to be applicable to cases from different contexts and with different designs and approaches. We therefore encourage you to further specify the questions presented in the schemes categories to better match your case. In the case that a certain category does not apply to your case, please indicate this.

3. **Think from the experiment.** One idea behind this scheme is to generate better insights regarding the dependencies of contexts, labs in real-world settings, and sustainability-oriented experiments. We therefore suggest to think from the experiment and the lab when reporting. What are the crucial features that determined the lab design and experiments?

4. We acknowledge the **high degree of context dependency** of the research and the experiments you will report on. We are aware that not all of the categories and features will fit perfectly. Therefore, we are highly interested in your feedback when using the scheme.



Context Level - **external to the lab**	***What are the general contextual factors that significantly influence the overall purpose of the lab or the specific design, outputs, or outcomes of the experiments the lab conducts?***	Fill in answers below
Construct	**Guiding Question (descriptive analysis)**	
Environmental	What environmental factors (biological or physical), if any, such as climate, soil type, or vegetation, significantly influence the lab's purpose or activities?	
Social/Cultural	What socio-cultural factors, if any, of populations or sub-populations, such as diversity, education, income, health, language, religion, values, beliefs, and social norms, significantly influence the lab's purpose or activities?	
Financial/economic	What financial/economic factors, if any, such as funding sources, financing mechanisms, taxes, diversity of enterprises, unemployment, and diversity of workforce, significantly influence the lab's purpose or activities?	
Technical/Infrastructure	What technical or infrastructure factors, if any, such as water and energy infrastructure, transport networks, housing stock, other built environment, and green infrastructure, significantly influence the lab's purpose or activities?	
Legal/Political	What legal or political factors, if any, such as laws, regulations, standards, permits, dominant ideology, activism, public participation, significantly influence the lab's purpose or activities?	
Organizational/Capacity	What organizational or capacity factors, if any, such as knowledge, skill, organizational stuctures, networks, training programs, and support services, significantly influence the lab's purpose or activities?	

Lab Level	***What is the general purpose, structure and composition of the lab?***	Fill in answers below
Construct	**Guiding Question (descriptive analysis)**	
	Space	
Spatial scope	What is the spatial scope of the lab: the geographical and or administrative boundaries?	
Temporal scope	What is the temporal scope of the lab?	
	What historical aspects are crucial to understanding the lab's work?	
	What is the lab's future and long-term persepctive?	
	Process	
Experimentation	What type of experiments was conducted in the lab?What are the central experiments in the lab? How were these determined? How might these address the identified real world problems?	
Transdisciplinarity	Who are the primary participants (operators, partners, sponsors, etc.) in the lab and experiment activities? Indicate their representative roles e.g. academic, private, municipal. Which groups/voices are not/under represented? Why?	
Learning and Reflexivity	How does the lab enable learning and create spaces for reflexivity (inlcuding the synthesis and integration of knowledges)?	
Actvities	What are further lab activities supporting the lab process?	
	Organization	
Organizational Structure	What is the general orgnaizational structure of the lab?	

	What are the key roles of the lab's participants? Who has what responsibilities? How are these roles and responsibilities determined and maintained?	
	How does the lab deal with conflict situations?	
Sustainability		
Sustainability orientation and purpose	What is the sustainability orientation of the lab? How does the lab engage with societal change processes for sustainability? How will lab outcomes interact with society? How will lab actors engage with society differently?	

Experiment level			Fill in answers below
Construct	**Features**	**Guiding question**	
Outputs			
What kind of outputs were generated through the experiment?	Built Capacities	What capacities were built through the experiment?	
	Actionable knowledge	What kind of actionable knowledge was generated through the experiment that provides evidence on how to generate sustainability solutions?	
	Accountability	How did the experiment build confidence and commitment for generating and realizing sustainability solutions?	
	Changes in physical structures	What physical changes were generated that support solutions for the identified sustainability problem?	
	Changes in social structures	What changes in social structures were generated that support solutions for the identified sustainability problem?	
	Transferability	How does the experiment ensure that the sustainability solution can be transferred to different contexts?	
	Scalability	How does the experiment indicate the potential for and how outputs can be scaled out to broader applications or up to higher hierarchical levels?	

	Accounting for unintended consequences associated with up-take	How does the experiments account for unintended consequences that are associated with the up-take of sustainability solutions?	
Outcomes			
How did the experiment contribute to sustainability?	Socio-ecological integrity	How do the experiment's outputs strengthen socioecological integrity?	
	Livelihood sufficiency and opportunity	How do the experiment's outputs enhance livelihood sufficiency and opportunity?	
	Intra- and intergenerational equity	How do the experiment's outputs improve intra- and intergenerational equity?	
	Resource maintenance and efficiency	How do the experiment's outputs contribute to overall resource maintenance and efficiency?	
	Socio-ecological stewardship and democratic governance	How do the experiment's outputs build or support socio-ecological understanding and democratic governance?	
	Precaution and adaptation	How do the experiment's outputs ensure precaution and adaptation?	
Processes			
How was the experiment designed and conducted?	Sequence of actions	Is the experiment structured into a meaningful sequence of actions?	
	Sound methodology	What is the methodology to conduct the experiment?	
	Collaboration	How does the experiment facilitate collaboration among relevant stakeholders in the experimentation process?	

	Reflexivity and learning	How does the experiment foster reflexivity and learning throughout the process?	
	Transparency	How does the experiment ensure transparency throughout the process?	
Inputs			
What are the enabling factors of the experiment?	Awareness	How does the experiment involve participants that are aware of the need for transformational change pursued through the experiment?	
	Commitment	How does the experiment involve participants committed to carrying out the experiment?	
	Expertise	How does the experiment involve participants who possess the necessary skills and knowledge to carry out the experiment?	
	Trust	How does the experiment involve participants who trust each other?	
	Support	How does the experiment secure sufficient support for the experimentation?	

Case Report:
Leuphana University of Lüneburg

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Reporting procedure

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The reporting scheme is structured following a basic logic model of context, laboratory and experiment/s (see figure above).

Moreover, we want to share our understanding of the reporting process:

1. **Use the data you have.** Collaborative lab research in real-world contexts is highly context dependent and the data collected varies across different labs. We do not expect researchers to collect new data for filling the reporting scheme. Instead, we encourage the users to use the data they have available as a result of the collaborative research process, such as meeting minutes, interviews conducted along the process, and other sources. To ensure some degree of comparability between case reports, we suggest to clearly state data

sources where possible and indicate if answers are based on the researcher's perspectives and experiences.

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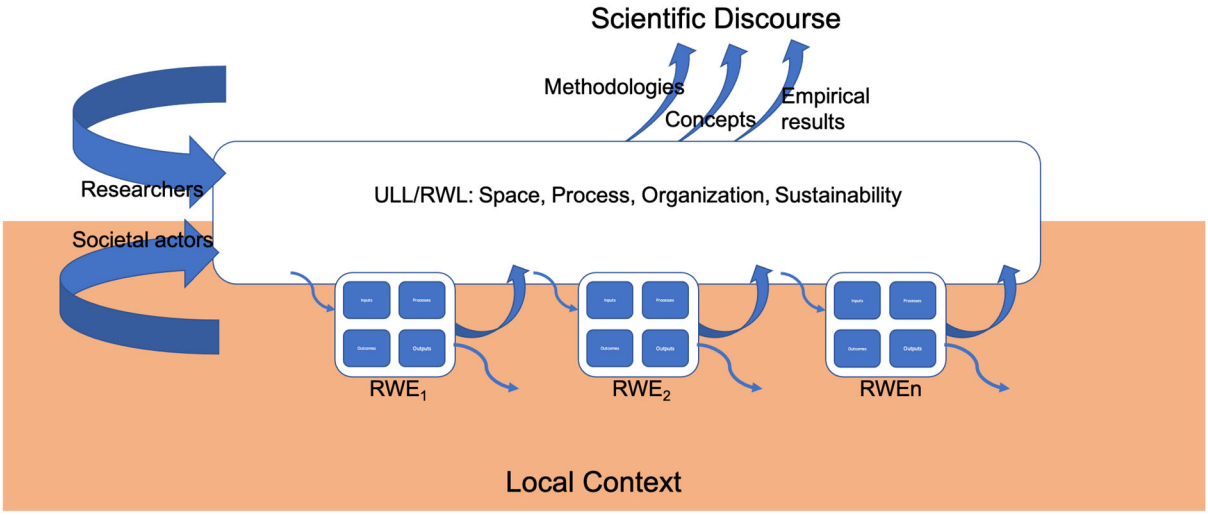
3. **Think from the experiment.** One idea behind this scheme is to generate better insights regarding the dependencies of contexts, labs in real-world settings, and sustainability-oriented experiments. We therefore suggest to think from the experiment and the lab when reporting. What are the crucial features that determined the lab design and experiments?

4. We acknowledge the **high degree of context dependency** of the research and the experiments you will report on. We are aware that not all of the categories and features will fit perfectly. Therefore, we are highly interested in your feedback when using the scheme.



Context Level - **external to the lab**	***What are the general contextual factors that significantly influence the overall purpose of the lab or the specific design, outputs, or outcomes of the experiments the lab conducts?***	Fill in answers below
Construct	**Guiding Question (descriptive analysis)**	
Environmental	What environmental factors (biological or physical), if any, such as climate, soil type, or vegetation, significantly influence the lab's purpose or activities?	Not relevant for the experiment
Social/Cultural	What socio-cultural factors, if any, of populations or sub-populations, such as diversity, education, income, health, language, religion, values, beliefs, and social norms, significantly influence the lab's purpose or activities?	Lüneburg is a city with a high number of sustainability-oriented consumers (Avenir perspective) large proportion of the population with high degree of environmental awareness, large proportion of the population with high degree of formal education (University), large number of sustainability initiatives within the civil society
Financial/economic	What financial/economic factors, if any, such as funding sources, financing mechanisms, taxes, diversity of enterprises, unemployment, and diversity of workforce, significantly influence the lab's purpose or activities?	Real-world laboratory Lüneburg 2030+ as an umbrella for real-world lab/experiment activities of Leuphana University, city administration, civil society, and local economy.
Technical/Infrastructure	What technical or infrastructure factors, if any, such as water and energy infrastructure, transport networks, housing stock, other built environment, and green infrastructure, significantly influence the lab's purpose or activities?	No special infrastructures related to lab activities.
Legal/Political	What legal or political factors, if any, such as laws, regulations, standards, permits, dominant ideology, activism, public participation, significantly influence the lab's purpose or activities?	The lab activities took place in an environment characterized by a growing movement of purpose-oriented business in Germany as well as a push towards a “Lieferkettengesetz (act of corporate due diligence obligations in supply chains) initiative by the German federal government. Over the past few years, Lüneburg has seen a growing political focus on environmental and sustainability issues, resulting in the election of a green party mayor in late 2021.
Organizational/Capacity	What organizational or capacity factors, if any, such as knowledge, skill, organizational structures, networks, training programs, and support services, significantly influence the lab's purpose or activities?	Leuphana University is a central actor for sustainability in Lüneburg: The faculty of sustainability and especially the professorship for transdisciplinary sustainability research has been involved in real-world lab research and activities for more than 10 years. There is continuous collaboration with local actors and businesses. Lüneburg 2030+ has established mutual experimental collaborations between businesses, local organizations, city administration.

Lab Level	***What is the general purpose, structure and composition of the lab?***	Fill in answers below
Construct	**Guiding Question (descriptive analysis)**	
	Space	
Spatial scope	What is the spatial scope of the lab: the geographical and or administrative boundaries?	The spatial scope of the Lab is the city of Lüneburg (local) embedded in the regional context of the Districto of Lüneburg. Due to the topical focus of coffee trade and supply chains, a global perspective is recognized in all lab activities. However, the focus of the lab activities and more specifically the experiment discussed below is on the consumer to coffee shop relation
Temporal scope	What is the temporal scope of the lab?	The lab (the original group of 3 local businesses and the university team) was established in 2020 with some lab-building activities preceding this date. The lab team working on the experiment that was realized in this study worked closely from spring to fall 2021.
	What historical aspects are crucial to understanding the lab's work?	Our main collaborator Avenir Café has emerged from an initiative of Leuphana students focusing on fair-trade coffee. Therefore, a long term and strong relation to the University exist.
	What is the lab's future and long-term perspective?	The collaboration with Avenir is planned as a long term partnership with several experiments. It is also planned to realize joint experiments with other partners, partly already engaged in the 2030+ context.
	Process	
Experimentation	What type of experiments was conducted in the lab?What are the central experiments in the lab? How were these determined? How might these address the identified real world problems?	The central experiment, the co-development and implementation of a communication strategy for transparency of sustainable coffee businesses, conducted by the lab is considered a type 5 experiment, i.e. experiment on sustainability solutions with participatory control (Caniglia et al. 2019), with an embedded analytical part adopting a methodological approach from business psychology (Weber et al. 2021). The topic/real-world problem was selected as a crucial aspect of the Avenir Cafe's transition to becoming a collectively managed sustainable coffee shop with a local roastery devoted to transparent business practices.
Transdisciplinarity	Who are the primary participants (operators, partners, sponsors, etc.) in the lab and experiment activities? Indicate their representative roles e.g. academic, private, municipal. Which groups/voices are not/under represented? Why?	The primary participants of the lab are a number of members of the Avenir coffee shop and roastery, mainly Kristin Jordan, with Joshua Hoof as a long standing partner of Avenir Café and responsible for the web design of Avenir Café, Sven Ostendorf from Quijote Kaffee, a Hamburg direct-trade importer of sustainably produced coffee and business partner of Avenir Café, and Hanna Weber and Philip Bernert from Leuphana University as research partners. Furthermore the team was supported by the research group of David Loschelder, Professor in Business Psychology at Leuphana University of Lüneburg.

Learning and Reflexivity	How does the lab enable learning and create spaces for reflexivity (including the synthesis and integration of knowledges)?	The lab partners have built a trustful relationship over the course a number of regular meetings both online (mostly due Covid) and offline in which the process of the lab and the experiment was jointly reflected and discussed. The concluding reflection of learnings and results was covered in one-on-one meetings between Avenir (Kristin Jordan) and the research team (Philip Bernert).
Activities	What are further lab activities supporting the lab process?	The initial phase of the lab collaboration included two more businesses with whom a large number of sustainability challenges of local beer and coffee businesses was identified and developed into early-stage experiment ideas. Due to the circumstances of the global Covid pandemic, the labs work quickly focused on the close collaboration with Avenir. Over the course of the project, Avenir has become a close partner not only in the lab research, but also in other events of Leuphana university and Lüneburg 2030+, such as the future of the city magazine, a number of workshops with other labs and partners, and student led transdisciplinary projects, such as the development of an assessment tool for local money flows.
Organization		
Organizational Structure	What is the general organizational structure of the lab?	The lab was collaboratively led between Avenir and the research team, e.g. meetings were prepared jointly and methodological workshops designs were developed in close collaboration. The analytical part of the experiment was designed and conducted by the Leuphana research team.
	What are the key roles of the lab's participants? Who has what responsibilities? How are these roles and responsibilities determined and maintained?	There were no defined key roles. Responsibilities were shared across all team members, while the Leuphana team took a stronger lead in developing the experimental concept and the Avenir team taking a stronger role in developing the material used in the experiment.
	How does the lab deal with conflict situations?	Due to the open and trustful collaboration, no conflicts emerged during the experimentation phase.
Sustainability		
Sustainability orientation and purpose	What is the sustainability orientation of the lab? How does the lab engage with societal change processes for sustainability? How will lab outcomes interact with society? How will lab actors engage with society differently?	The main focus of the lab revolved around the aspect of “transparency” focusing on the coffee supply chain, with the general aim to make contributions to increase sustainability at the food-water-energy nexus but also related to social questions such as income and living/working conditions of producers. On a local level the lab aims to contribute to more sustainable consumption patterns of Lüneburg citizens.

Experiment level			Fill in answers below
Construct	**Features**	**Guiding question**	
Outputs			
What kind of outputs were generated through the experiment?	Built Capacities	What capacities were built through the experiment?	Capacity to communicate sustainability efforts more openly and transparently, while learning about existing challenges to make the Avenir's coffee supply more sustainable (through close collaboration with Quijote). Analytical understanding of the effectiveness of experiential marketing tools for communicating sustainability efforts. Capacity to collaborate with partners both from science and practice.
	Actionable knowledge	What kind of actionable knowledge was generated through the experiment that provides evidence on how to generate sustainability solutions?	The experiment is a practical example of how to design low-barrier marketing approaches for communicating sustainability efforts aimed at increasing consumer-effectiveness, understanding of coffee production and trade, and increasing relational proximity between consumers and producers. This knowledge is represented by a number of tools that were developed: a graphic novel explaining the specific coffee supply chain of Avenir, an image video portraying Avenir Café's plans to transform its business model, and a mindful coffee tasting audio guide.
	Accountability	How did the experiment build confidence and commitment for generating and realizing sustainability solutions?	Collaboratively realizing the sustainability solutions as part of the experiment allowed all partners to stay committed to the joint process, as practitioners reported to need a concrete project to work on because of day-to-day business (especially during covid) often being overwhelming to be motivated for additional sustainability initiatives. The clear alignment of the experiment with the Avenir's transition process helped to increase commitment. On the other hand, the implementation of an already tested approach to the marketing tool design and a clear methodology of testing it, enabled the commitment of further researchers from the psychology department.
	Changes in physical structures	What physical changes were generated that support solutions for the identified sustainability problem?	The experiment led to the development and implementation of a communication campaign building on four central elements: (1) an informational video, (2) a graphic novel, (3) an informational leaflet, (4) a mindful coffee tasting audio guide. These elements were used in different contexts and now form a central column of the Avenir online and offline communication.
	Changes in social structures	What changes in social structures were generated that support solutions for the identified sustainability problem?	The experiment built on the collaboration between Avenir Cafe, Leuphana University and Quijote Kaffee, a Hamburg based importer and roaster of sustainable coffee. The collaborative work as part of the experiment has led to a close exchange between these actors and the mutual interest in further pursuing the development of joint projects.
	Transferability	How does the experiment ensure that the sustainability solution can be transferred to different contexts?	The transferability of the sustainability solution is ensured through the comprehensive reporting of the lab's work as the basis of a research paper. Through this case reporting, the more focused perspective of the paper will be complemented to provide a more holistic understanding of the case and its results.

	Scalability	How does the experiment indicate the potential for and how outputs can be scaled out to broader applications or up to higher hierarchical levels?	The sustainability approach developed in this study builds on a transdisciplinary case study developed with another sustainable coffee business and thus already represents a form of scaling a sustainability solution. In this case study, the real-world experiment is planned to serve as an example of communication approaches that strengthen consumer to coffee roaster/importer relationships and thus foster sustainable consumption patterns. The developed communication approach is specifically designed for Avenir Café. However, the approach is open for other businesses to adopt to their own needs. On a local scale, the experiment supports the transition of Avenir Café to become a collectively owned and managed sustainable business.
	Accounting for unintended consequences associated with up-take	How does the experiments account for unintended consequences that are associated with the up-take of sustainability solutions?	
Outcomes			
How did the experiment [1]contribute to sustainability?	Socio-ecological integrity	How do the experiment's outputs strengthen socio-ecological integrity?	The experiment showed that the exposure to the newly developed communication tools has an influence on the coffee drinkers' general consumption behavior (buying organic fair trade products…).
	Livelihood sufficiency and opportunity	How do the experiment's outputs enhance livelihood sufficiency and opportunity?	The experiment shows how sustainable business practices can be communicated to include consumers as supporters of practices such as paying prices for producers that are truly fair.
	Intra- and intergenerational equity	How do the experiment's outputs improve intra- and intergenerational equity?	Through the successful open and transparent communication of sustainable business practices, the experiment supports the building of long-term partnership with producers (hopefully over generations), maintaining coffee plantation ecosystems also in the future (organic farming).
	Resource maintenance and efficiency	How do the experiment's outputs contribute to overall resource maintenance and efficiency?	
	Socio-ecological stewardship and democratic governance	How do the experiment's outputs build or support socio-ecological understanding and democratic governance?	
	Precaution and adaptation	How do the experiment's outputs ensure precaution and adaptation?	
Processes			

How was the experiment designed and conducted?	Sequence of actions	Is the experiment structured into a meaningful sequence of actions?	The experiment was embedded in the ongoing business transition of Avenir Café. Overall the experiment can be separated in three distinct phases: (1) joint development of the communication approach, (2) implementation of the communication tools including a dedicated testing weekend involving around 200 consumers and 200 non-local online participants, (3) long-term adoption of the tools into Avenir's communication strategy.
	Sound methodology	What is the methodology to conduct the experiment?	The collaborative work between Avenir Café, Quijote, and the Leuphana team followed a strong transdisciplinary research understanding and participatory methodology. Particular steps, such as the testing event for the graphic novel and video as marketing tools for Avenir were designed around methods from business psychology used in a previous study (Weber et al. 2021).
	Collaboration	How does the experiment facilitate collaboration among relevant stakeholders in the experimentation process?	The experiment not only established a space of collaboration regarding the design of the communication tools as well as the process itself. Decisions regarding the methods of participation were made collaboratively while the research team took responsibility for the methodological design of the testing event, and the Avenir team took responsibility for realizing the contents of the graphic novel and website.
	Reflexivity and learning	How does the experiment foster reflexivity and learning throughout the process?	Reflexivity and learning was fostered through a close communication between all involved actors and regular check-ins. The originally planned concluding reflection workshop could however not be held due to time constraints and was instead replaced by a one-on-one session between one of the researchers and one representative from Avenir Café.
	Transparency	How does the experiment ensure transparency throughout the process?	The transparency of the process was ensured through the communication through a shared messaging group to which all of the involved partners had access. It bears mentioning, that the small number of participating partners drastically helüed to ensure the transparent communication among all involved parties.
Inputs			
What are the enabling factors of the experiment?	Awareness	How does the experiment involve participants that are aware of the need for transformational change pursued through the experiment?	Avenir Café has been a sustainable business pioneer in Lüneburg for a couple of years. Originally started as a student initiative, the business is currently undergoing a transition to become collectively organized and owned. Hence, awareness for sustainability was already high among all the involved partners of the experiments. At the same time, the experiment helped to push the transformation process by highlighting the communication towards consumers and customers.
	Commitment	How does the experiment involve participants committed to carrying out the experiment?	Over the course of the process commitment was ensured through regular check-ins. Initially, the partners mentioned that the process had to bring forward concrete and tangible outputs (graphic novel). The regular meetings were concluded with a list of to dos after each session and for each partner to ensure engagement.
	Expertise	How does the experiment involve participants who possess the necessary skills and	Expertise on various domains was brought into the project by the project partners: researchers had experience in the field of (1) transdisciplinary and transformative research with a focus on real-world labs and experiments and (2) sustainable coffee businesses and communication practices. The Avenir Café team has a lot of experience in establishing new business practices in the city of Lüneburg as

		knowledge to carry out the experiment?	well as business development, Quijote coffee provided expertise in sustainable coffee supply that was crucial in developing the graphic novel.
	Trust	How does the experiment involve participants who trust each other?	Trust among partners was fostered through an open communication of the shared research process and the creation of an open environment where partners both from research and practice could state their motivation and interests at the beginning and throughout the process.
	Support	How does the experiment secure sufficient support for the experimentation?	Financial support was secured through the GLOCULL funding that also covered the expenses for the development of the communication tools (website, graphic novel, informational video)