Environmental and agricultural sustainability: knowledge gaps (and tools) in evaluating the effectiveness and impacts of Living Labs

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WWW.SOCIALECOLOGY.CA

Carleton UNIVERSITY

uOttawa

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

llio living lab en innovation ouverte

SSHRC CRSH

Knowledge Synthesis Grants

Background – SSHRC Knowledge Synthesis Grant (KSG)

KNOWLEDGE MOBILIZATION/TRANSFER RESEARCH (NGUYEN) + LIVING LABS (MCPHEE- AAFC)

OPPORTUNITY TO STUDY LIVING LABS FROM SOCIAL PERSPECTIVE

CSPC | CANADIAN SCIENCE POLICY CENTRE

The Research Team

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Carleton U (PI)

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U of Ottawa (co-PI)

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Agriculture Agri-Food Canada

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LLio

Jean-Francois Jasmin
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Christine Beaudoin

Jessika Guay

Dr. Rachana Devkota

Sam Richard

Julie Sell

Gap and Objectives of LL Knowledge Synthesis Project

A gap exists in understanding **how to evaluate and measure** the effectiveness of LLs and their **longer-term impacts – notably, social and environmental ones.** Further, LLs for sustainability remain underexplored in literature and practice.

We used a knowledge synthesis grant to fill this gap. Our team set out to:

1: Synthesize **best practices for evaluating** impacts and effectiveness of LLs via a scoping review

2: Develop a **research agenda (in context of sustainability)** by eliciting expert knowledge on gaps and strengths of LLs

3: Build and engage a **network** of cross-sectoral LL actors interested in LLs for sustainability

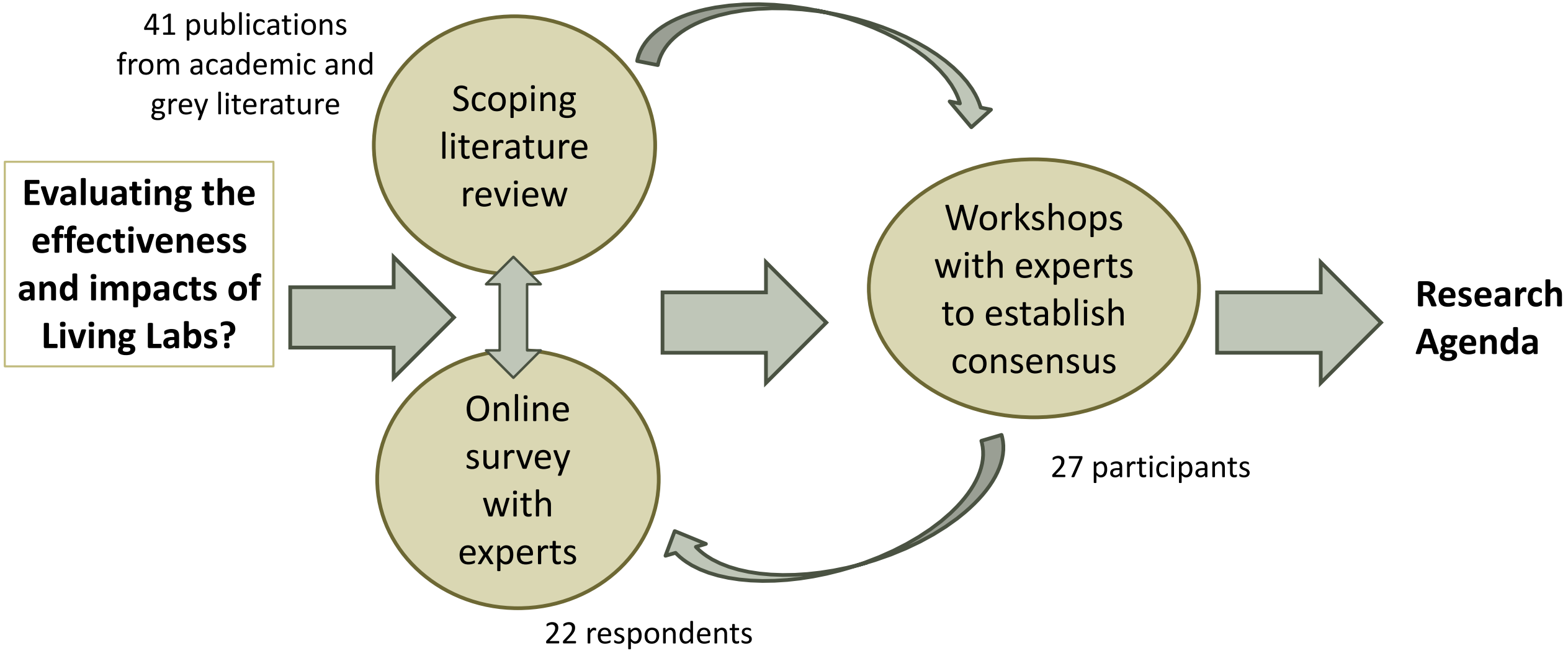
Goal today

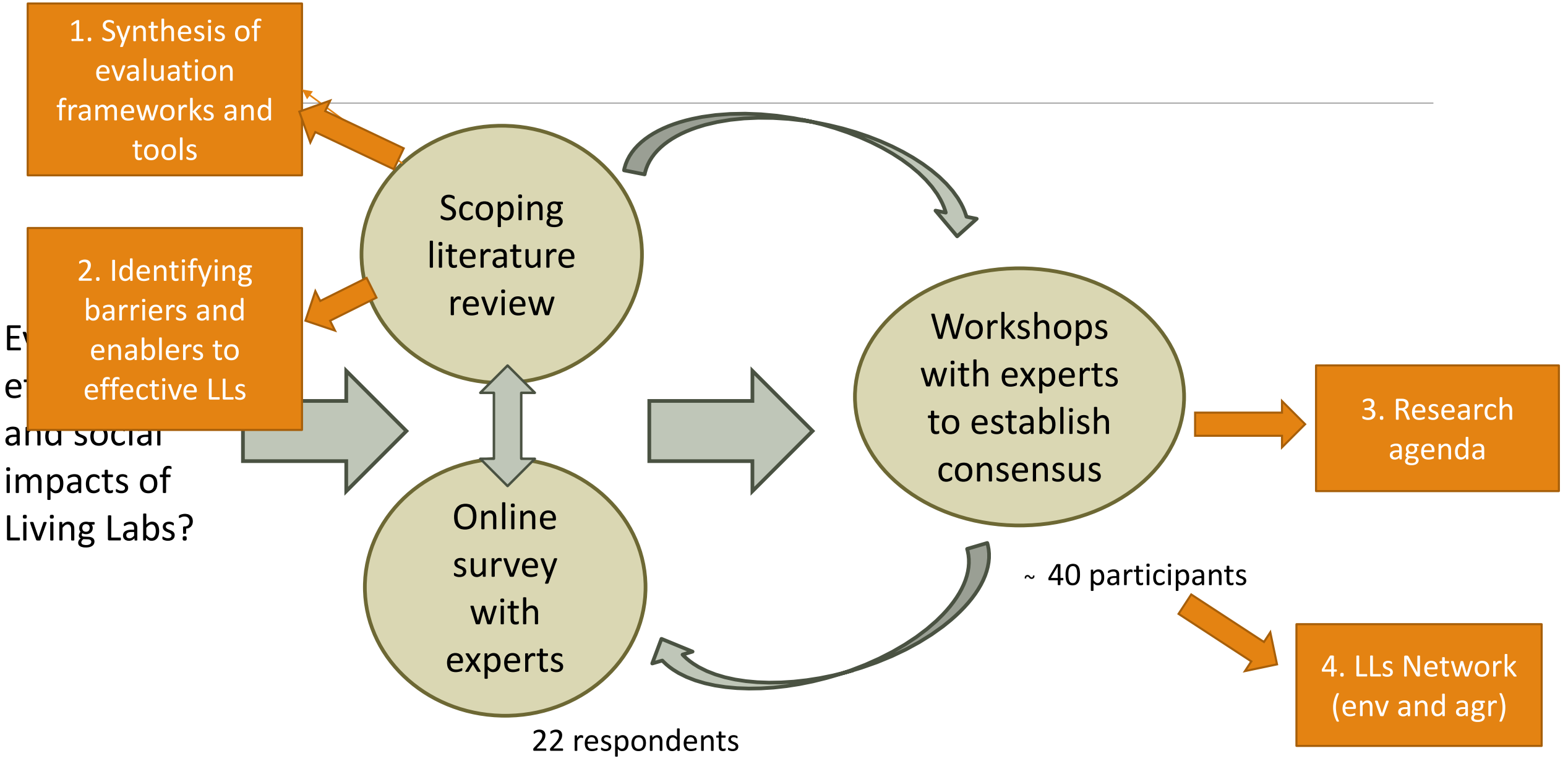
1. To provide an **overview of the outputs** of our knowledge synthesis project (SSHRC), not to go into details of each

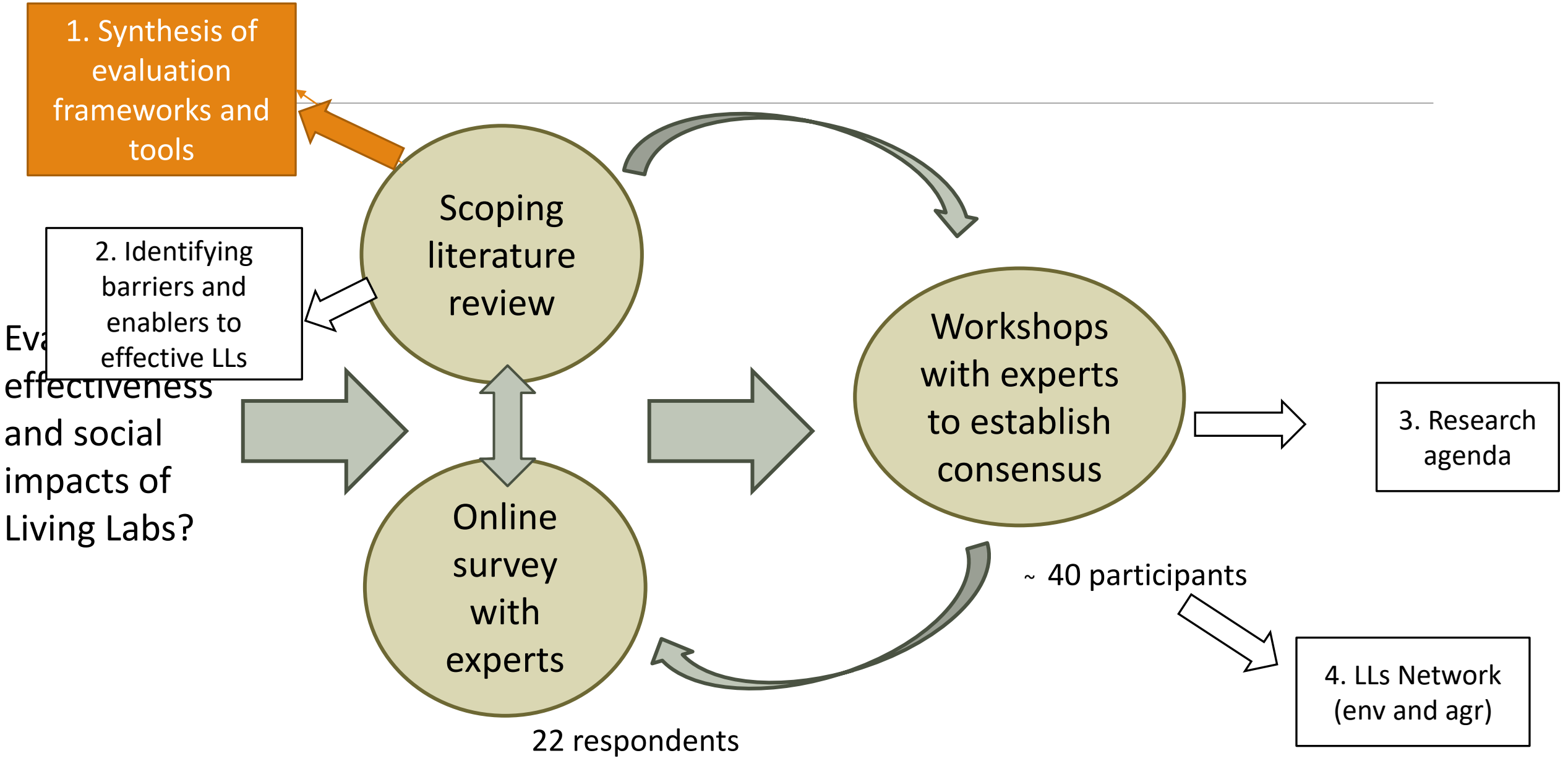
2. To raise awareness of the **potential applications of findings**

3. To highlight potential **future research** and collaborative opportunities

Overview of Project Approach




1. Synthesis of evaluation frameworks and tools
2. Identifying barriers and enablers to effective LLs
Scoping literature review
Online survey with experts
22 respondents
Workshops with experts to establish consensus
~ 40 participants
3. Research agenda
4. LLs Network (env and agr)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Obj 1: Synthesizing best practices for evaluating LLs

sustainability

MDPI

Review

Moving toward Generalizability? A Scoping Review on Measuring the Impact of Living Labs

Kelly Bronson [1], Rachana Devkota [1,*] and Vivian Nguyen [2]

[1] School of Sociological and Anthropological Studies, Faculty of Social Sciences, University of Ottawa, Ottawa, ON K1N 6N5, Canada; kbronson@uottawa.ca
[2] Interdisciplinary Science and Practice Program, Institute of Environmental and Interdisciplinary Science, Carleton University, Ottawa, ON K1S 5B6, Canada; VivianNguyen@cunet.carleton.ca
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Abstract: The living labs (LLs) approach has been applied around the globe to generate innovation within and suited to real-life problems and contexts. Despite the promise of the LL approach for addressing complex challenges like socio-ecological change, there is a gap in practitioner and academic community knowledge surrounding how to measure and evaluate both the performance of a given LL process and its wider impacts. Notably, this gap appears particularly acute in LLs designed to address environmental or agricultural sustainability. This article seeks to verify and address this knowledge gap by conducting an adopted scoping review method which uses a combination of tools for text mining alongside human text analysis. In total, 138 academic articles were screened, out of which 88 articles were read in full and 41 articles were found relevant for this study. The findings reveal limited studies putting forward generalizable approaches or frameworks for evaluating the impact of LLs and even fewer in the agricultural or sustainability sector. The dominant method for evaluation used in the literature is comparative qualitative case studies. This research uncovers a potential tension regarding LL work: the specificity of LL studies works against the development of evaluation indicators and a universal framework to guide the impact assessment of LLs across jurisdictions and studies in order to move toward generalizability.

check for updates

Citation: Bronson, K.; Devkota, R.; Nguyen, V. Moving toward

Keywords: living labs; evaluation; impact; environment; agriculture; sustainability; scoping review

Obj 1: Synthesizing **best practices** for evaluating LLs

sustainability

MDPI

Review

Moving toward Generalizability? A Scoping Review on Measuring the Impact of Living Labs

Question asked:

What **evaluation methods, metrics or frameworks exist for measuring the effectiveness of LLs** (generally), and specific to environmental and agricultural sustainability?

to address environmental or agricultural sustainability. This article seeks to verify and address this knowledge gap by conducting an adopted scoping review method which uses a combination of tools for text mining alongside human text analysis. In total, 138 academic articles were screened, out of which 88 articles were read in full and 41 articles were found relevant for this study. The findings reveal limited studies putting forward generalizable approaches or frameworks for evaluating the impact of LLs and even fewer in the agricultural or sustainability sector. The dominant method for evaluation used in the literature is comparative qualitative case studies. This research uncovers a potential tension regarding LL work: the specificity of LL studies works against the development of evaluation indicators and a universal framework to guide the impact assessment of LLs across jurisdictions and studies in order to move toward generalizability.

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Keywords: living labs; evaluation; impact; environment; agriculture; sustainability; scoping review

Final search string:

"living lab*" AND
evaluat*
OR performance
OR effective*
OR impact
OR assess*
OR metric
OR measure*
OR indicator

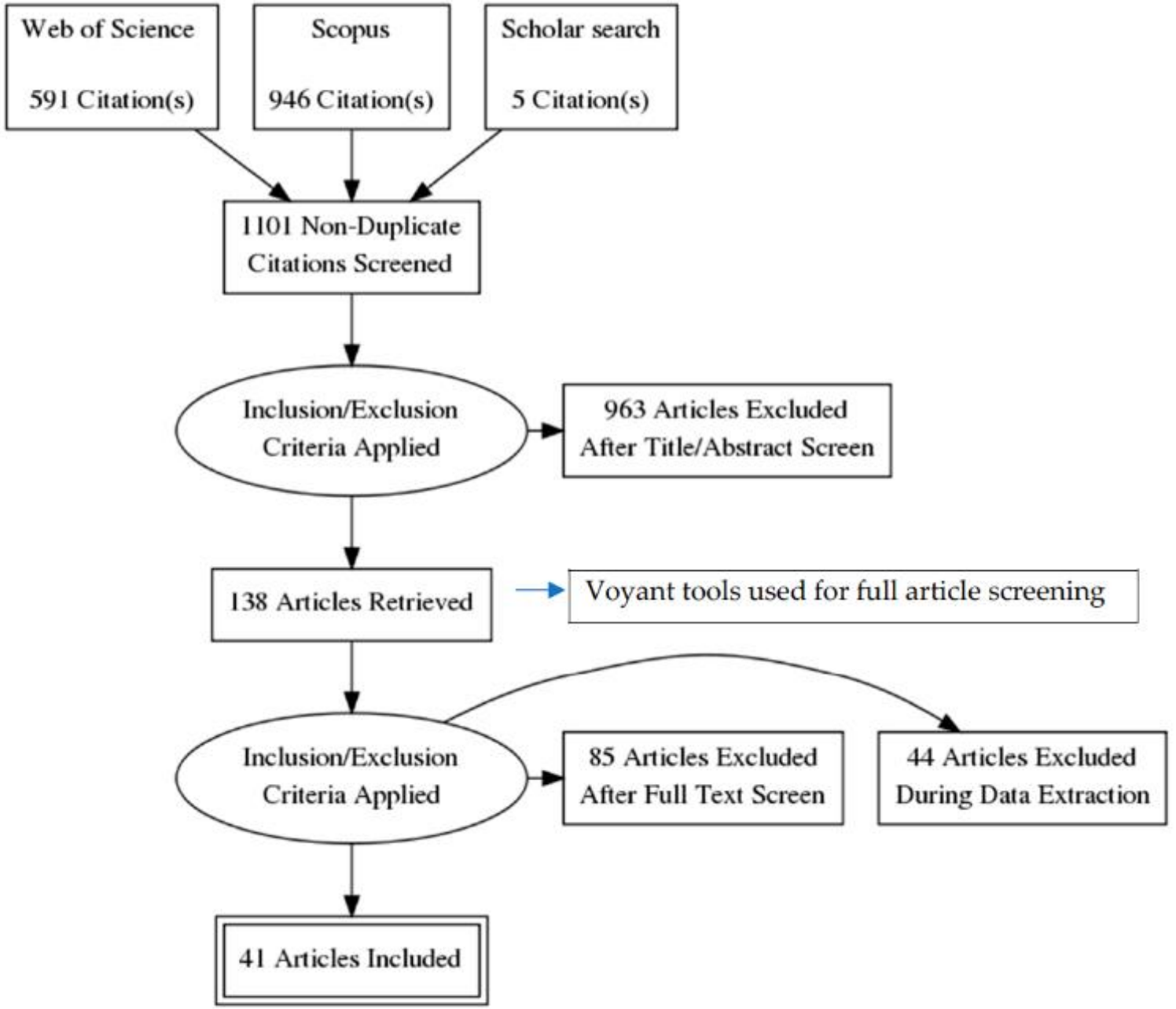


Figure 1. Flow diagram of scoping review using Prism-ScR checklist in this study.

Summary of Findings: *very few studies on agricultural sustainability evaluation*

Figure 4. No. of articles published on living labs focusing on innovation, social impact and agricultural sustainability. Articles are not mutually exclusive. Source: Scoping review.

Summary of Findings: a *plurality of evaluation methods*

- Most method are qualitative
- Reason for plurality – nature of LLs?
- Only 30 % of articles focused on measuring impacts

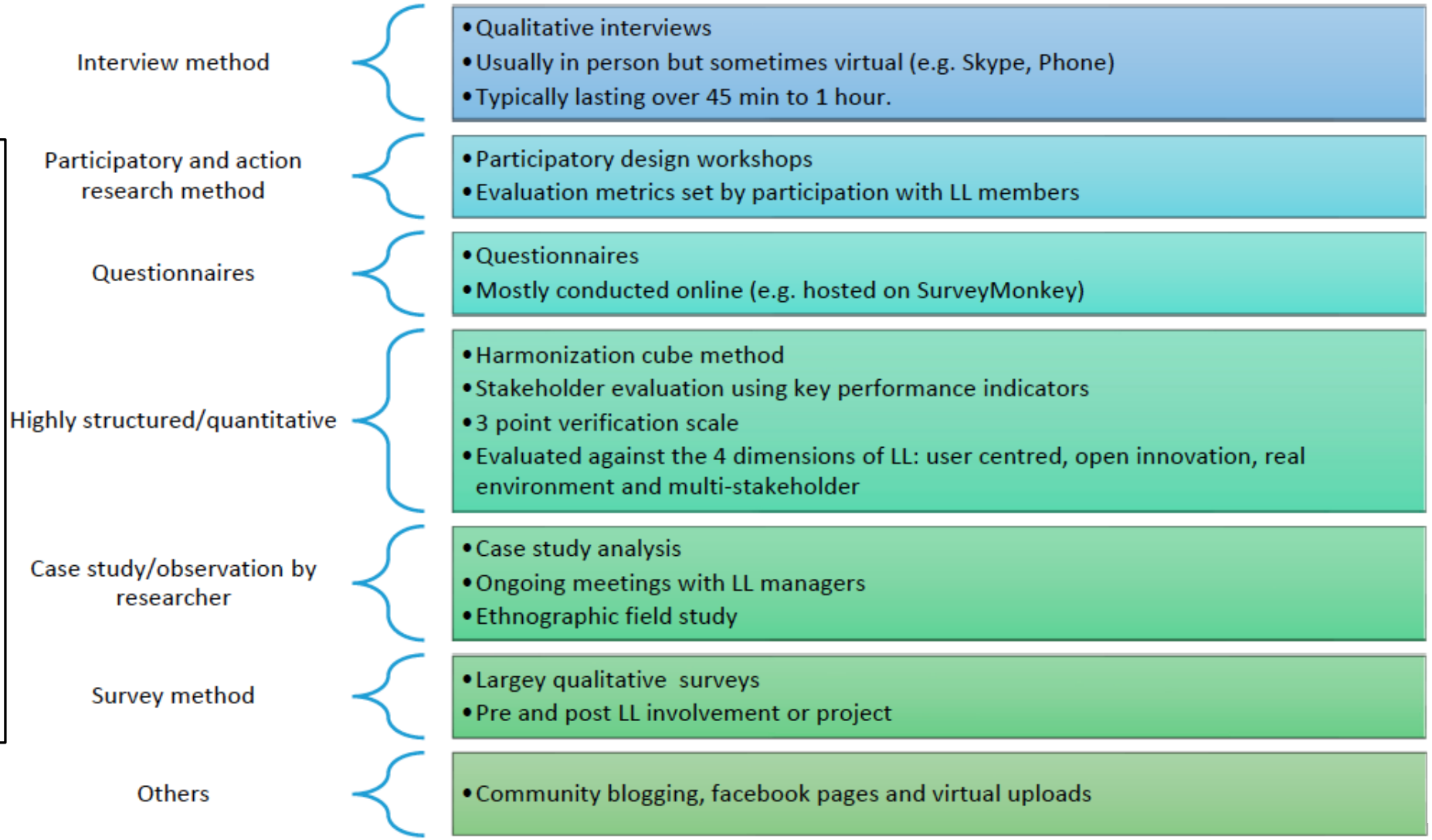


Figure 8. Summary of different evaluation approaches used in LL studies which discuss evaluation.

Summary of Findings: *no unifying framework for evaluating LLs*

Table 2 in Bronson et al. – summary of relevant evaluation frameworks from LL literature

Opportunity for agro-ecosystem living labs to build a framework?

Table 2. Summary of relevant evaluation frameworks and models used in LLs evaluation literature.

Evaluation Framework/Principles/Model	Key Focus	Key Elements	Authors
Digital Co-Creation Index (DCCI) framework for evaluation in EU	A systemic understanding of the basic factors shaping the co-creative processes in LLs.	Emphasize the interplay between places, technology, and people within LLs.	Mačiulienė & Skaržauskienė [38]
The four-capital method of sustainable development evaluation, originally developed by Ekins et al. 2008	Relationship between the needs, objectives, inputs, operations, and output	Consists of four capitals: human, financial, environmental, and manufactured.	Ondiek & Moturi [21]
Conceptual framework: mixing user-centred strategy and participatory strategy	Conceptualise the impacts of the user-centred and participatory strategies on innovation performance outcomes by assessing the project performance and transfer performance.	In user-centred strategy, observing user's behaviours, capturing users' insights, and receiving users' feedback are considered. Co-designing and collaborating with users and enabling users' experience through prototypes are the major elements of participatory strategy.	Dell'Era et al. [35]
Logical effect model for LL projects	For the evaluation of small and medium sized enterprises, potential effects of LL projects are categorized as short-term, mid-term and long-term.	Key elements are use, usefulness and value of LL project, initial objectives and achieved effects, effects on investments, revenues, and employment because of LL project results.	Ballon et al. [2]
A maturity grid-based assessment tool	Framework developed by reviewing eight frameworks that focus specifically on innovation laboratories	Guidance tool to evaluate the maturity degree of an innovation laboratory or to adapt an existing LL project	Osorio et al. [41]
Harmonization cube	LL Harmonization Cube created, in alignment with the structure of the "Rubik" cube	The columns of the cube describe the organizational, contextual, and technological issues, the rows represent the maturity level of LLs, as: setup, sustainability, and scalability.	Kovacs [37]

Key Takeaways from Scoping Review

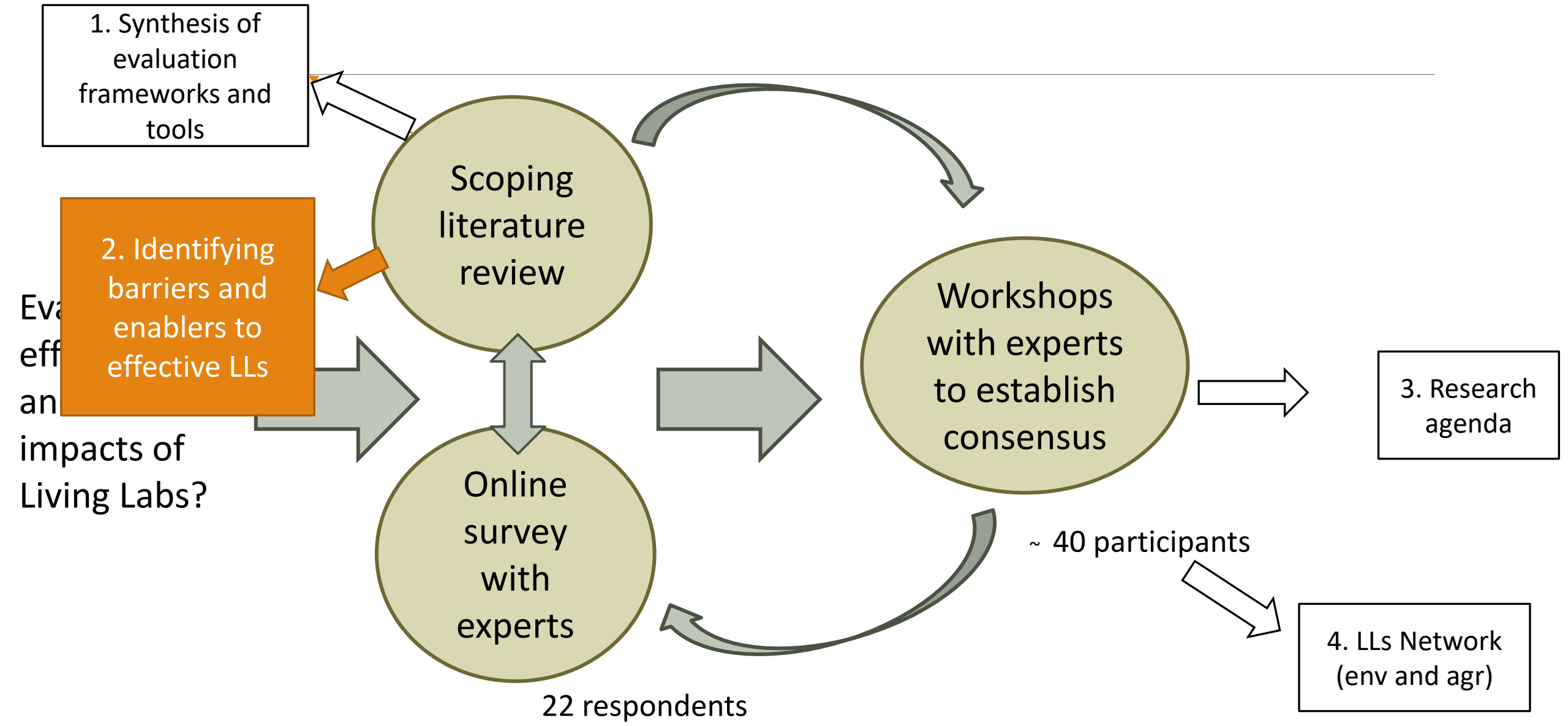
Several large networks of LL initiatives have recently been formed in North America and across Europe that focus on **agro-ecosystem sustainability**

These larger research projects could work to develop a **unifying framework for evaluating sustainability LLs** by focusing on three key elements which we synthesized from best practices:

(1) level of participant involvement and empowerment,

(2) time-series analysis, and

(3) long-term viability of the LL project.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Obj 1: Identifying barriers and enablers for effective Living Labs

Routledge
Taylor & Francis Group

Local Environment

The International Journal of Justice and Sustainability

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cloe20

Enablers, barriers, and future considerations for living lab effectiveness in environmental and agricultural sustainability transitions: a review of studies evaluating living labs

A. Berberi, C. Beaudoin, C. McPhee, J. Guay, K. Bronson & V. M. Nguyen

To cite this article: A. Berberi, C. Beaudoin, C. McPhee, J. Guay, K. Bronson & V. M. Nguyen (05 Aug 2023): Enablers, barriers, and future considerations for living lab effectiveness in environmental and agricultural sustainability transitions: a review of studies evaluating living labs, Local Environment, DOI: 10.1080/13549839.2023.2238750

To link to this article: https://doi.org/10.1080/13549839.2023.2238750

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Obj 1: Identifying barriers and enablers for effective Living Labs

Routledge
Taylor & Francis Group

Local Environment

The International Journal of Justice and Sustainability

Question asked:
What specific factors lead to effective LL processes and outcomes?
Used same database built from Bronson et al. 2021

A. Berberi, C. Beaudoin, C. McPhee, J. Guay, K. Bronson & V. M. Nguyen

To cite this article: A. Berberi, C. Beaudoin, C. McPhee, J. Guay, K. Bronson & V. M. Nguyen (05 Aug 2023): Enablers, barriers, and future considerations for living lab effectiveness in environmental and agricultural sustainability transitions: a review of studies evaluating living labs, Local Environment, DOI: 10.1080/13549839.2023.2238750

To link to this article: https://doi.org/10.1080/13549839.2023.2238750

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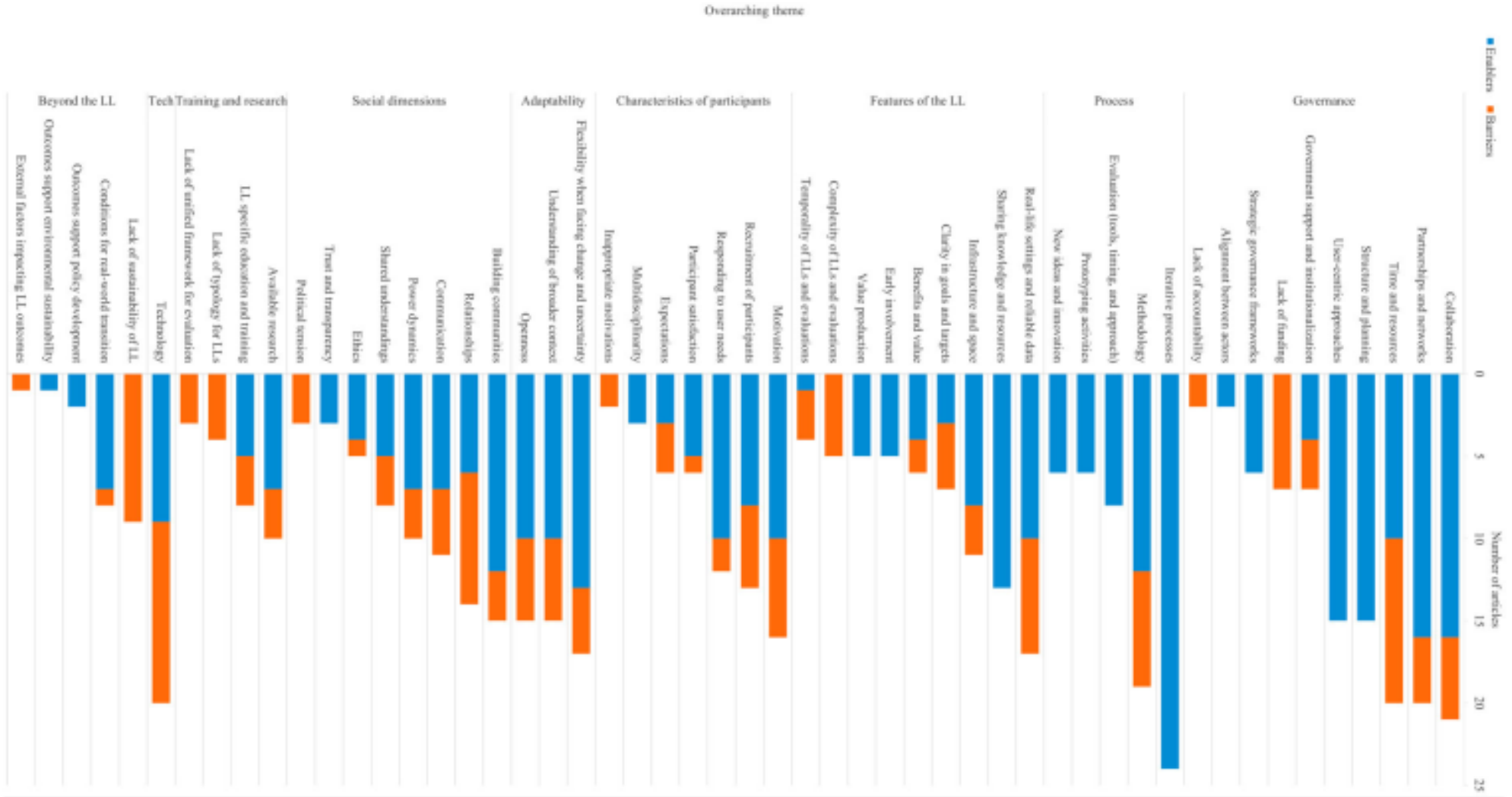
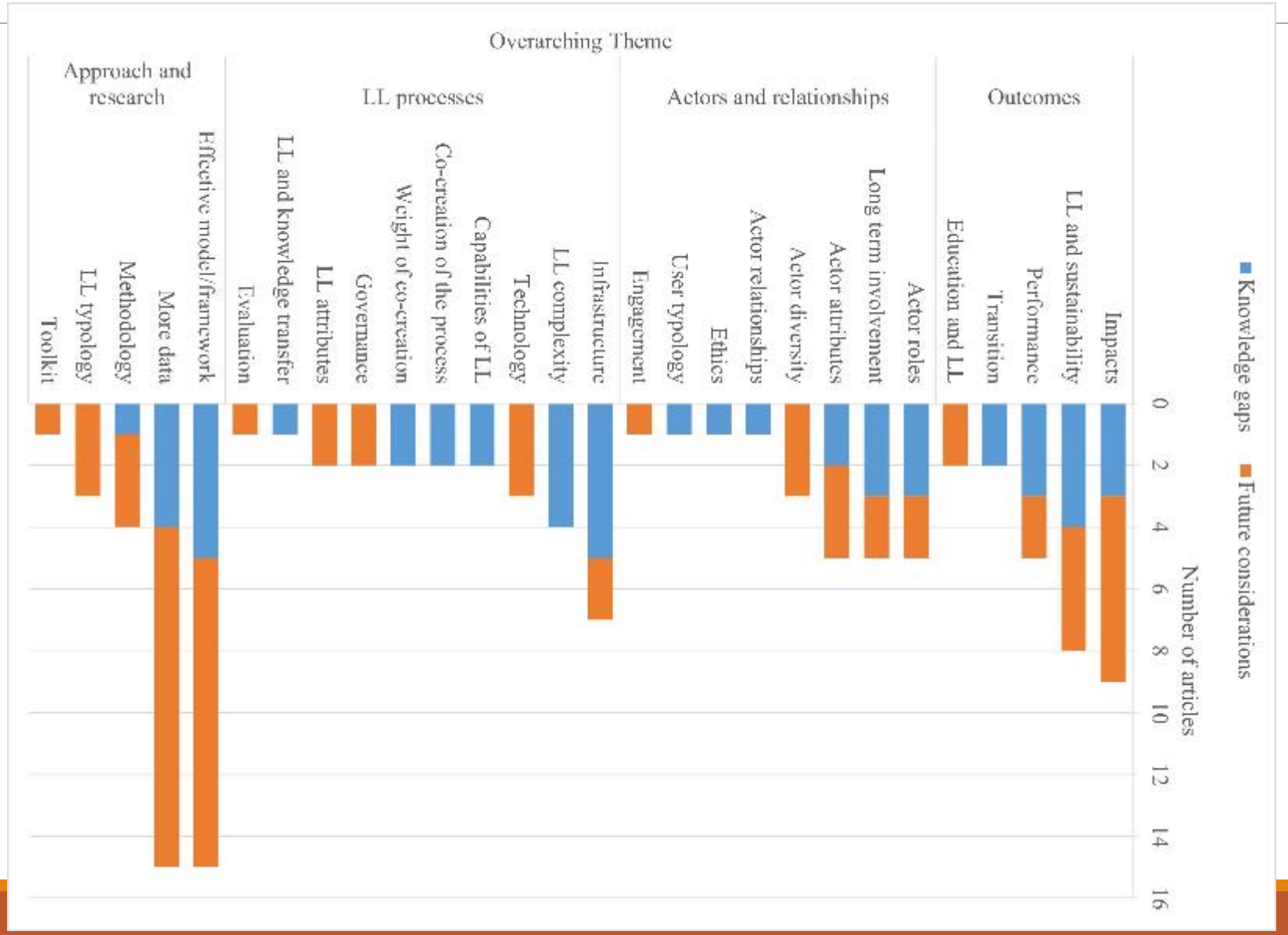
Summary of findings: 32 barriers/enablers grouped under 9 themes



List of 27 knowledge gaps and future considerations



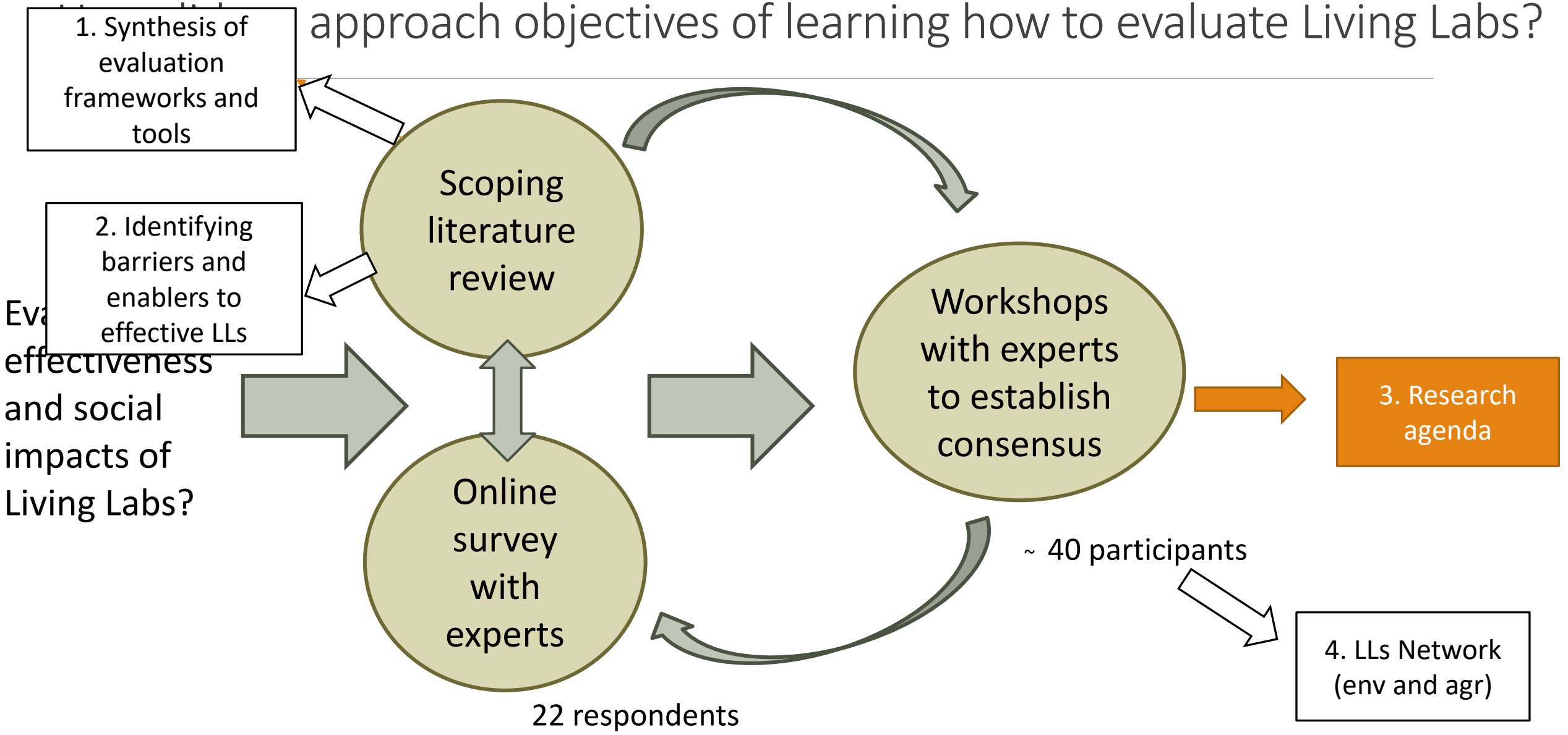
Take home from Berberi et al. 2023: barriers/enablers

We need more research to **track social-ecological impacts** tied to LL efforts

For now, we can **use the list to leverage key elements that can drive LL success**

- Identified enablers, barriers, and future consideration **can help develop frameworks for evaluating** LL effectiveness (as touched on in Bronson et al. 2022)

approach objectives of learning how to evaluate Living Labs?



Obj 2: Develop research agenda on evaluation of LL

Environmental Challenges 7 (2022) 100505

Contents lists available at ScienceDirect

Environmental Challenges

journal homepage: www.elsevier.com/locate/envc

A research agenda for evaluating living labs as an open innovation model for environmental and agricultural sustainability

Christine Beaudoin[a,*], Steve Joncoux[b], Jean-François Jasmin[b], Albana Berberi[c], Chris McPhee[d], R. Sandra Schillo[e,f], Vivian M. Nguyen[c,g]

[a] School of Sociological and Anthropological Studies, University of Ottawa, 120 University Private, Ottawa, ON K1N 6N5, Canada
[b] Living Lab en innovation ouverte, Centre collégial de transfert du Cégep de Rivière-du-Loup, 78 rue Frontenac, Rivière-du-Loup, QC G5R 1R1, Canada
[c] Biology Department, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada
[d] Agriculture and Agri-Food Canada, Ottawa Research and Development Centre, 960 Carling Avenue, Ottawa, ON K1A 0C6, Canada
[e] Telfer School of Management, University of Ottawa, 55 Laurier E, Ottawa, ON K1N 6N5, Canada
[f] Institute for Science, Society and Policy, University of Ottawa, 120 University Private, Ottawa, ON K1N 6N5, Canada
[g] Institute of Environmental and Interdisciplinary Science, Carleton University, Ottawa, ON K1S5B6, Canada

Obj 2: Develop research agenda on evaluation of LL

Environmental Challenges 7 (2022) 100505

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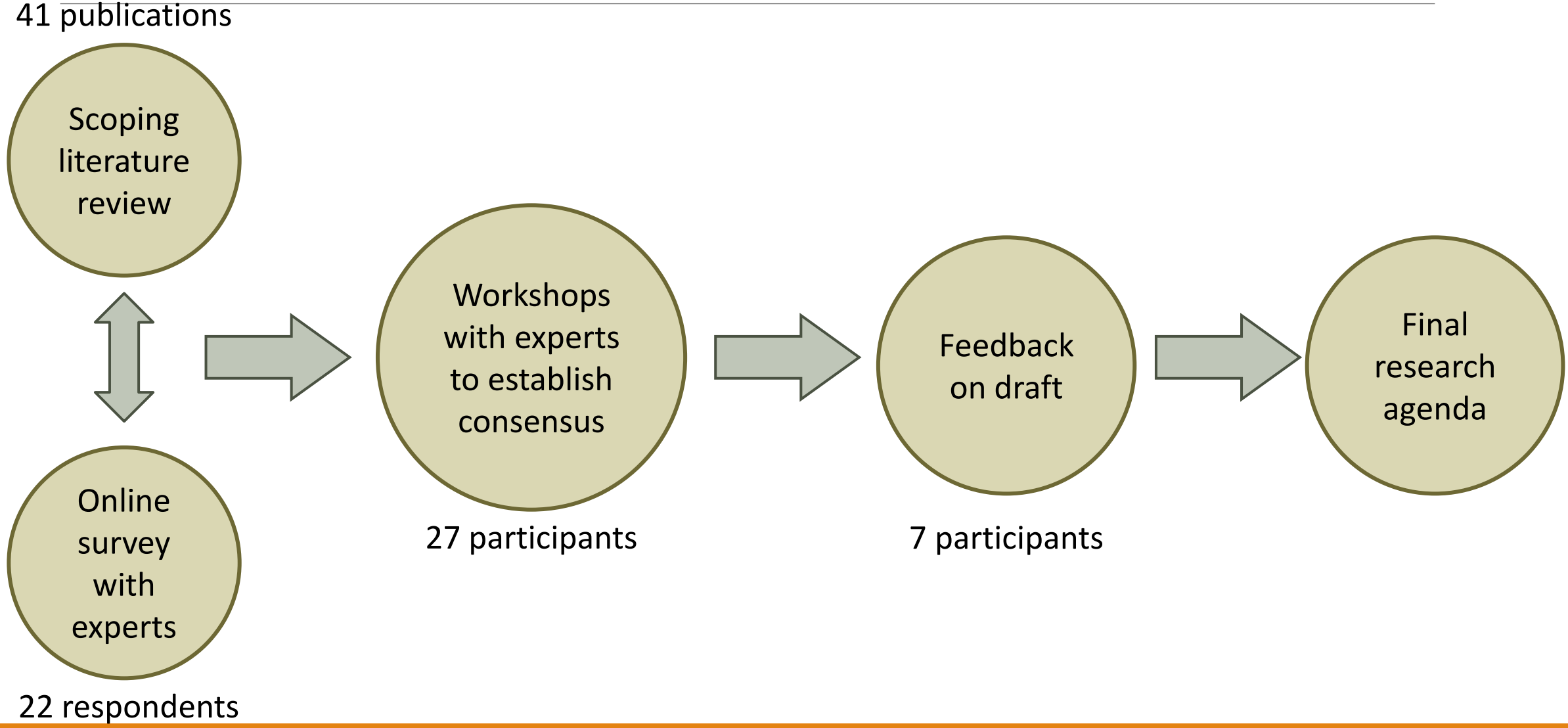
journal homepage: www.elsevier.com/locate/envc

<u>Goal</u>: Identify **key research questions** to **improve understanding and evaluation of impacts of LLs** within an environmental and agricultural sustainability context (gap identified in Bronson et al. 2021)

[d] Agriculture and Agri-Food Canada, Ottawa Research and Development Centre, 960 Carling Avenue, Ottawa, ON K1A 0C6, Canada
[e] Telfer School of Management, University of Ottawa, 55 Laurier E, Ottawa, ON K1N 6N5, Canada
[f] Institute for Science, Society and Policy, University of Ottawa, 120 University Private, Ottawa, ON K1N 6N5, Canada
[g] Institute of Environmental and Interdisciplinary Science, Carleton University, Ottawa, ON K1S5B6, Canada

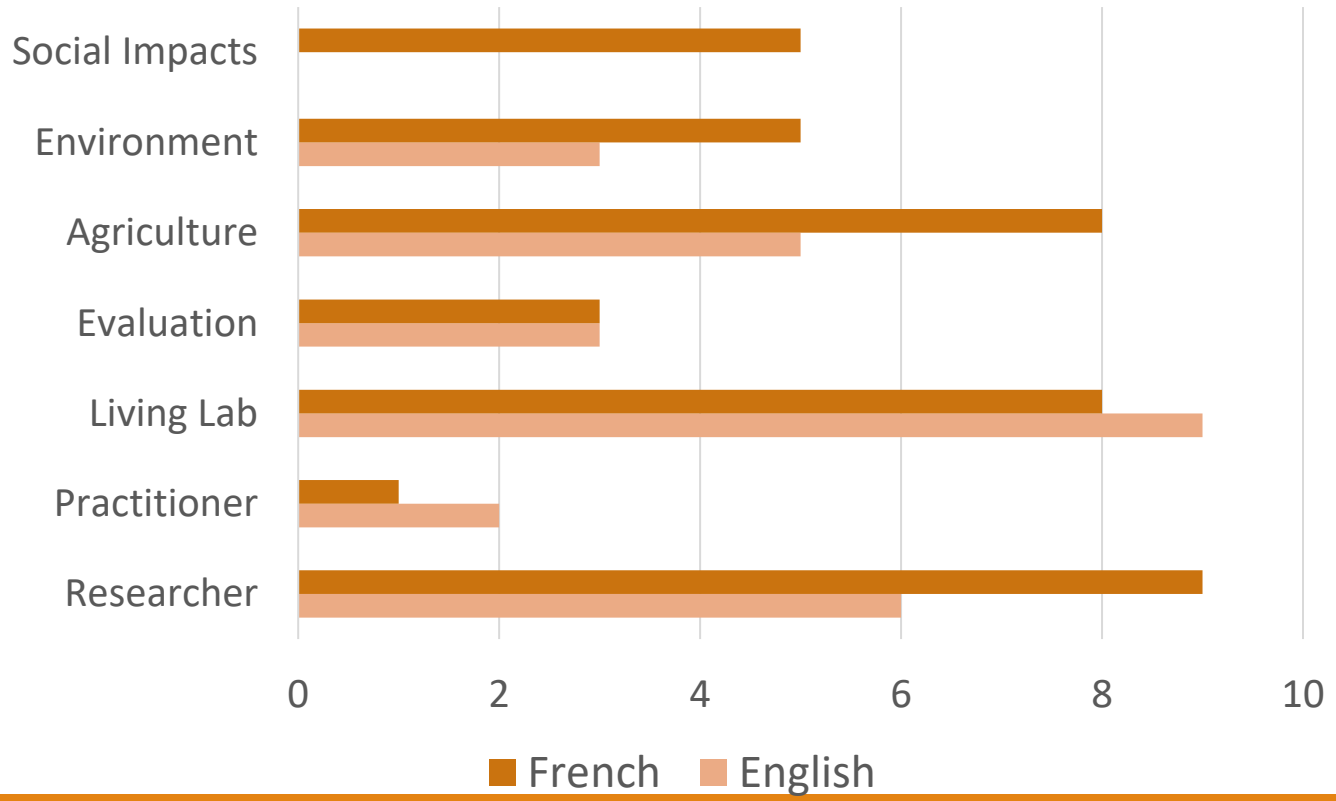
Delphi Method



Obj 2: Delphi survey results

Question: Rank the following themes in order of importance for advancing knowledge about Living Labs (1 being the highest priority).

22 respondents (11 French, 11 English)



HIGH

- The role of stakeholders in evaluation
- The objectives and use of evaluation results
- Effectiveness of open innovation
- The specific objectives of evaluation
- **Evaluation methods and tools**

MEDIUM

- Measuring environmental sustainability
- Conditions for success
- The role of evaluators
- Measuring social impacts
- Scales of evaluation
- Temporality of evaluation

LOW

- The funding methods of the evaluation.
- Evaluation repositories.

Workshops

27 participants
(10 French, 17 English)

Experts in living labs, collaboration, evaluation, environment

<u>Activities held in breakout rooms</u>

1-Validation of theme prioritization
2-Unpack priority themes and generate research questions

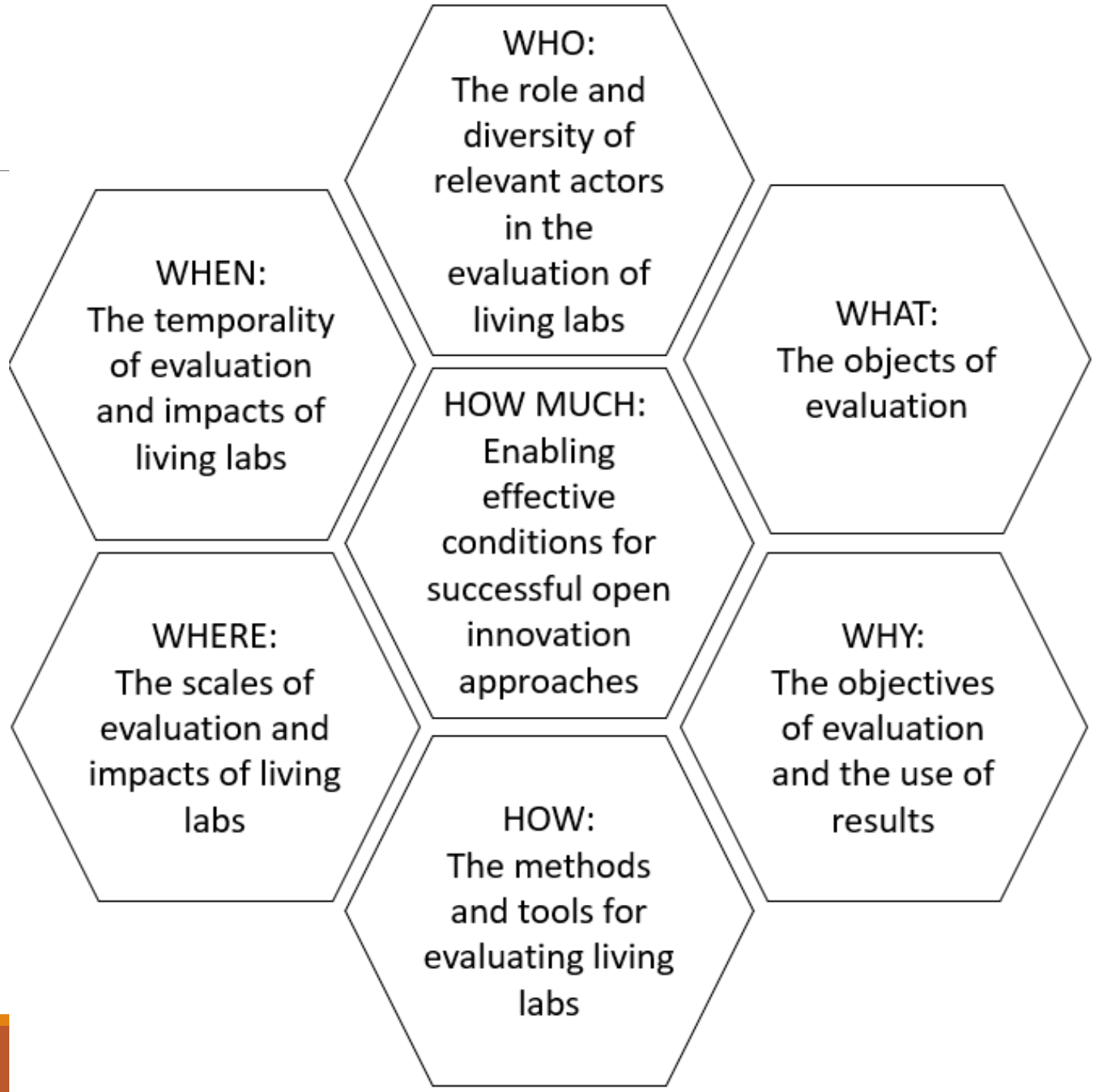
Research agenda

Thematically organized

7 themes

Each theme is composed of

- Sub-themes
- Research questions
- Descriptions to highlight points of tension and ideas shared during the workshop and/or which emerged during analysis



So what can we do with all this?

- Synthesis of evaluation tools, frameworks + barriers/enablers to effective LLs in one place
  - Early stages of agroecosystems LL network - opportunity to leverage these lessons learned and approaches
  - Build unifying evaluation framework or standardized metrics (also based on your experiences)

- Use research agenda to study LL in action within context of sustainability
  - Need researchers to tackle key questions identified (social impacts gap)
  - Agro-ecosystems LLs can make good systems and case studies to address research questions

YOU, the community of practice, are knowledge holders to support these actions

Future direction: *mobilize agenda and findings into practice*

Please reach out – looking for interested partners who want to do more knowledge transfer and knowledge mobilization research with LLs

Vivian.Nguyen@Carleton.ca

Find our publications at www.socialecology.ca

Or **use QR code below.** There are also handouts, please see me!

Bronson et al. 2021
Evaluation frameworks

Berberi et al. 2023
LLs barriers/enablers

Beaudoin et al. 2022
Research agenda

Summary of findings: top 3 enablers

Top 3 Enablers

1. **Iterative processes**
   - Iterative processes for data collection, feedback, and monitoring to increase LL efficiency. This also includes identifying changing expectations and arising obstacles throughout the LL process.

2. **Collaboration**
   - Participatory approaches (e.g., co-design and co-creation) and identifying strategies for supporting long-term collaboration (e.g., building teamwork and problem-solving skills).

3. **Partnerships and network**
   - Identify and facilitate actions to support partnerships and networks. This can include developing social activities for communication, informal interactions, and networking opportunities.

Summary of findings: top 3 barriers

Top 3 Barriers

1. **Technology issues**
   - Technology is not properly used or understood, or it is underused. There are also risks such as unpredictable technical problems or failures.

2. **Time and cost of collaboration**
   - There are cdontsraints (e.g., time and cost) tied to highly structured collaboration approaches. Mismatches between capacitgy and expected collaboration outcomes – increased workload

3. **Lack of sustainability of LL**
   - Lack of resources, initiative, and competence for LL processes and outcomes to be diffused beyond project

Summary of findings: Top 3 Future Considerations

Top 3 Future Considerations

1. **More empirical data to compare LLs** E.g., large samples, long-term assessments, different sclaes of analysis, more user feedback, more analysis of existing practice and tools etc.

2. **More adaptable LL frameworks** – define stages and processes for effective LL practices

3. **Assessment of LL impact beyond the project** – long-term impacts and tracking innovation implementation (e.g., user experience, social change, place-making, increased knowledge etc.)

Workshops

27 participants
(10 French, 17 English)

Experts in living labs, collaboration, evaluation, environment

<u>Activities held in breakout rooms</u>

1-Validation of theme prioritization
2-Unpack priority themes and generate research questions

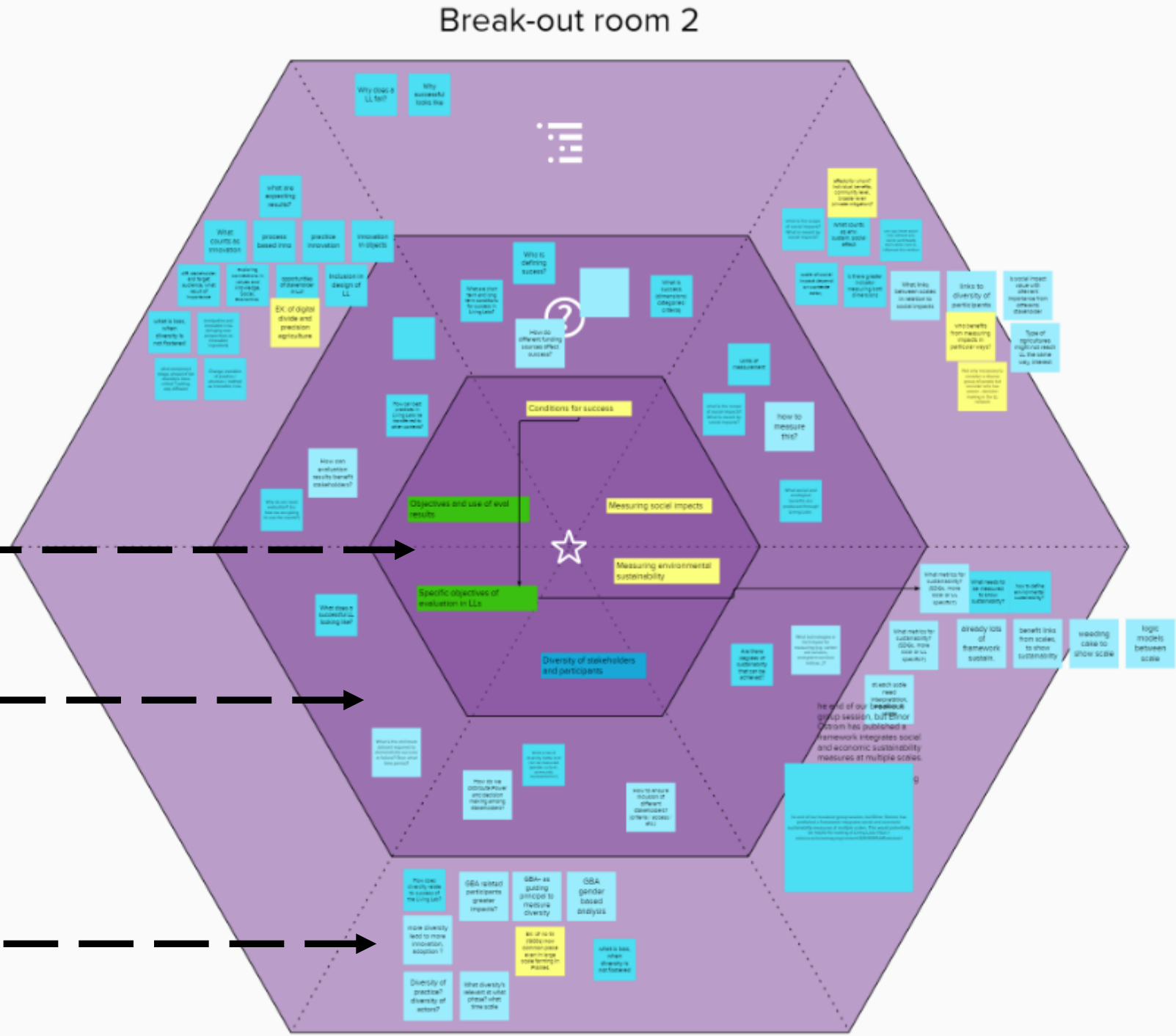
Workshops

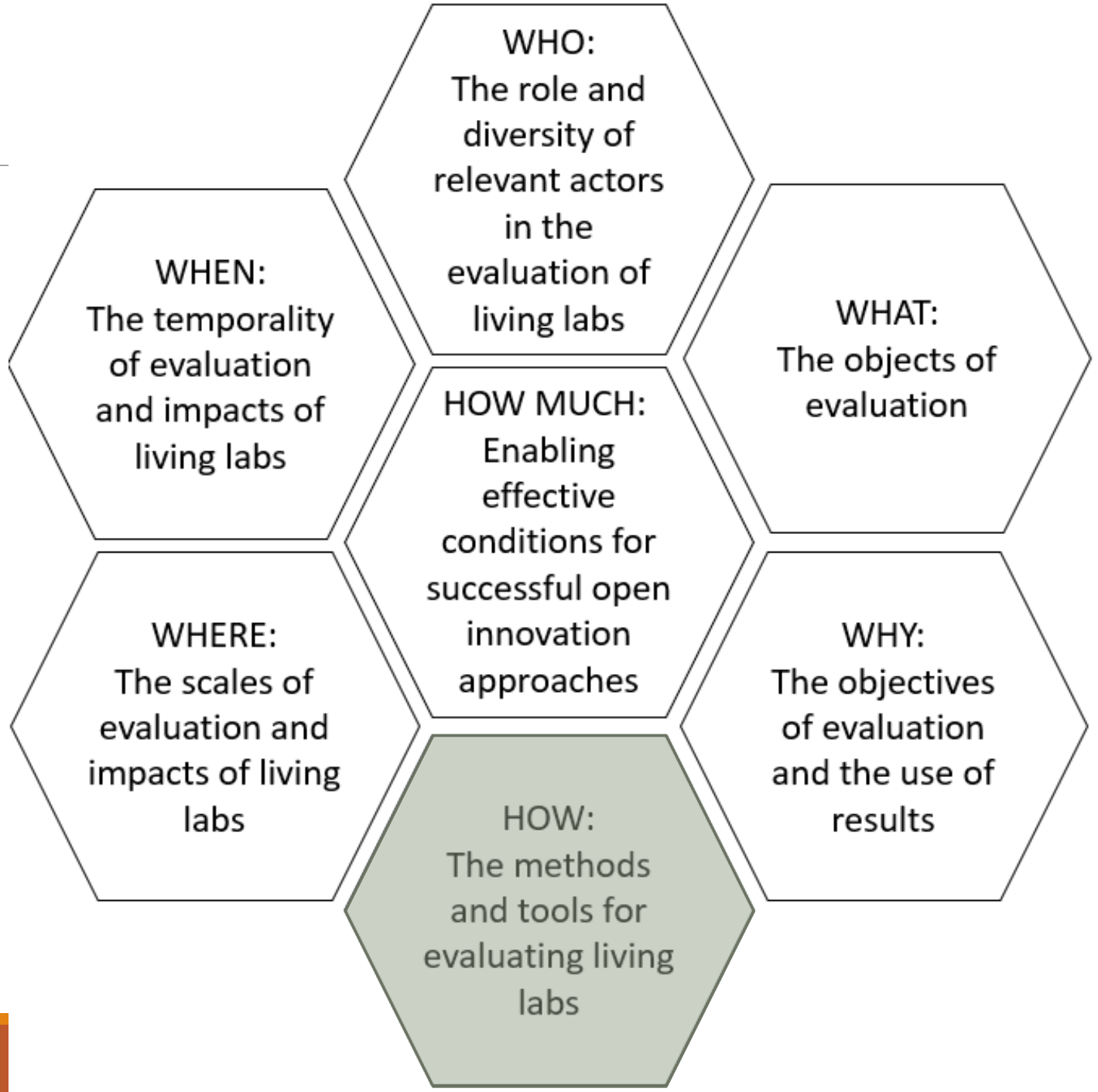
Activity 2

Themes prioritized by participants

Research questions generated by participants

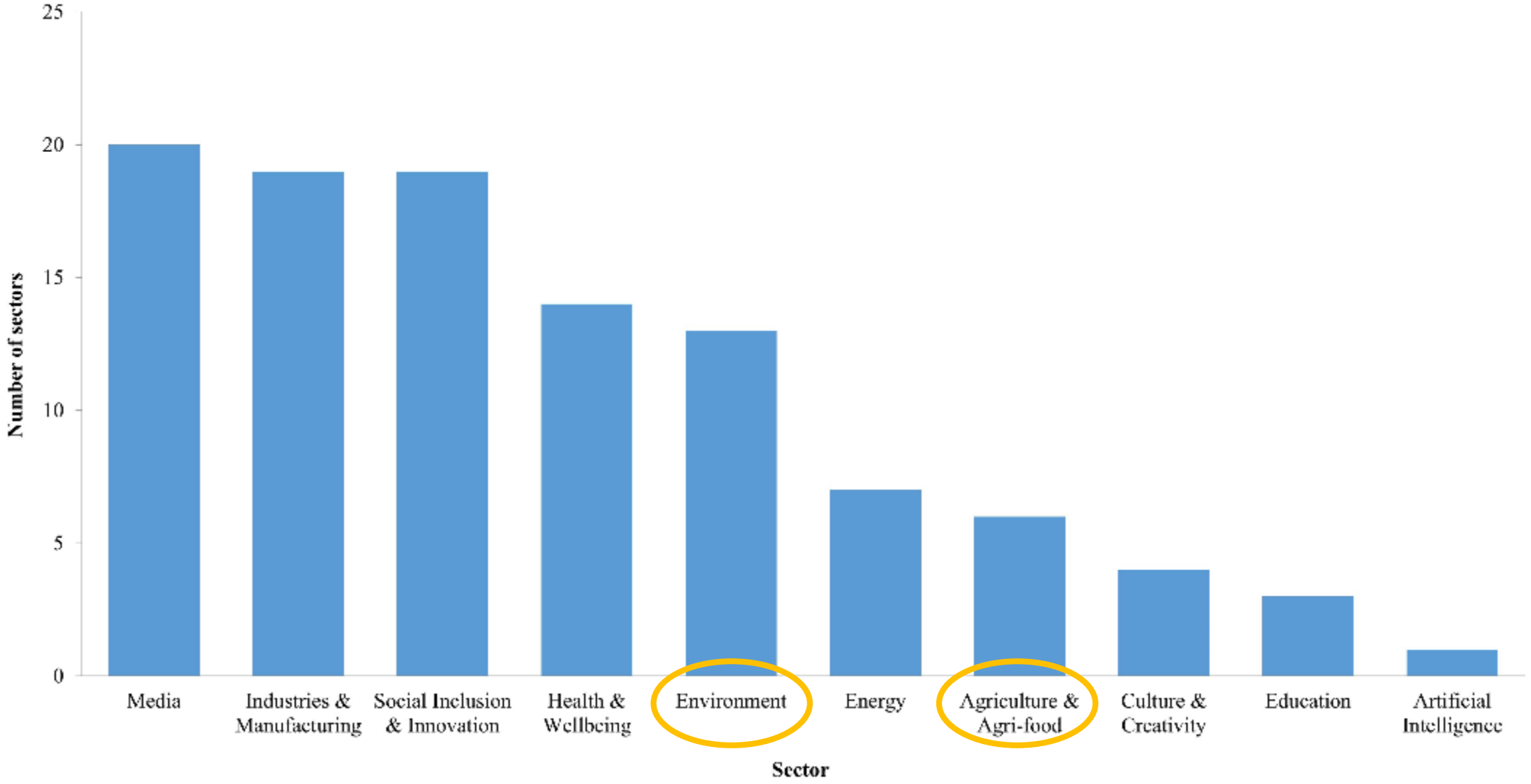
Most important research questions for discussion




WHO:
The role and diversity of relevant actors in the evaluation of living labs
WHEN:
The temporality of evaluation and impacts of living labs
WHAT:
The objects of evaluation
HOW MUCH:
Enabling effective conditions for successful open innovation approaches
WHERE:
The scales of evaluation and impacts of living labs
WHY:
The objectives of evaluation and the use of results
HOW:
The methods and tools for evaluating living labs

Theme	Sub-theme	Synthesis question
How: Methods and tools for evaluation	Methods	How can a common methodology be established for the evaluation of living labs?
		What are the strengths and limitations of different methods to evaluate living labs?
		How might existing frameworks from other fields be used to evaluate the "building blocks" of living labs across sectors and contexts?
	References	How can a collection of references and tools support the evaluation of living labs?
		How can evaluation support improved understanding of the different points of reference of actors in living labs?
	Perspectives	What are the roles of subjectivity and objectivity in the different evaluation processes of living labs?
	Trust	What role do trust and willingness to share data play in the evaluation of living labs?
	Comparison	How does the evaluation of living labs compare with evaluation of other approaches?
		What methods, metrics, and criteria of evaluation for living labs are needed to compare between projects, sectors, contexts, specific processes, and overall approaches?

Summary of sectors articles were from



Summary of findings: overarching themes of enablers and barriers

Table 1. Overarching themes that emerged from the analysis of enablers and barriers in the articles reviewed.

Overarching theme	Description
Governance	Processes that organise the functioning of living labs (e.g. structure, institutions, collaboration and coordination, resources).
Process	Processes specific to the LL framework (e.g. methodology, iteration, prototyping, evaluation).
Features of LLs	Key characteristics that play a role in the overall operations of LLs (e.g. complexity, real-life setting, early involvement, focus, infrastructure).
Characteristics of participants	Elements tied to the actors that participate in LLs (e.g. motivation, expectations, experience, needs).
Adaptability	The ways in which LLs cope with change, uncertainties, and the broader context (e.g. openness and flexibility or lack of openness and flexibility).
Social dimensions	Dimensions of social interactions in LLs that range from micro to macro scales (e.g. community, ethics, relationships, shared understandings or lack thereof, trust or lack thereof).
Training and research	Education, training, and research (or lack thereof) in LLs.
Technology	Use of technology not as the targeted innovation, but as an element to support LL processes.
Beyond the LL	Processes and elements that extend beyond the initial project or LL network (e.g. transition of the innovation to real-world adoption).

Summary of Findings: *majority of articles were from Europe*

- Articles typically focus on more than one LL “site” or “sector”
- The majority of articles come from European authors or sites

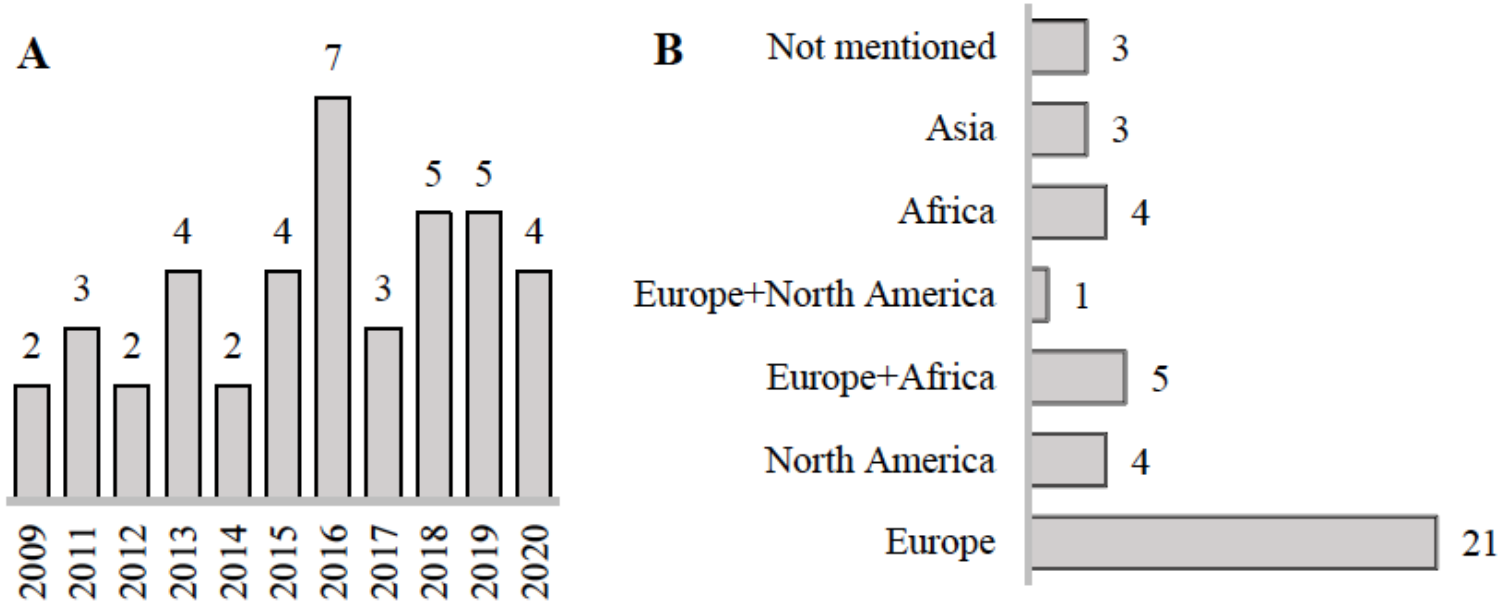
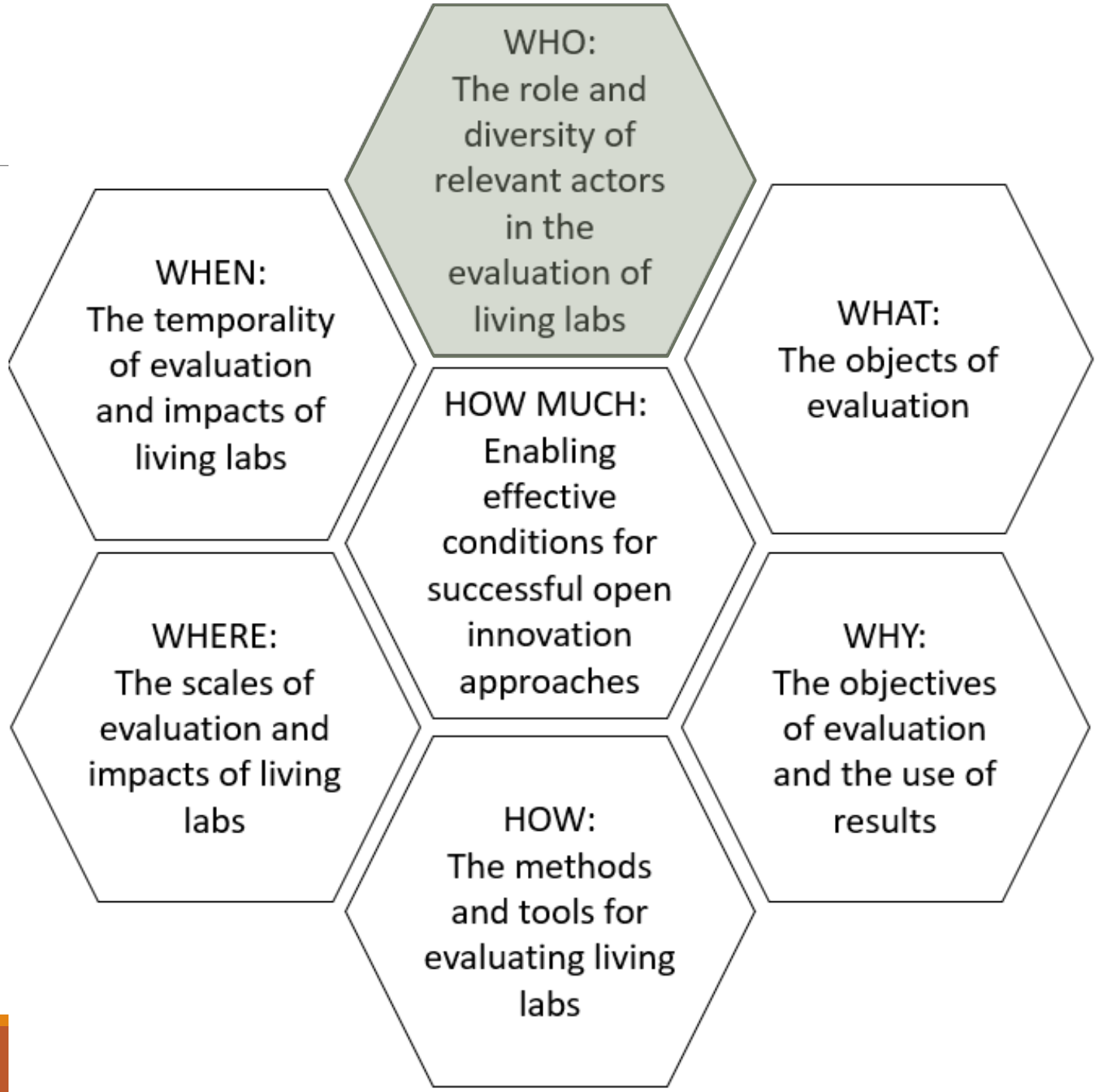


Figure 3. The total number of articles included in the scoping review process. Figure (**A**) shows the total articles published (in no.) by year and (**B**) shows the countries involved in publishing articles on living labs (in no.).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WHY:
The objectives of evaluation and the use of results
HOW:
The methods and tools for evaluating living labs

Theme	Sub-theme	Synthesis question
Who: **The role and diversity of relevant actors in the evaluation**	**Role of the different actors**	What conditions enable each category of actors to fully participate in evaluation of living labs?
	Differentiated actor involvement	What forms of evaluation are most conducive to including actors in the process? Which moments of evaluation are most conducive to including actors in the process?
		How can evaluations take into account differing needs and priorities of actors who work within different timelines and timescales?
	Role of the evaluators	What issues are tied to the different positions of evaluators?
	Diversity of actors	What types of diversity should be considered in the evaluation of living labs?
		How can the contributions of non-human actors be evaluated in living labs?
	Equity and power relations	How can representation and power be balanced between the different actors in the evaluation process?
		How does the process of evaluation influence the balance of relationships among actors? How can the process be taken into account?