Research Workshop: Dissertation Objective

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Summary of Research Methods in Urban Design: A Framework for Researching the Performance and Resilience of Places (Lehmann 2023)

Section 1. Introduction and purpose

Steffen Lehmann opens by noting how research in urban design remains under-theorised compared with, say, engineering or the natural sciences. He quotes the Oxford definition: "research is the systematic investigation … in order to establish facts and reach new conclusions."

He poses the question: **What constitutes "research" in the domain of urban design performance and resilience?**

Because urban design is inherently interdisciplinary — combining architecture, planning, ecology, sociology, environmental engineering — the methods used must be appropriate to that complexity.

The aim of the paper is twofold: (1) to discuss and clarify what methods are appropriate when researching the performance and resilience of places in urban design; and (2) to present a conceptual framework (and practice-based examples) illustrating how research-informed design can operate in this field.

Thus, for your workshop, this paper gives both a "how to" (methods) and a "why it matters" (performance & resilience) for urban design research.

2. What counts as appropriate research methods in urban design

Lehmann outlines the methodical terrain:

2.1 Distinguishing research through vs. into urban design

He notes two broad approaches:

- Research through urban design: where the design act itself becomes the research vehicle (the act of designing yields new knowledge).
- Research into urban design: where the design (or place) is the object of study, and one investigates its performance or resilience.

This distinction helps practitioners and academics frame whether they are driving change via design work, or studying design outcomes.

2.2 Key characteristics of rigorous performance-oriented urban design research

Performance-focused urban design research typically features:

- New knowledge or new interpretation regarding how places perform (e.g., energy use, water use, comfort) rather than simply descriptive work.
- Focus on measurable performance across defined criteria (resource use, environment, comfort, social functioning).
- Analytical or interpretive frameworks, rather than purely intuitive or stylistic design.
- Potential for scale or replication: i.e., insights that extend beyond a single building or locale.
- Dissemination and peer review: so that the findings influence future design thinking and practice.

Lehmann emphasises that many urban designers and planners currently lack training in systematic data-collection, analysis and evaluation of performance—this is a gap and opportunity.

2.3 Choosing methods: quantitative, qualitative, mixed

Methodological options:

Quantitative: numerical data (e.g., microclimate readings, energy usage, water flows).

Qualitative: non-numerical data (user interviews, observations, diaries, visuals).

Empirical research: directly from experience or observation.

He emphasises selecting the method(s) that best suit the research question and context.

In particular:

- **Framing a compelling research question early**, based on an identified knowledge gap and literature review.
- **Defining aims, objectives and possibly hypotheses**.
- Acknowledging limitations: feasibility, data availability, scope.

Using mixed-methods if appropriate: combining quantitative and qualitative to enrich the understanding of how a place performs and adapts. If you collect data (say in R), you should pair that with qualitative insights (surveys, interviews) to deepen analysis.

3. How to get started with urban-design performance research

Roadmap:

Precedent and case-study analysis: Investigate existing examples or comparable typologies to establish context or baseline.

Literature review: Identify what has been done, where gaps remain.

Glossary/key terms: Clarify terminology around performance and resilience early on.

Formulate the research question: Clearly state what you want to find out, and under what performance dimension.

Select methods: Choose the most appropriate mix and justify them.

Structure the research procedure: plan data collection, analysis, reporting.

He also reminds that urban designers, given their visual and spatial training, are well placed to organise and visualise technical data (for example via diagrams, mapping, charts) and to translate that into decision-making tools.

3.1. Task

Pick a place (or hypothetical neighbourhood) and outline their research question, method choice (quant/qual/mixed), and visualisation/analysis strategy.

4. Practice-Oriented Research with Impact

The link between research and practice: how can research in urban design have real-world impact? He describes "practice-oriented research-by-design" as a promising approach.

Different types of impact:

- Scientific (knowledge creation)
- Economic (business model innovations)
- Environmental (reduced emissions, improved resource efficiency)
- Instrumental (new policies)
- Capacity-building (skills, expertise)
- Cultural/social (behaviour change)
- Conceptual (adoption of new theory)

Key message: urban design research should not stay in the academic realm only—but feed back into the profession, informing design decisions, practice workflows, policy, etc.

Lehmann uses examples from leading practices (e.g., research-driven architecture firms) to illustrate how design firms with embedded research capability can gain competitive advantage.

For those new to research, this means your methods should not just yield interesting findings—but findings that practitioners can act upon.

5. What is performance? What is resilience?

Performance: how well a place or neighbourhood fulfils its functions, how efficient it is in resource use (energy, water), how comfortable, healthy, accessible it is, how well it meets its design intent.

Resilience: the adaptive capacity of a place to respond to disruptions (climate change, supply chain shocks, demographic change) and recover or transform positively.

He emphasises that high-performance urban design integrates a lifecycle perspective: resource efficiency, operational performance, durability, adaptability.

5.1 Metrics and measurement

Lehmann provides examples of measurable indicators:

- Energy Use Intensity (EUI) in buildings or districts (kBtu/sqm-yr or similar)
- Water Use Intensity (WUI)
- Embodied carbon (kg or tonnes CO e) – from material extraction, manufacture, transport, construction, decommissioning.
- Operational carbon (annual emissions during use)
- Access to daylight, views to nature, microclimate (shade, glare, urban heat island effect)

He also touches on more qualitative performance dimensions: user satisfaction, mental/physical health outcomes, social interaction, community well-being.

He flags the urban heat island effect, loss of green space, and how nature-based solutions (green roofs, walls, sustainable drainage) serve both performance and resilience aims.

5.2 Challenges and issues

Lehmann flags several practical and methodological challenges:

- Post-Occupancy Evaluation (POE) is valuable but data collection can be hindered by privacy, corporate unwillingness to share inefficiencies, user reticence.
- Qualitative studies often face issues of transferability / replicability: context matters a lot, and what works for one city may not for another.
- Integrating diverse disciplinary perspectives (environmental, social, technical) is still a challenge in many urban design research contexts.
- The temptation remains for design to rely on intuition, aesthetics or precedent only, rather than evidence-based performance metrics.

Lehmann argues for a shift towards more systematic, analytical, critical methodologies.

5.3 TASK

Identify such methodological threats (bias, data availability, transferability) and discuss how to mitigate them.

6. Four Selected Examples of Regenerative Design Research

Project 1: A new public park on top of a freeway tunnel, reconnecting two communities through landscape and cultural facilities. **Research question**: How can a resource-efficient park bring people together for community wellness? Research approach: qualitative precedent study, thematic analysis.

Project 2: An urban food hub – vertical food production & distribution centre with drone delivery port. **Research question**: How can urban farming and new tech create a food-distribution centre and promote sustainability, local access? Research approach: extensive precedent studies and contextual observation.

Project 3: A new gateway to the Las Vegas Arts District: a public plaza + cultural facility. Research question: How can art and architecture catalyse regeneration in the arts district?

Research approach: qualitative observational data of social behaviour, interactions, spatial organisation.

Project 4: "Neo-Metabolism": modular micro-housing for urban infill. Research question: What is the most efficient/flexible approach for revitalising vacant sites downtown using low-carbon, off-site manufactured construction? Research approach: immersive, evolving design research process; field immersion.

Lehmann uses these to show how research questions, methods, data, design and outcomes can be combined in an urban-design studio environment. Importantly: he notes that each of these is context-specific, and that no single study "solves" the whole problem — research is part of a continuing inquiry.

6.1. TASK

Participants must consider a comparable "mini-design research" for their city/context.

7. Conclusions and implications

There is a growing need for research-led and design-informed methods in urban design, especially given pressing challenges: climate change, urban population growth, resource constraints, health & well-being, equity.

To address these, urban design must become more evidence-based: linking theory, method, data, design decision. He argues that the profession must shift from "creating architectural objects" to "systems thinking, research-informed design".

Urban designers must become lifelong learners and research-capable professionals: willing to collect, analyse, visualise data, reflect on outcomes, iterate.

More comparative case-studies, mixed-method research, longitudinal monitoring of performance/resilience are needed to build the evidence base for the future of urban design.

He emphasises that even good design remains a "journey of enquiry": research does not yield final, definitive answers, but enables better questions, better understanding, better design decisions.

For your workshop, you could highlight: the takeaway here is that research methods are not optional but foundational to designing places that perform and endure.**

8. Relevance for PGR (linking to new-reseachers)

Research question → method → data → analysis is a chain that also applies if one uses R (or any statistical software). Although Lehmann's examples are urban design–centric, the logic is the same, e.g., you might ask: Does a neighbourhood with higher tree canopy cover have lower surface-temperature anomalies during heat-waves compared to similar density areas? Then you collect microclimate data, tree-canopy GIS layers, user surveys, analyse in R, visualise findings, perhaps compare multiple cities.

Emphasise mixed methods. Urban design deals with spatial, social, environmental data – so combining e.g., DTS microclimate data + user satisfaction data + GIS metrics is powerful. Your audience might feel comfortable with quantitative (R) but need encouragement to incorporate the qualitative side.

Visualisation and storytelling matter. Urban designers are good at spatial diagrams; you can link that to R's capabilities (ggplot2, sf, raster or other apps) so that quantitative findings become actionable.

Performance/resilience metrics: some of Lehmann's listed metrics (EUI, WUI, embodied carbon, operational carbon, heat-island effect) can inspire variable choices or control variables in research projects (e.g., you might proxy tree cover, building density, material age, etc).

Research into place performance has relevance beyond architecture: for example, economic geographers, urban economists, sustainability analysts (which fits your subject lead role in Economics). So bridging urban design methods with economics (cost-benefit, productivity, well-being) is possible.

Real-world impact: Lehmann's emphasis on practice-oriented research means "how will our research inform decisions (policy, design, investment)?" This can resonate for careers in design, planning, data science, sustainability, etc.

limit scope: be realistic. Lehmann notes that research problems may be overly ambitious; he advises narrowing or breaking down into sub-problems. Good advice especially for beginners/new researchers.

9. Final suggestiona using the paper

Here's a proposed flow you could use:

Introduction – hook your audience ("Why does a place perform? Can we test it?").

Define key terms – performance, resilience, research methods (qual/quant/mixed)

Methodological framework – go through Lehmann's roadmap: research idea → literature/precedent → research question → methods → data → analysis → reporting. Use a slide with the steps.

Metrics & measurement – discuss specific measurable variables (tree cover, energy use, carbon, user comfort) from the paper. Possibly an interactive brainstorm: what metrics would you use for your local urban place?

Case-studies review – see the four examples from Las Vegas used by Lehmann.

Common pitfalls & tips – highlight what Lehmann flags (data availability, transferability, context specificity, qualitative vs quantitative challenges).

Linking to your field – tie home to economics/Investing Club/data science: e.g., how place performance metrics might matter for real-estate investment, urban regeneration economics, sustainability investing.

Wrap-up

(a) rigorous research in urban design matters for performance/resilience; (b) methods must be selected thoughtfully; (c) bridging design and data is essential; (d) this is relevant for emerging researchers and practitioners alike.

Q&A / reflection – invite participants to reflect on: "What surprised you from Lehmann's framework?" or "What's one method you might include in your next project?"

References

Reading: Lehmann, S. (2023). Research Methods in Urban Design: A Framework for Researching the Performance and Resilience of Places. Buildings, 13(6), 1548. https:// /10.3390/buildings13061548

Section 2 - AI feedback

Learning Outcomes

By the end of this session, participants will be able to:

Formulate clear and researchable objectives.

Critically assess how well objectives align with ideas and justifications.

Use a chatbot as a formative feedback tool to refine their research design.

Launch Dr Cam 1.0 Robot