Systems Approaches for Urban Transitions

URB-401, 4 ECTS, Fall 2025

CITY LABS

I. PROJECT DESCRIPTION

The City Lab project is designed to equip you with the tools and mindset to address real-world urban sustainability challenges. It complements the lectures with hands-on project work providing a unique opportunity to apply systems thinking for developing strategies fostering sustainability in a city of your choice. Throughout the semester, you will delve into how urban systems function, identify their challenges, and develop specific interventions for a more sustainable future. Your City Lab project will mirror the course content and will guide you in understanding the various dimensions of urban systems including infrastructure, ecology, social behavior, and governance.

Your journey in the City Lab is guided by three core principles:

- **Goal understanding: What should be?** Explore your chosen city's sustainability visions, goals, and priorities.
- **System understanding: What is?** Analyze the current state of your city using diverse data sources, understanding the interactions between infrastructures, ecosystems, and the social system.
- **Transformation understanding: How can we get there?** Develop strategies and interventions to overcome challenges and enable urban transitions towards sustainability.

II. PROJECT GUIDELINE

The following steps will guide your progress in the City Lab project while several iterations and refinements will likely be necessary:

Step 1: Define your city's sustainability policy landscape

Begin by selecting a Swiss city and thoroughly researching its stated sustainability or climate goals (e.g., carbon neutrality by 2050). Study the city's policy documents to identify the foundational frameworks, strategies, and proposed interventions that underpin these goals. Additionally, identify the key actors related to these strategies and interventions. Pinpoint the key priorities emerging from its agenda and critically reflect on two aspects: (i) the interventions' specificity, particularly in terms of how they can be quantified and measured, and (ii) coherence across sectors (e.g., mobility, housing) or dimensions (e.g., infrastructure, technologies, ecosystems, social behavior).

Step 2: Collect spatial-explicit data for your city

Investigate and collect various data layers to build a comprehensive system map of your city's current state. Data layers may include: (i) infrastructure (e.g., building stock, energy grid, public transport networks, electric charging infrastructure); (ii) ecosystems (e.g., urban forests, rivers, green spaces, air quality, water quality); (iii) social aspects (e.g., social infrastructure, population density, income levels, demographic data); and (iv) technological elements (e.g., renewable energy penetration, electric vehicle infrastructure). Spatial-explicit data and reliable sources typically include official city websites, national statistical bureaus, academic databases, and international organizations. Utilize mapping tools and data visualization techniques to overlay and analyze these different data layers.

Step 3: Identify key challenges and define system boundaries

Through the analysis of these data layers, identify specific urban challenges and their spatial distribution (e.g., heat islands in socio-economically weak neighborhoods, areas with high energy consumption, or transport bottlenecks). Reflect and prioritize these challenges based on their relevance to the city's sustainability goals. From this prioritization, select a single systemic urban challenge that may interconnect multiple challenges in different thematic domains (e.g., a challenge at the intersection of mobility, energy consumption, and social behavior). This focus will enable a deeper and more cohesive analysis of its interconnected dynamics within your urban system. For this selected challenge, clearly define its related spatial and functional boundaries within the city (e.g., the city as a whole or specific neighborhoods).

Step 4: Analyze urban system dynamics

Based on the systemic challenge identified in Step 3, analyze the dynamics within your urban system using a systems approach. This involves identifying the core system elements related to the identified challenge and focusing on their relationships and causal links. Identify both reinforcing and balancing feedback loops that drive or stabilize the identified challenge and broader system behavior (e.g., how building density contributes to heat islands, and how policy influences green space provision to mitigate this). Simultaneously, identify and characterize the key actors concerned considering their roles, interests, perceptions, or power within the system. Throughout this process, continuously validate your understanding of your city’s dynamics by referring back to available data and policy documents from Step 1 and 2. Utilize system mapping tools (e.g., causal loop diagrams, actor maps, or stock-and-flow diagrams) to effectively visualize these interactions and feedbacks.

Step 5: Develop holistic interventions towards sustainability

Identify key leverage points for systemic change, then propose concrete interventions to address the identified challenges and guide your city toward its desired sustainable future. For these proposed interventions, assess their potential co-benefits, trade-offs, and anticipated challenges that may influence their feasibility or acceptance. This assessment should be firmly grounded in your

identified system interactions, feedbacks, and actors, thereby illuminating effective transition pathways.

III. EXERCISES & PROJECT SESSIONS

Throughout the course, teaching assistants will provide weekly support sessions for your City Lab project. Each session offers guiding questions and insights into helpful concepts and tools to directly support the project steps outlined above. These sessions will also include dedicated coaching on scientific report writing and effective presentation skills, alongside a designated space for Q&A discussions.

In Week 7 of the course, you will have an interim presentation. The primary goal of this presentation is to showcase your preliminary results – specifically, an overview of your chosen city's sustainability strategy, the data you have collected, and the challenges you have identified so far (Steps 1-3 of the project guidelines). This session is designed to provide you with targeted support and feedback on your data collection and the definition of your challenges and system boundaries, ensuring a smooth continuation of your project work. The teaching assistants and the teaching team will be present to support you in the best possible way. Please note that this interim presentation is not part of the course assessment.

IV. SCIENTIFIC REPORT

For your City Lab project, you will write a scientific report that provides a concise overview of your work. The main body of the report should not exceed 8,000 words, excluding tables, figures, references, and the appendix. Please ensure your report uses 11pt Arial with 1.15 line spacing and 6pt paragraph spacing. The report must be uploaded to the Moodle platform by January 9, 2026, at 12:00 a.m.

The suggested structure for the scientific report is the following:

- **Title page:** Report title, your name(s), course name, and submission date.
- **Abstract:** A brief, standalone summary (max. 250 words) of your chosen city's sustainability goals, the key findings from your urban system analysis, and the core proposed transition strategies.
- **Introduction:** Introduce your chosen city and critically reflect on its existing sustainability policy landscape, including its stated goals, proposed interventions, and key actors. Based on this analysis, describe the gaps in the city's current approach and outline your project's specific goals to address them.
- **Methodology and data:** Detail the chosen systems approach, including the data sources and the methods used to collect or merge data layers (Step 2). Explain how these data were utilized to identify and select your systemic urban challenge and define their spatial and functional boundaries (Step 3). Describe the system mapping tools (e.g., causal loop

diagrams, actor maps) and analytical techniques applied to understand urban dynamics (Step 4).

- **Results:** Present your understanding of the city's current urban system, focusing on the specific challenges you identified and selected. Detail the key system elements (e.g., infrastructure, ecological, social, technological, governance) and thoroughly explain the significant interactions and feedback loops relevant to these challenges. Describe the key actors influencing these system dynamics. Following this analysis, propose concrete interventions designed to guide your city toward its sustainable future. Identify and justify the key leverage points where these interventions are focused and discuss their potential co-benefits, trade-offs, and anticipated implementation challenges.
- **Discussion and conclusion:** Summarize the core insights derived from your urban system analysis, explicitly articulating how these findings align with or diverge from the city's stated sustainability goals and its proposed interventions. Specifically, show how the systems approach you chose leads to different results than a "typical" list of uncoordinated city interventions. Offer a reflective outlook on the feasibility and potential impact of your recommendations, and consider any broader lessons learned from applying systems thinking to your chosen city.
- **References:** List all sources cited within your report using American Psychological Association (APA) style.
- **Appendix:** Include any supplementary materials that are too detailed for the main body but support your analysis, such as your full system map (if not integrated directly), raw data tables, or other relevant visualizations.
- **Contributions:** All contributors to the report must be acknowledged, with their specific roles clearly defined in a dedicated section. You may use the Contributor Roles Taxonomy (CRediT) to categorize contributions (e.g., conceptualization, methodology, data collection, formal analysis, drafting, review, editing, project administration). Explicitly detailing each contributor's unique input ensures proper recognition, accountability, and fosters collaborative integrity.
- **Artificial Intelligence:** The report must adhere to ethical writing standards, including transparency regarding the use of generative AI tools. If AI was utilized, a disclaimer must be included, specifying its role (e.g., for grammar checking, code development, data analysis, drafting sections, or formatting) and confirming that at all AI-generated content has been reviewed and appropriately integrated by the authors.

V. FINAL PRESENTATION

The final presentation will take place in the last week of the course and is your opportunity to act as a consultant reporting to key city representatives, such as the Director of Urban Sustainability or a similar high-level official. This session is designed for you to clearly articulate your chosen city's sustainability challenges, present your core urban systems analysis and related insights, and outline

your proposed transition strategies. The primary objective is to demonstrate how your systems approach leads to different or "better" insights than a "typical" list of unconnected city interventions, emphasizing the potential impact of your recommendations and identifying areas for future collaboration or deeper engagement with the city.

Your presentation should be 10-15 minutes in length, followed by a 5-10 minute discussion. Given the busy nature of your executive audience, who are familiar with high-level analytical frameworks but have not read your detailed report, it is crucial to focus on your main conclusions, actionable suggestions, and the practical implications of your findings. To facilitate this, we recommend limiting the text on your slides and leveraging compelling visual elements, such as system maps, data visualizations, and strategy depictions, to convey your key messages effectively. Additionally, we recommend limiting your presentation to a maximum of 15 slides. This range encourages conciseness and forces a sharp focus on your most relevant messages, ensuring clarity and impact rather than a dense display of information. You may, however, prepare additional "backup" slides to address potential questions or delve deeper into specific aspects during the discussion period.

VI. PROJECT ASSESSMENT

The City Lab project, accounting for 50% of your final grade, will be assessed based on a scientific report (30%) and a final presentation (20%).

The report will be assessed based on specific scientific criteria evaluating content quality, analytical depth, and the quality of scientific writing, including:

- **Problem framing:** Clarity in outlining the chosen city's context, its stated sustainability strategy and goals, actors involved, and a critical understanding of the specificity and holistic coherence of proposed interventions.
- **Data-driven insights:** Effective integration and interpretation of diverse data to understand the urban system's current state, identify challenges and validate the urban system map.
- **Urban system analysis:** Thoroughness and insightfulness in identifying and explaining urban system elements, interactions, feedback loops, and key actors related to the chosen challenges.
- **Methodological soundness:** Clarity and appropriateness of the chosen systems approach, data collection methods, system mapping techniques, and analytical methods applied.
- **Strategies for transition:** Coherence, justification, and realism of identified leverage points and interventions, including the assessment of their potential co-benefits, trade-offs, and anticipated challenges.
- **Critical engagement and reflection:** Demonstrating a critical perspective on the urban systems analysis and proposed solutions, discussing limitations of recommendations, and outlining broader lessons learned.

- **Scientific writing:** Overall quality of scientific writing, conciseness, accurate use of terminology, logical global structure, consistent language, and correct academic referencing.

The final presentation will be assessed based on specified criteria evaluating societal impact and communication effectiveness, including:

- **Clarity, coherence, and comprehensiveness:** The ability to communicate complex systems concepts and project findings clearly to a diverse audience (e.g., city representatives), ensuring a logical line of argumentation, and comprehensive coverage of the most relevant aspects.
- **Societal relevance and impact:** The alignment of proposed strategies with real-world urban challenges, and their contribution to fostering positive societal and environmental impact.
- **Visual communication effectiveness:** Quality, relevance, and impact of visual elements (e.g., system maps, data visualizations) in conveying key messages.
- **Overall engagement and persuasiveness:** The presenter's ability to convey enthusiasm, answer questions effectively, and inspire confidence in the project's recommendations.

VII. ADDITIONAL SOURCES

Data sources

Swiss Geocatalog: https://map.geo.ch

OpenStreetMap: https://www.openstreetmap.org

Humanitarian OpenStreetMap Team (Switzerland): https://data.humdata.org/search?q=switzerland&ext_search_source=main-nav

City initiatives

C40 Cities: https://www.c40.org/

United for Smart Sustainable Cities (U4SSC) initiative: https://u4ssc.itu.int/

Resilient Cities Network: https://resilientcitiesnetwork.org/

Metabolism of Cities: https://metabolismofcities.org/