4. Open Spaces of University Campuses as Living Labs for Urban Sustainable Transformation

A Case Study

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Humanity is faced with many interrelated environmental and social crises including biodiversity loss, depletion of soils, climate change, overexploitation of natural resources and the limits to growth, pollution, pandemics, socio-economic inequalities, poverty, hunger, political instability, and a crisis of democracy, amongst others (IPBES, 2019; United Nations, 2019; von Weizsäcker & Wijkman, 2018). All of these crises are related to an accelerating degradation of the natural capital of the planet as well as to an increasing pressure on diverse local livelihoods and their social and cultural capital. Evidently, technological solutions alone will not suffice to solve these grand challenges, and the current economic system is a major driver of them (Akandil et al., 2021).

The seventeen Sustainable Development Goals, or SDGs (United Nations, n.d.), of the 2030 *Agenda for Sustainable Development*, adopted by all United Nations member states in 2015, call for urgent action to tackle these interconnected global crises, which ultimately threaten humanity. While global networking and collective action of the nations of the world are essential, the problems are too big and diverse to be solved through top-down approaches. It is questionable whether the problem-solving strategy characteristic of science-policy approaches of modernity that aims to simplify complex problems by separating the understanding of a problem (systems knowledge) from reaching a consensus on targets (target knowledge) and devising solutions (transformation knowledge) can still work (Kueffer et al., 2019). It might often be unrealistic to achieve a definite clarification of prob-

lem diagnosis, targets, and solutions. Instead, continuous and locally rooted social learning processes might foster cultures of responsibility, empowerment, and agency. Nature-based and social innovations, do–it–yourself technologies, and the reappraisal of vernacular technologies and traditional knowledge might often be a more reliable guide to the future than the hope for disruptive technological breakthroughs (e.g., Kueffer, 2020a).

Living labs are in the sustainability sciences increasingly explored as a promising transdisciplinary research, innovation, and problem-solving strategy to tackle complex, socio–environmental challenges in specific local settings (Hossain et al., 2019). They are conceptually embedded in theoretical insights from science and technology studies, or STS (Gross & Krohn, 2005), and transdisciplinarity scholarship (Jahn & Keil, 2016). Living labs enable experimental co-learning processes involving academics as well as practitioners and stakeholders with the aim to generate robust and systemic solutions in a specific implementation context, but also generalizable insights that are transferable to other cases. In Europe, often the term "real-world laboratory" is used (Schäpke et al., 2018; Kueffer, 2024). The real-world laboratory approach has become an important strategic instrument for science-funding (Defila & Di Giulio, 2020) and for guiding collaborations at the science-policy interface (von Wirth et al., 2019); for instance, in Baden-Wuerttemberg, Germany (Wagner & Miller, 2018; Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg, n.d.) or in the city of Zurich (Stadt Zürich, n.d.). The hope is that living labs foster societal transformations toward sustainability (Augenstein et al., 2022; Wagner & Grunwald, 2019). The issues addressed through living lab research are very diverse and include amongst others sustainability on university campuses (Leal Filho et al., 2020; Evans et al., 2015); the design of educational buildings (Kirschbaum & Wacker, 2018); and the creation of outdoor learning environments (Rudow & Bugmann, 2021).

We discuss in this chapter a specific case study of a university campus in Switzerland as a living lab for social learning and innovation at the intersections of ecology, landscape design, and civil society. Specifically, we discuss how the open space of a university situated in an urban environment can serve as a creative space for interactions between students and researchers, between different disciplines, and importantly between academia, practitioners, and the general public. Cities are increasingly seen as innovation hubs for societal transformation toward sustainability (Barber, 2013), and the development of urban transformative capacity is considered a high prior-

ity for research and planning policy (Wolfram et al., 2019). A majority of the world population, meanwhile, lives in cities, and consequently, urban populations are responsible for the bulk of global resource consumption (IRP, 2018). Urban life has long been seen as an incubator of ideas, initiatives, and social and cultural change. What works and what does not work becomes quickly visible in cities. We consider the open green spaces of our university as a real-world laboratory of how a specific urban space can function as such an innovation hub.

Our living lab is part of a university of applied sciences, and thus research and teaching are closely interwoven with practice (Kueffer et al., 2017; Swiss Academies of Arts and Sciences, 2020). We educate students for specific professions and are in constant exchange with professionals. Students mostly work part-time while studying, and professors work—besides teaching and basic research—in applied and transdisciplinary research and as policy consultants. As a technical university, we combine planning, building, and design disciplines with engineering and information technologies, but we also include teaching programs for social work and health professions. These institutional settings integrate our real–world laboratory not only into the urban fabric of the city and the daily life of the region, but they also form regional to national networks bridging between innovation, diverse professions and businesses, civil society, and policymaking at communal, cantonal/county, and national levels.

The living lab is run by a landscape architecture school and more specifically by the ecology and planting design team. As a plant-focused team, we develop inter- and transdisciplinary solutions at the intersections of ecology, nature conservation, and horticulture—for instance, on the potentials of horticulture for *ex–situ* rare species conservation (Ismail et al., 2021). As a landscape architecture school, we educate the designers of green and blue infrastructures and thus can use the open space surrounding the university in a very specific way as research and learning grounds for our own discipline and profession. As ecologists and horticulturalists, we work on bringing ecology back into cities and man-made landscapes by developing nature-based solutions, regenerating degraded ecological systems, designing novel ecologies, and strengthening human-nature relationships (Beatley, 2016; Hes & du Plessis, 2014; Krasny & Tidball, 2015; Kueffer, 2020b; TEEB DE, 2017). In this sense, we understand our living lab as an experimental space for enabling an ecological U-turn in a time of ecosystem degradation, biodiversity loss, and subsequent loss of human-nature interaction (Soga & Gaston,

2016). We build on the long history of landscape architecture in designing spaces that bring humans and other living beings together (Girot, 2016; Kueffer et al., 2022; Ndubisi, 2014). There is growing literature that demonstrates the great value of urban nature and gardening for fostering learning, enabling sustainability, and contributing to health, life quality, an ethic of sustainability, and social cohesion (Beatley, 2016; Cooper, 2006; Hes & du Plessis, 2014; Krasny & Tidball, 2015; Stuart-Smith, 2020; TEEB DE, 2017).

In the following, we describe our Open Space Living Lab on the Campus Rapperswil-Jona (Switzerland). We start by reviewing the fifty–year history of the campus and then describe the current setup of the open spaces (Glander et al., 2022; Lerch, 2022). Thereafter, we present some of the specific research, teaching, and social learning activities and discuss how they show the potentials of open urban spaces and gardening as societal learning opportunities for tackling challenges such as climate change adaptation, biodiversity loss, and sustainability.

The Living Laboratory at Campus Rapperswil-Jona (Switzerland)

The Campus and its History

In 2022, the University of Applied Sciences in Rapperswil celebrated its fiftieth anniversary (Campus Rapperswil, OST Ostschweizer Fachhochschule, formerly HSR Rapperswil [OST Rapperswil, n.d.]). The campus complex of low pavilion buildings on an open green space next to the lake of Zurich was built in 1972 and modeled after American universities (Joshi et al., 2022; Lerch, 2022). The intention of the architectural and landscape design was to make the site's tension perceptible: the tension between the partially protected lakeside landscape with its old trees and remaining fens and reeds against the medieval old town surrounded by more recent urban developments, which is separated from the site by the tracks of the Rapperswil train station (Krieger et al., 2022). In 1999 and 2015, new buildings were constructed on the site while maintaining the open character of the campus landscape. There are now around six hundred employees and fifteen hundred students sharing the 30,000 m^2 campus park between the lake and the

city with the public. Thanks to the promotion of biodiversity, in 2020 the campus was awarded the quality label of a Swiss foundation devoted to promoting biodiverse green spaces on public and private land (figure 1).

Figure 1: *On the OST Campus in Rapperswil-Jona, substantial space is reserved for nature. A large meadow in the center of the campus and in front of the university's main food court serves as a demonstration object of the effects of microtopographic and abiotic variation on vegetation patterns and biodiversity. A dry-to-wet gradient that ranges from the dry hill on the left to the regularly inundated depression on the right was deliberately designed.*

Planting Designs

The concept of the plantings stages the location between the nature reserve near the lake and the town of Rapperswil (Joshi et al., 2022; Krieger et al., 2022). Toward the lake, native species dominate the plant selection. There is a wild plant garden with native species typical of the site, but also a selection of drought-tolerant "climate change" plants from the Valais—a Swiss inner alpine valley characterized by a continental, dry climate—and a selection of alpine plants. In addition, there are various habitats for wild bees, deadwood structures to enhance fungal and insect diversity and soil formation, a flowering lawn—"Tapestry Lawn" (Ignatieva, 2017; Smith & Fellowes, 2013)—and a species-rich meadow that ranges from fen vegetation to dry calcareous grassland thanks to designed micro-topographical variation (figure 1). Various rare, native plant species have established here spontaneously. Toward the city, ornamental plants from around the world increasingly dominate. In the last five years, the basic structure of the campus has been revitalized with a total of more than 350 newly planted woody plants,

nine thousand new and five thousand replanted perennials and sixteen thousand bulbs and tubers. Within these plantings, drought–tolerant trees have been introduced, which may be resilient to the changing climatic conditions. Native and nonnative perennials are planted in mixed plantings designed based on ecological principles (figure 2): species and ecotypes are fitted to the particular ecological conditions of the microsite (e.g., light, soil, microclimate, topography) and combined according to life history traits (e.g., ruderals, competitors, stress-tolerators, guerilla- versus phalanx-growth of clonal plants or complementarity of root systems; Hitchmough, 2017). Perennial plantings are dynamic; especially under the influence of hotter and drier summers, changes in the composition are allowed and observed. The collection of plants from around the world is meant to showcase the wonders of global biodiversity, to contribute to its conservation as *ex-situ* collection (Ismail et al., 2021), and to promote a diversification of plant uses in horticulture to make gardens and urban green more resilient (age-structural, genetic, ecotype, and species diversity).

Figure 2: *Mixed plantings of native and ornamental plants are modeled after natural vegetation types and fitted to the different environmental conditions, e.g., a combination of annuals, perennials, and woody species in a shaded habitat. In total over one thousand different plant species can be found on the campus.*

The Campus as a Living Lab

Figure 3: *Throughout the year, the aesthetic appearance of the plantings changes, for instance thanks to colorful leaves in autumn. Changing seasons, the effects of extreme climate events such as a drought period or heavy rainfall, and the efforts needed to care for the green spaces can be observed on a daily basis directly in front of the working and teaching environment.*

Based on the evolved qualities of the outdoor space as a plant collection and public meeting place, we use the campus as a so-called "Freiraumlabor" (Open Space Living Lab) for teaching, applied research, and outreach (Glander et al., 2022; Krieger et al., 2022). Students have the opportunity to discover numerous labeled ornamental and wild plants. They experience the day-to-day changes in plantings and thus learn about the practical challenges of caring for them (figure 3). For instance, we trimmed the branches of an old willow tree instead of felling it, thereby ensuring that there are no hazard risks while keeping an attractive landscape feature on the campus. More generally, we integrate deadwood from fallen and cut branches and uprooted trees in the evolving design of the campus. An alley of birch trees is currently dying due to the age of the trees but also due to droughts and other negative human influences. We left the uprooted rootstocks or the remains of the dead but still standing trees in the places where the trees grew as a habitat for invertebrates and as a memorial for the trees, and we moved the cutoff deadwood—or even the complete stem of the dead

tree—to different locations on the campus where they can, for instance, be used as informal benches (figure 4). For research, we test new international developments such as urban microforests ("Miyawaki Forests," figure 4) and grass-free, multi-colored flowering lawns beneficial for insect pollinators ("Tapestry Lawns").

Figure 4: *In a 10×10 meter area we planted seven tree individuals per square meter from more than twenty species to create a tiny forest ("Miyawaki forest"). The stem of a birch tree that was uprooted on the campus by a storm was integrated into the design. The topsoil was removed and used to create an artificial hill in the middle of the forest (top right photograph taken by a drone, courtesy of Paul Haverkamp, VegeEye Lab, OST Rapperswil). The public, including children, were involved in the initial planting (top left photograph).*

The Open Space Living Lab also enables the promotion of wild animal species in urban areas by applying so-called animal-aided designs (Apfelbeck et al., 2020). For example, Common Terns (*Sterna hirundo*) and Black-headed Gulls (*Larus ridibundus*) have been successfully established on the flat roof of the OST Rapperswil administration building after using recorded bird voices to signal this space as a putative breeding ground, and the public can observe them via a webcam. A highly visible wild bee hotel with an information board is located in the immediate vicinity of the outdoor cafeteria area and adjacent to a tapestry lawn. It is important to us that the Open Space Living Lab provides opportunities for public exchange—for instance through science-art projects like the interactive experiment "Climate Garden 2085"

(Schläpfer-Miller & Dahinden, 2017; Schläpfer-Miller et al.,2023; Klimagarten, n.d.), which we carried out in 2019 with the artist Juanita Schläpfer-Miller. Two greenhouses formed the core of the installation: one heated to 28°C, the best-case scenario of the average summer temperature in 2085, and the other heated to 31°C, the climate to be expected if current CO_2 emissions continue (figure 5). Native wild plants from alpine and lowland areas as well as crops—for example, wheat, corn, soybeans, buckwheat, peanuts, and the dwarf millet *Eragrostis tef*—were grown in both greenhouses. Visitors of the public exhibition were able to observe how the climate might affect plants familiar to them, from the field to the kitchen, and experience the difference of the effect on crops from arid and subtropical versus temperate areas. The art project was accompanied by events such as a public lecture series and art workshops with plants (Schläpfer-Miller & Dahinden, 2017).

Figure 5: *The art-science public intervention project "Climate Garden 2085" allowed us to observe the response of various plant species to different climate conditions in two greenhouses (upper photograph). Food and ornamental plants familiar to the general public were grown in the greenhouses (lower left photograph). A series of workshops and lectures accompanied the installation (lower right photograph).*

Much of our teaching in ecology and plant use takes place outdoors on the campus. During the time of the COVID-19 pandemic, when indoor classes were almost impossible, the campus became our main classroom. We collect plants and study their stomata under the microscope, observe birds and their ecological interactions, discuss drainage systems hidden in the soil, discover features typical of healthy soils, and develop small landscape architecture projects from planning to implementation. For instance, we have planted drought-adapted as well as fruit trees together with students. Behind our wild plant garden, we have established our own compost system, trying to combine function with design. Further, students are responsible for

a recreation area surrounded by raised beds in front of the landscape architecture program building.

Figure 6: *In the teaching module on sustainability of the bachelor program in landscape architecture, student teams imagine positive futures of the university campus. This visualization includes some of the often addressed themes of many student teams: social appropriation of open spaces, enabling communication and cooperation between institutes and students from different disciplines, unsealing sealed surfaces and climate adaptation, green facades and roofs, renewable energy, human-nature and human-animal relationships, and urban gardening and farming (student team: Julia Bieri, Alexandra Held, Corina Niederberger, Dominika Sovcikova).*

In classes about sustainability, students learn to connect different perspectives of campus users and develop visions for the future (figure 6; Kueffer et al., 2022). To do this, they try out, for example, the "inventive analysis"—a method developed in the late 1980s by the French artist and landscape architect Bernard Lassus, b. 1929 (Koenecke et al., 2010; Lassus, 1998; figure 7). Through different artistic and creative strategies staged within the open space, designers, and, in our case, students attempt to disturb, broaden, and enrich their perceptions of the characteristics and potentials of a location with the aim of discovering new possibilities for the development, uses, and designs of the space. Broadening inventive space in the analysis phase of a design process should help to transgress lock-in situations and reach novel solutions. This method demonstrates how experiential activities in a living lab can invite critical reflection—especially also

about the invisible aspects of design such as ownership and regulations, power relationships, social codes, everyday routines, and symbolic meanings inscribed in a particular urban space (Burckhardt, 2015; Lefebvre, 1991; de Certeau, 1984). An important aspect of our living lab in this context is that it overlaps with the everyday lifeworld of the participating students and lecturers. From the new insights gained from these explorations, the students develop their visionary concepts and ideas for specific interventions on and future designs and uses of the campus (figure 8).

Figure 7: *The "inventive analysis"—a method developed by the French artist and landscape architect Bernard Lassus—invites students to discover the open spaces of their university in new ways through different artistic and creative strategies. The lack of opportunities for students to appropriate the open spaces of the university campus was a recurrent theme. This team installed an informal recreational space in front of the main entrance of the administration building of the university (student team: Lukas Ahmadi, Sanghamitra Dhar, Theo Hagen, Ayo Merz).*

Further, based on texts by the famous German garden architect Leberecht Migge (1881–1935; Gadient et al., 2018)—whose plans are mainly archived and curated in the Swiss Landscape Architecture Archive at our university—students are innovating ways to integrate food production as well as a circular economy on the campus. Migge was an important representative of the life reform movement of the early twentieth century, when urban and small-

scale gardening was fashionable in European cities more than one hundred years ago as a way to alleviate food shortages (Lerch & von Schwerin, 2017). Hence, the living lab on the campus allows for hands-on experiences of the history of garden culture. We critically discuss with our students past and current visionary thinking while experiencing in a real-world setting what they might encompass and what the specific and tangible challenges and benefits might be. Importantly, the actual design solutions of the students are put in relation to other ecological design projects that they engage with during their studies on the campus, especially with horticultural aspects. Thereby we link reflection on social transformation of urban spaces with rich and specific ecological thinking and the concrete experience of gardening and caring for a planted space. We believe that a garden, in this broad sense, can be a heterotopic site *sensu* Michel Foucault (Foucault, 1984) that allows us to link the past to the future but in novel and subversive ways. And we believe that gardening as an individual and social activity invites the nurturing of virtues such as cooperation, humility, responsibility, biophilic sensibilities, or care (Stuart-Smith, 2020; Krasny & Tidball, 2015; Cooper, 2006).

Figure 8: *Broadening inventive space through the "inventive analysis" method should help to transgress lock-in situations and reach novel solutions. The picture on the left shows the inventive analysis of a student team that placed pockets of vegetation on a large sealed surface from which plants and trees start to grow in the form of children's drawings. The right picture shows the visualization of a possible future open space that developed from this intervention (Student team: Luana Federer, Noémie Stalder, Zora Zweifel).*

Discussion

We have now been developing our Living Lab in the outdoor space of our university for several years, and both some challenges and opportunities have become apparent. A crucial design principle for the success of our living lab is that we are building it on a specific and well-chosen conceptual backbone while allowing for great interdisciplinarity and open-ended processes. This chapter explains in particular the underlying conceptual vision of our living lab: developing gardening—understood in a broad sense—as a sustainability practice that cares for green urban spaces and thereby contributes to transformative social processes toward sustainability. This vision is well-chosen because it fits to our specific geographic space, to our focal disciplines and professions, and to key aspects of sustainable transformations: public green spaces and urban sustainability. Thanks to such a clear overall focus, we can communicate the integrative character of our living lab despite its diversity and evolving nature, demonstrate its positive outcomes through tangible improvements of the urban open spaces on the university campus, and legitimate it as a pivotal tool for teaching and research at the university. Importantly, such a conceptual core does not constrain but rather fosters open-endedness and interdisciplinarity (compare the boundary object concept; Opdam et al., 2015; Star & Griesemer, 1989). For instance, the student projects on the campus emphasized, in particular, the demand for social appropriation of public spaces (figures 6 and 7)—a demand that can be in contradiction to the promotion of biodiversity and ecosystem services. Through this tension we ended up exploring questions of social and cultural sustainability in connection with the dimension of ecological sustainability. More generally, through growing interests in our living lab, we are increasingly confronted with ideas of other disciplines such as architecture or engineering on how to further develop the campus as a living lab. This forces us to think about the intersections, and possible synergies, between interventions and infrastructures in urban spaces that are not necessarily easy to reconcile.

A major opportunity of our living lab is that because of the proximity and the familiarity of these spaces amidst our daily working environment, innovative inter- and transdisciplinary teaching and research ideas can often be implemented easily, quickly, and in an informal way by using synergies and fitting activities into existing budgets and teaching formats. For instance,

while sitting during a coffee break under the plane trees in front of the cafeteria (figure 1) with a colleague from another institute, a part of nature in front of our eyes on the campus might trigger a discussion, and this might directly lead to a small activity that otherwise might never have happened.

We have for instance organized a public event on climate-friendly living on the campus with the climate and energy competence center of our university and within the scope of the energy transition strategy of the regional government (canton of St. Gallen). The outdoor classrooms during the COVID-19 pandemic are a particularly telling example of pragmatically using such opportunities. It sufficed to organize a couple of chairs and tables, store them in an outdoor rain shed location, and start teaching ecology outdoors, whether it was sunny or rainy.

Such informal processes, however, also contribute to a major challenge: they do not fit with the existing budgets of university administration. Maintaining an ambitious urban green space full of native and ornamental plant biodiversity and nature-based learning opportunities requires a lot of planning and maintenance work that is financed neither through teaching nor facility management budgets. Therefore, at present, maintenance of our living lab is mostly done voluntarily and is not paid for. The hope is that the living lab as a key infrastructure of our university and as an innovative teaching as well as research and development approach will gain further recognition and will get a budget in the future. In the Swiss academic world, the living lab approach is currently gaining momentum as a strategic priority, which will help to further develop such models.

More generally, establishing living labs and other forms of outdoor learning experiences has become a major focus of interest at universities as well as other types of schools but also, amongst others, at museums and as part of participatory processes and interventions by city administration. There are, thus, increasingly opportunities for networking at local, regional, and global scales. In Europe, there exists, for instance, a Real World Lab network, a growing network of biodiversity campuses, and there are numerous global networks of local learning initiatives, including the Global RCE Network for Education for Sustainable Development coordinated by the United Nations University. We try to engage with other living labs through such networks, although, due to time constraints, this is often not possible to the extent we would wish. However, collaborations do happen. In the spring term of 2023, we taught a design studio as part of a living lab focused on circular economy in the city of Zurich run by RCE Zurich.

Our living lab is meant to create a tangible and archetypical space for exploring much broader issues of a societal transformation toward a sustainable future in a participatory and context-sensitive way. The current societal crises force us to rethink what scientific innovations are and which role academic institutions should play in society. We need to find strategies that help us as individuals and societies to free ourselves from psychological, social, cultural, and economic constraints that lock us into destructive pathways of societal development. The political philosopher Hannah Arendt attempted to show how humans as creative and cooperative beings always have the capability to work against prevailing developments and teleological narratives of the future through free action that leads to natality—the miracle of new beginnings (Arendt, 1958). Arendt's hopes focused on the public spheres of discourses, democratic deliberations, changing narratives, and resulting cooperative action. Sustainability science builds heavily on participatory processes, and with this on the trust in democratic deliberations of political philosophers such as Hannah Arendt or Jürgen Habermas.

New developments within the cultural sciences, such as the environmental humanities, emphasize the importance of narratives and other cultural forms of shared orientation and meaning for a societal transformation. However, increasingly, life in unprivileged as well as affluent social contexts is confronted daily with environmental limits and, thus, the natural laws of the material world. Our health depends on easy access to high-quality outdoor spaces, clean air and water, the ecosystem services of healthy ecosystems, and a functioning climate. Reproduction of life itself becomes by necessity a public not just private issue (von Redecker, 2020). And we also realize that we can only change the economic system if we rethink work—the process of making things—as craftmanship that is faithful to an ethics of skillful work and fairness in the interest of the common good (Sennett, 2008). In short, knowledge production must find ways to enable novelty simultaneously along the three dimensions of (1) the labor of existence as biological being within the web of nature; (2) work as responsible craftmanship and meaningful and socially fair activity; and (3) action through speech, narratives, reconnection to myths, interweaving of cultural traditions, and social and cultural cooperation (e.g., Salami, 2020).

The modern sciences work by bounding the complexity of physical realities in constrained settings such as a laboratory that allow for trial-and-error learning processes. A living lab can be seen as such a laboratory setting that allows us to simultaneously address the three dimensions of labor—exis-

tence, work, and speech—with the aim to enable a radical restructuring of social, economic, and environmental systemic interdependences. A living lab, thus, has to be specific but generalizable in terms of (1) work and craftmanship, (2) living within environmental boundaries, and (3) cultural and social change. In the case of our living lab, plants, green spaces, and urban life intersect. Thus, we bring together the craftmanship of gardening and horticulture, the biological conditions of urban life—including the health effects of urban green on humans—and the sociocultural space of an agora where the public, academics, and students can meet. Our Open Space Living Lab is, thus, conceptually an attempt at making the idea of cities as innovation hubs for sustainable transformation tangible for new forms of knowledge production and consumption in the context of urban greening and civic ecology (Krasny & Tidball, 2015).

Conclusion

Our Open Space Living Lab is, for us, an inspiration, but also an invitation for (self-) critical thinking. Above all, it is a way of being—as educators, researchers, and citizens—normative and political in a reflexive and evidence-based way. Developing a biodiverse and accessible urban green space lets us experience that the cultivation of gardens is at the origin of culture (Cooper, 2006; Harrison, 2008; Girot, 2016; Stuart-Smith, 2020). Gardens and plants have accompanied us since time immemorial and are a central component of functioning urban areas. In this time and age of globally interrelated complex environmental crises, the ecological and inclusive design of open spaces can reconnect us to the origins of culture. Our Open Space Living Lab provides an experimental field for creating desirable urban environments where people and biodiversity can thrive. Biodiverse and attractive open spaces can make people happier and healthier, giving rise to alternative notions of quality of life not defined by high consumption. Providing ecologically high-quality urban green space to the majority of people in the world can thus play a key role in the necessary transformative change.

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References

Akandil, C., Ismail, S. A., & Kueffer, C. (2021). No green deal without a nature-based economy. *GAIA – Ecological Perspectives for Science and Society*, 30(4), 281–283. https://doi.org/10.14512/gaia.30.4.13

Apfelbeck, B., Snep, R. P. H., Hauck, T. E., Ferguson, J., Holy, M., Jakoby, C., MacIvor, J. S., Schär, L., Taylor, M., & Weisser, W. W. (2020). Designing wildlife-inclusive cities that support human-animal co-existence. *Landscape and Urban Planning*, 200, 103817. https://doi.org/10.1016/j.landurbplan.2020.103817

Arendt, H. (1958). *The Human Condition*. University of Chicago Press.

Augenstein, K., Bögel, P. M., Levin-Keitel, M., & Trenks, H. (2022). Wie entfalten Reallabore Wirkung für die Transformation? Eine embedded-agency perspective zur Analyse von Wirkmechanismen in Reallaboren. *GAIA – Ecological Perspectives for Science and Society*, 31(4), 207–214. https://doi.org/10.14512/gaia.31.4.4

Barber, B. R. (2013). *If Mayors Ruled the World. Dysfunctional Nations, Rising Cities*. Yale University Press. https://doi.org/10.12987/9780300164831

Beatley, T. (2016). *Handbook of Biophilic City Planning and Design*. Springer. https://doi.org/10.5822/978-1-61091-621-9

Burckhardt, L. (2015). *Why Is Landscape Beautiful? The Science of Strollology*. Birkhäuser. https://doi.org/10.1515/9783035604139

Cooper, D. E. (2006). A *Philosophy of Gardens*. Oxford University Press. https://doi.org/10.1093/oso/9780199290345.001.0001

de Certeau, M. (1984). *The Practice of Everyday Life*. University of California Press.

Defila, R. & Di Giulio, A. (2020). Science policy recommendations for funding real-world laboratories and comparable formats. *GAIA – Ecological Perspectives for Science and Society*, 29(1), 63–65. https://doi.org/10.14512/gaia.29.1.14

Evans, J., Jones, R., Karvonen, A., Millard, L., & Wendler, J. (2015). Living labs and co-production: university campuses as platforms for sustainability science. *Current Opinion in Environmental Sustainability*, 16, 1–6. https://doi.org/10.1016/j.cosust.2015.06.005

Foucault, M. (1984). Des Espace Autres. *Architecture, Mouvement, Continuité*, 5, 46–49.

Gadient, H., Orga, S., & von Schwerin, S. (Eds.) (2018). *Migge. The Original Landscape Designs: Die originalen Gartenpläne 1910–1920*. Birkhäuser.

Girot, C. (2016). *The Course of Landscape Architecture: A History of our Designs on the Natural World, from Prehistory to the Present*. Thames & Hudson.

Glander, I. et al. (2022). Der Campus Rapperswil-Jona als Freiraumlabor. In J. Joshi, G. Lerch, P. Petschek, S. von Schwerin, & D. Siegrist (Eds.). *Landschaftsarchitektur lernen. Geschichte, Gegenwart und Perspektiven. 50 Jahre Lehre und Forschung in Rapperswil* (pp. 210–222). Hochparterre.

Gross, M., & Krohn, W. (2005). Society as experiment: Sociological foundations for a self-experimental society. *History of the Human Sciences*, 18(2), 63–86. https://doi.org/10.1177/0952695105054182

Harrison, R. P. (2008). *Gardens: An Essay on the Human Condition*. University of Chicago Press.

Hes, D., & du Plessis, C. (2014). *Designing for Hope. Pathways to Regenerative Sustainability*. Routledge. https://doi.org/10.4324/9781315755373

Hitchmough, J. (2017). *Sowing Beauty: Designing Flowering Meadows from Seed*. Timber Press.

Hossain, M., Leminen, S., & Westerlund, M. (2019). A systematic review of living lab literature. *Journal of Cleaner Production*, *213*, 976–988. https://doi.org/10.1016/j.jclepro.2018.12.257

Ignatieva, M. (2017). *Lawn alternatives in Sweden from theory to practice: manual*. Department of Urban and Rural Development, Swedish University of Agricultural Sciences. https://res.slu.se/id/publ/90124

IPBES (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES secretariat. https://doi.org/10.5281/zenodo.3831673

IRP (2018). *The Weight of Cities: Resource Requirements of Future Urbanization*. United Nations Environment Programme.

Ismail, S. A., Pouteau, R., van Kleunen, M., Maurel, N., & Kueffer, C. (2021). Horticultural plant use as a so-far neglected pillar of ex situ conservation. *Conservation Letters*, 14(5), e12825. https://doi.org/10.1111/conl.12825

Jahn, T. & Keil, F. (2016). Connecting Real-world Laboratories with Transdisciplinary Research. *GAIA – Ecological Perspectives for Science and Society*, *25*(4), 247–252. https://doi.org/10.14512/gaia.25.4.6

Joshi, J., Lerch, G., Petschek, P., von Schwerin, S., & Siegrist, D. (Eds.) (2022). *Landschaftsarchitektur lernen. Geschichte, Gegenwart und Perspektiven. 50 Jahre Lehre und Forschung in Rapperswil*. Hochparterre.

Kirschbaum, M. & Wacker, A. (2018). Social-Ecological Transformation of Schools. First results of the Real-World Lab STADT-RAUM-BILDUNG. *GAIA – Ecological Perspectives for Science and Society*, *27*(4), 396–397. https://doi.org/10.14512/gaia.27.4.15

Klimagarten (n.d.). *Climate Garden 2085*. https://klimagarten.ethz.ch/en/

Koenecke, A., Weilacher, U., & Wolschke-Bulmahn, J. (Eds.) (2010). *Die Kunst, Landschaft neu zu erfinden. Werk und Wirken von Bernard Lassus*. Martin Meidenbauer.

Krasny, M. E., & Tidball, K. G. (2015). *Civic Ecology: Adaptation and Transformation from the Ground Up*. MIT Press.

Krieger, M., Joshi, J., & Kueffer, C. (2022). Der Campus als Freiraumlabor. *g'plus*, 3, 11–13.

Kueffer, C. (2020a). Cities as Ecosystems and Buildings as Living Organisms. In I. Ruby & A. Ruby (Eds.). *The Materials Book*. Ruby Press.

Kueffer, C. (2020b). Plant sciences for the Anthropocene: What can we learn from research in urban areas? *Plants, People, Planet*, 2(4), 286–289. https://doi.org/10.1002/ppp3.10124

Kueffer, C. (2024). Can real-world labs reach through the fog? *GAIA-Ecological Perspectives for Science and Society*, 33(S1), 1. https://doi.org/10.14512/gaia.33.S1.1

Kueffer, C., Carabias, V., Schneider, A., & Siegrist, D. (2017). Recognizing the Value of Universities of Applied Sciences for Environmental and Sustainability Research in Switzerland. *GAIA – Ecological Perspectives for Science and Society*, 26(2), 152–154. https://doi.org/10.14512/gaia.26.2.23

Kueffer, C., Schneider, F., & Wiesmann, U. (2019). Addressing sustainability challenges with a broader concept of systems, target, and transformation knowledge. *GAIA – Ecological Perspectives for Science and Society*, 28(4), 386–388. https://doi.org/10.14512/gaia.28.4.12

Kueffer, C. et al. (2022). Ökologie, Nachhaltigkeit, grüne Städte und resiliente Landschaften. In J. Joshi, G. Lerch, P. Petschek, S. von Schwerin, & D. Siegrist (Eds.). *Landschaftsarchitektur lernen. Geschichte, Gegenwart und Perspektiven. 50 Jahre Lehre und Forschung in Rapperswil* (pp. 168–184). Hochparterre.

Lassus, B. (1998). *The Landscape Approach*. University of Pennsylvania Press.

Leal Filho, W., Salvia, A. L., Pretorius, R. W., Brandli, L. L., Manolas, E., Alves, F., Azeiteiro, U., Rogers, J., Shiel, C., & Do Paco, A. (Eds.). (2020). *Universities as Living Labs for Sustainable Development: Supporting the Implementation of the Sustainable Development Goals*. Springer.

Lefebvre, H. (1991). *The Production of Space*. Blackwell.

Lerch, G. (2022). Rapperswil – der schönste Campus der Schweiz? Entstehung und Entwicklung von 1972 bis heute. In J. Joshi, G. Lerch, P. Petschek, S. von Schwerin, & D. Siegrist (Eds.). *Landschaftsarchitektur lernen. Geschichte, Gegenwart und Perspektiven. 50 Jahre Lehre und Forschung in Rapperswil* (pp. 78–94). Hochparterre.

Lerch, G. & von Schwerin, S. (2017). Gärten für alle. *TEC21*, 34, 28–30. https://www.espazium.ch/de/aktuelles/gaerten-fuer-alle

Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg (n.d). *Baden-Württemberg fördert Reallabore.* https://mwk.baden-wuerttemberg.de/de/forschung/forschungspolitik/wissenschaft-fuer-nachhaltigkeit/reallabore

Ndubisi, F. O. (2014). *The Ecological Design and Planning Reader.* Island Press. https://doi.org/10.5822/978-1-61091-491-8

Opdam, P., Westerink, J., Vos, C., & De Vries, B. (2015). The role and evolution of boundary concepts in transdisciplinary landscape planning. *Planning Theory & Practice*, 16(1), 63–78. https://doi.org/10.1080/14649357.2014.997786

OST Rapperswil (n.d.). *Rapperswil-Jona Campus.* https://www.ost.ch/en/university-of-applied-sciences/campus/rapperswil-jona-campus

Rudow, A., & Bugmann, H. (2021). Waldlabor Zürich: Das Reallabor für angewandte Forschung und umfassenden Wissenstransfer zu Waldthemen nimmt Gestalt an. *GAIA-Ecological Perspectives for Science and Society*, 30(3), 200–203. https://doi.org/10.14512/gaia.30.3.14

Salami, M. (2020). *Sensuous Knowledge: A Black Feminist Approach for Everyone.* Zed Books.

Schäpke, N., Bergmann, M., Stelzer, F. & Lang, D. J. (2018). Labs in the Real World: Advancing Transdisciplinary Research and Sustainability Transformation: Mapping the Field and Emerging Lines of Inquiry. *GAIA – Ecological Perspectives for Science and Society*, 27(S1), 8–11. https://doi.org/10.14512/gaia.27.S1.4

Schläpfer-Miller, J., & Dahinden, M. (Eds.) (2017). *Climate Garden 2085. Handbook for a Public Experiment.* Park Books.

Schläpfer-Miller, J., Kueffer, C., & Dahinden, M. (2023). Climate Garden 2085: An easily applicable transdisciplinary public art-science experiment for transformative learning about climate change. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-023-03899-2

Sennett, R. (2008). *The Craftsman.* Yale University Press.

Smith, L. S. & Fellowes, M. D. E. (2013). Towards a lawn without grass: the journey of the imperfect lawn and its analogues. *Studies in the History of Gardens & Designed Landscapes*, 33(3), 157–169. https://doi.org/10.1080/14601176.2013.799314

Soga, M., & Gaston, K. J. (2016). Extinction of experience: the loss of human–nature interactions. *Frontiers in Ecology and the Environment*, 14(2), 94–101. https://doi.org/10.1002/fee.1225

Stadt Zürich (n.d.). *Pilotprojekt «Unsere Siedlung – nachhaltig leben».* https://www.stadt-zuerich.ch/gud/de/index/umwelt_energie/umwelt-energie-beratung/nachhaltige_siedlung.html

Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19(3), 387–420. https://doi.org/10.1177/030631289019003001

Stuart-Smith, S. (2020). *The Well Gardened Mind.* HarperCollins.

Swiss Academies of Arts and Sciences (2020). *Forschung für gesellschaftliche Innovationen an Fachhochschulen (FHs) – Potenziale, Rahmenbedingungen, Handlungsfelder.* Swiss Academies Communications, 15(12). https://zenodo.org/record/4090403

TEEB DE [Natural Capital Germany] (2017). *Ecosystem services in the city. Protecting health and enhancing quality of life. Summary for decision-makers.* Technical University of Berlin Helmholtz Centre for Environmental Research – UFZ.

United Nations (2019). *Global sustainable development report: The future is now: Science for achieving sustainable development*. United Nations, Department of Economic and Social Affairs.

United Nations (n.d.). *The 17 Goals.* https://sdgs.un.org/goals

von Redecker, E. (2020). *Revolution für das Leben: Philosophie der neuen Protestformen.* S. Fischer.

von Weizsäcker, E.U., & Wijkman, A. (2018). *Come On! Capitalism, Short-termism, Population and the Destruction of the Planet.* Springer. https://doi.org/10.1007/978-1-4939-7419-1

von Wirth, T., Fuenfschilling, L., Frantzeskaki, N., & Coenen, L. (2019). Impacts of urban living labs on sustainability transitions: Mechanisms and strategies for systemic change through experimentation. *European Planning Studies*, 27(2), 229–257. https://doi.org/10.1080/09654313.2018.1504895

Wagner, F. & Grunwald, A. (2019). Reallabore zwischen Beliebtheit und Beliebigkeit: Eine Bestandsaufnahme des transformativen Formats. GAIA – *Ecological Perspectives for Science and Society*, 28(3), 260–264. https://doi.org/10.14512/gaia.28.3.5

Wagner, F. & Miller, E. (2018). The Background and History of Real-World Laboratory Funding in Baden-Württemberg. GAIA – *Ecological Perspectives for Science and* Society, 27(S1), 5.

Wolfram, M., Borgström, S., & Farrelly, M. (2019). Urban transformative capacity: From concept to practice. *Ambio*, 48(5), 437–448. https://doi.org/10.1007/s13280-019-01169-y