Scales of Change

Conference Proceedings

Commemorating 50 years of
Landscape Architecture study programme at
University of Ljubljana

University of Ljubljana

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University of Ljubljana Biotechnical faculty

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Contents

Preface: Change of Scale

Prof. dr. Mojca Golobič
Conference committee chair

The question of scale is not new to landscape architects but is one that does not have a definite answer; it needs to be asked again and again. The issue addresses the very identity of the profession and the nature of the context in which landscape architects operate and teach. The theme of the 2022 conference in Ljubljana was inspired by the 50th anniversary of the landscape architecture program at the University of Ljubljana as well as the fact that 50 years have passed from the pioneering conference on landscape planning held in Ljubljana which was organized by professor emeritus Dušan Ogrin, one of the founders of landscape architecture and the first recipient of the ECLAS Lifetime achievement award.

During the last half-century, landscape architecture has evolved into a mature discipline, and has developed theories and tools for different scales of operation to address a number of challenges. During the same period, the nature of these challenges has shifted towards a more global scale; examples including demographic, climate, and technological processes. The participants of the conference were asked to reflect on how the (change of) scale af ects the profession; its ontology, epistemology and (social) relevance. Three keynote speakers set the stage for these discussions. The first speaker, climatologist ***Lučka Kajfež Bogataj*** *gave the global perspective with an insight into the scale and relevance of global (climate) changes for the future landscape, as well as the role of landscape architects in responding to this challenge. The following keynote speaker* ***Carl Steinitz*** *linked to the topic and provided some answers on how geodesign approach can provide tools to address such challenges. He introduced the coming global geodesign project, in which landscape architecture schools across the world will link to provide a globally relevant and spatially specific response. The topic of the third keynote speaker,* ***Martin Prominski****, linked to the design process and explained how the research through design is used to provide solutions that consider the site characteristics when addressing the global objectives. His keynote speech was directly linked to the topic of the doctoral colloquium, entitled Research through design and coordinated by* ***Jose Lameiras*** *and* ***Ana Kučan.***

The participants discussed different aspects of the main topic in five tracks of the conference.

1. *Evolution and reflection (track chairs:* ***Richard Stiles*** *and* ***Mojca Golobič****) looked back at the 50 years of the professions' evolution as well as the evolution of the research foci and trends, in particular marked by the shift of the challenges towards a more global scale.*
2. *Relation between design and planning (track chairs:* ***Henrik Schultz*** *and* ***Tadej Bevk****) questioned the justification of this distinction and discussed its implications for landscape architecture. They also discussed the specifics of the methods best fit for one or another approach.*
3. *Teaching across scales (track chairs:* ***Udo Weilacher*** *and* ***Nadja Penko Seidl****) discussed the teaching and learning practices and how these depend on scale. The informatization and digitalization influenced the teaching and learning process and the awareness of scale.*
4. *Context matters (track chairs* ***Jeroen de Vries*** *and* ***Davor Gazvoda****) addressed the influence of the context in which the landscape schools and professionals develop and operate. They focused on the diversity and need for streamlining of the curricula and the profession's profile. Schools should be different and choose own position in the spectrum of scales.*
5. *Beyond the field (****Tijana Dabović*** *and* ***Tomaž Pipan****) discussed the competences needed for addressing complex mutli-scale challenges which*

require multi and trans-disciplinary approaches. They identified the role of landscape architects in these work settings and the sills that could be learned from other disciplines.

*The wrap up of the conference was organised as a roundtable entitled "**next 50 years**", which aim was to identify lessons from the past that are relevant for the future. Mojca Golobič lead the discussion with Tijana Dabović, Martin Prominski, Carl Steinitz, Richard Stiles, Henrik Schultz, Udo Weilacher and Jeroen de Vries.*

The last decades proved that the scale has changed; the context has become more global, so did the interventions, and even the incremental ones inevitably refer to global background. Both planning and design are projective and both relate to site (whatever size). The choice of the third dimension distinguishes design from planning: height defines design, time defines planning. Scale is important: different scope, priorities, methods, participants, results are relevant at different scale. But no single scale optics is enough for complex challenges. We need methods that enable shifting between scales and concepts such as resilience that can be interpreted across scales and link scales.

To say what is 2072 going to look like is too speculative. It could be high tech dominated, it could be "back to basics" or "regenerative", it could and probably will be some hybrid of both. Regardless the level of technology, people will always depend on (natural) space. Planning will have to better develop the skills to deal with de-growth and help people live in a better cohabitation with nature, and with other human beings. How to teach our students to be able to design for this uncertainty? By acknowledging that we might not have the right answers, but we need to ask the right questions; by teaching them to reflect on what we are doing as a (multidisciplinary) team. We need to teach students collaborations; they will need to know a little about a lot and a lot about a little. It is wrong to think that students must get ready for practice: school gives something that student can't learn in practice. Faculty is not a factory; it is about building personalities and their confidence: the alumni will need it to be able to step out of the comfort zone. AI will be able to do many things better that students learn today; we need to focus on where our students can do better than AI; such as creativity and empathy.

Altogether 145 contributions were presented; 70 presentations were given on-site, 41 online and 34 as poster session. It was the first on-site conference after two years of on-line only events due to the Covid pandemic, which made the reunions quite emotional. However, the experience of on-line events resulted in technically and socially developed culture of such interaction. The decision to organize a hybrid event was made to benefit from both on-line and on-site formats, with awareness that something gets lost in translation/connection of both. We assume that the hybrid format is to stay with us (and improve) at least for some time.

In the name of the organizing committee, I would like to thank all the participants, who shared their experience and knowledge, who paid their tribute to the contributions of great spirits of landscape architecture and enjoy coming repeatedly to Ljubljana. We also hope and believe that young professionals got inspired at the event and will keep good memories on Ljubljana conference(s). Many people contributed to the success of the conference – not only those, whose names are mentioned above. I am therefore thankful to all the colleagues who helped in the process of conceiving the topics of the conference, in the review of contributions and chairing the sessions. I also thank Ellen Fetzer from ECLAS for all the support and advice. I am proud and happy to have a great team of young and enthusiastic people at the department, who made everything run smooth and in a good spirit.

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KEYNOTES

The role of landscape architecture in climate change mitigation

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Abstract
Our planet has capacity limits for air pollution, biodiversity, the extent of climate change, and other factors. These are boundaries that must be respected if we are to preserve the basis for human life. We have already overstepped some of these boundaries. Urban environment has the potential to become a major driving force for a green and just recovery - provided that landscape architects, designers, planners and engineers are actively involved in the decision-making process. It is time to transform the way we design cities, so that future urban development works with nature.

Introduction
In recent decades, humans have changed the conditions on our planet dramatically. Our greenhouse gas emissions are driving climate change and causing ocean acidification. Our fields, roads, and houses change the landscape, our vehicles and factories pollute the air. Some of the new chemicals we are releasing into the environment have a health impact on humans and ecosystems. We affect the hydrological balance, change important cycles, and are responsible for the extinction of many species. If the Earth is to remain habitable for future generations, the critical Earth systems that support life must remain within healthy limits. The Planetary Boundary Framework (PBF) proposes science-based targets to define the limits of acceptable alteration to nine key Earth systems - encompassing physical, chemical, and biological processes (Steffen et al., 2018). Climate change and biosphere integrity are recognised as 'core' boundaries through which all others operate.

Urbanization has altered the way cities and the people that inhabit them interact with nature but urban environments still rely heavily on Earth's systems to support urban life: fertile soils enable food production; rivers, lakes and oceans enable transport and provide core resources; forests regulate and purify water supplies while protecting against flooding; and nature broadly provides a space for leisure and wonderment fundamental to human wellbeing. Cities physically occupy just few percent of the Earth's surface, but they are home to more than half the global population. They play an outsized role in environmental degradation and are responsible for 70% of carbon emissions.

By understanding the thresholds set out in the PBF, and how the built environment contributes to them, we can implement actions that drive meaningful change (Hoornweg et al., 2016). Cities are facing other crisis, as well - from pandemic health impacts of COVID-19 to social and economic inequality. Despite these challenges, cities have the potential to become a major driving force for a green and just recovery - provided that landscape architects, designers, planners and engineers are actively involved in the decision-making process from the beginning. It is high time to transform the way we design cities, so that future urban development works with nature. This means improving air quality and soil health, creating carbon sinks and circular resource flows, fostering biodiversity and conserving water (ARUP, 2021). Incorporating environmental and sustainability assessments in projects, bringing diverse stakeholders to the table for project planning and implementation, respecting

Planetary boundary	Major drivers in urban environment
Biogeochemical flows degradation	– Sewage discharge is a major N and P pollution source – Landscaping runoff contributes to eutrophication (parks, lawns, gardens and other landscaped elements fertilisation) – Fossil fuel combustion increases N pollution – Cities are sinks for agricultural products demand for food, biofuels, cotton and other agricultural products
Loss of biodiversity	– Urban sprawl fragments habitats – Urban development destroys biodiversity hotspots – Urban areas are favourable for invasive species – Polluted waterways and soil cannot support life
Land system change	– Urban sprawl fragments and degrades forests and other land uses – Unsustainable timber products degrade forests – Cities are sinks for resources that degrade forests in extraction
Water system degradation	– Concentrated urban water use causes local ecological strain – Non-porous surfaces prevent ground water recharge and contribute to contamination – Illegal wells deplete the water table beyond regulated amounts
Atmospheric aerosol loading	– Cities are major energy consumers due to heating, cooling, transport, and industry – Construction and demolition produce particulate matter
Novel entities	– Building materials cause pollution throughout the supply chain **(s**teel and precious metals extraction and refining process, toxic building materials) – Industrial sites are often contaminated **(**industrial land, shipyards, power plants, military testing areas, waste dumping sites)
Ocean acidification	– CO2 emissions from transportation, energy production, and buildings – Sewage and urban runoff contribute to coastal acidity
Stratospheric Ozone Depletion	– Heat transfer fluids were ozone depleting ODS's are commonly used as a heat transfer agent in air conditioning, refrigeration, and other applications. – ODS's continue to be used illegally
Climate change	– GHG emissions – Land use change – Urban albedo change

Table 1

Planetary boundaries and major drivers of degradation in urban environment

indigenous knowledge, and taking a systems-based planetary-centric approach are the most important actions landscape architects must take.

Planetary boundaries and major drivers of degradation in urban environment

Earth has limited capacity to support the consumption patterns of modern humanity. The concept of planetary boundaries (PB) comprises nine categories that are crucial to the health and viability of human civilization (Table 1). Six of the nine PB have now been exceeded. For example, we have warmed the atmosphere by 1.2°C globally and are on our way to overstepping a variety of irreversible tipping points in the climate system. Global diversity loss has accelerated such that we have already crossed this planetary boundary. Humans have also caused serious imbalances in nitrogen and phosphorus cycles. There is too much nitrogen and phosphorus in circulation. This boundary has been exceeded by a wide margin. The ability of soils to store water is also diminishing. Land use have a special role in the PB concept. As built-up areas expand and agriculture becomes both more extensive and intensive, landscapes are transformed, important ecosystem functions are lost. Oceans are becoming more and more acidic because of more and more CO2 entering the atmosphere, which dissolves in oceanic water. However, the planetary boundary for acidification has not yet been exceeded. Bold international policies ensured that ozon layer planetary boundary was not exceeded.

What is driving climate change?

Climate change is the most important crisis at the moment, since it is intrinsically linked with all essential Earth system processes through numerous feedback loops on multiple scales. While Earth's climate has never been static, the current extent and rate of change is unprecedented in human history (IPCC, 2018). Climate change in the last 200 years is driven by elevated levels of CO2 and other GHGs. Sources include the combustion of fossil fuels and biomass, the release of stored carbon in biomass and soils through deforestation and land degradation, the release of nitrous oxides from fertiliser application, and the release of methane and CO2 from the microbial activity of decay. The reflectivity of the Earth's surface and atmosphere alters how much of the Sun's energy is absorbed or reflected. Changes in albedo include loss of reflective ice, land-system change and atmospheric aerosol loading. Climate change is also driven by positive feedbacks in the climate system which may v trigger irreversible changes to Earth systems driven by intrinsic bio geophysical feedbacks. Already observed examples of positive feedbacks in the climate system are loss of summer sea ice, permafrost thawing and weakening of terrestrial and aquatic carbon sinks.

Climate change has significant impacts upon landscapes, including: intensification of the urban heat island effect particularly in summer, water shortages as a result of reduced rainfall and increased evapotranspiration, flooding, particularly in built environments and floodplains, rising sea levels leading to significant landscape impacts in coastal areas, including displacement of communities, social infrastructure, biodiversity and alterations to landform configurations. Changes in biodiversity as a consequence of new

climatic conditions are also a problem. As some species increase in number and range whilst others decline changes food provision, the spread of diseases and our enjoyment of a healthy and aesthetically pleasing environment. Decreasing air quality as a result of higher temperatures and possible increases in ultraviolet radiation could also have consequences for human health and comfort. Climate change will also significantly impact the character of landscapes via environmental, cultural, social and economic factors which shape this character. Climate change has the potential to render some locations uninhabitable, with conflict over access to water, energy and food and this may lead to climate-related migration.

The form and function of urban development regarding mitigation and adaptation to climate change

Built environment is heavily contributing to climate change. Cities have an outsized contribution to GHG emissions, they house over half of the world's population, consume two thirds of the world's energy and account for more than 70 % of CO2 emissions. Transportation, energy production, and buildings are the primary sources of these emissions. Furthermore 'urban heat island' effect occurs in cities due to the increased use of manmade materials, such as asphalt, cement and glass, that tend to absorb more solar radiation than vegetated land. Higher temperatures increase summertime peak energy demand due to air conditioning, further exacerbating cities' contribution to climate change.

The form and function of urban development is fundamental to mitigation and adaptation to climate change. Transitioning toward regenerative practices in cities can have cascading benefits locally, regionally, and globally. Through their training and expertise, landscape architects are well positioned to provide holistic approaches to the planning and management of the built environment and rural areas. Sustainable landscape planning, design and management are essential if we are to adapt our environments to a changing climate and to mitigate future change. Mitigation and adaptation principles are often interlinked and mutually-reinforcing, whilst also providing wider socio-economic and environmental benefits. For example, provision of urban green space will mitigate through carbon storage as well as reducing surface run-off, an important aspect of adaptation. Cities are dynamic systems and the starting point in managing risks and building long-term resilience is for a city to understand its exposure and sensitivity, and develop responsive policies and investments that address these vulnerabilities. Adaptation is not a one-time effort but an ongoing cycle of preparation, response, and revision. Those cities that are able to integrate adaptation well with existing planning processes and goals—including priorities in disaster risk reduction, sustainable development, and poverty reduction—will be best positioned to thrive in the era of climate change.

The maximisation of renewable energy capacity as an essential aspect of climate change mitigation Renewable energy sources, such as wind and solar, emit little to no greenhouse gases, are readily available, but our technical responses to mitigate climate change will have additional implications. We will therefore increasingly be faced with the difficult task

of making decisions relating to the scale, nature and location of renewable energy solutions and balancing such requirements with the values we attribute to landscapes. The expertise that landscape architects have in design and the use of landscape and visual impact assessments ensures that proposals for the development of renewable energy generation, including bioenergy, can respond to and be properly considered in their wider environmental context. Some site specific interventions can also contribute to mitigation such as the creation of urban carbon sinks via the provision of green space which removes carbon from the atmosphere via storage in biomass or the installation of green roofs and green walls, thereby improving the thermal efficiency of buildings and reducing the use of conventional heating and cooling systems, whilst also alleviating flood risk.

Climate crisis requires a wide range of climate actions

Reducing urban GHG emissions in line with a 1.5°C trajectory requires a wide range of climate action at city, national and global levels, from both public and private actors. There are many ways, at a range of different scales, in which landscape architects can play an important role in helping to achieve these. Cities could have a significant impact on consumption based emissions. The consumption interventions for food, buildings and infrastructure, private transportation, aviation, clothing and textiles, and electronics and household appliances have the highest potential to reduce emissions. On construction, cities need to change what types of buildings and infrastructure are built as well as what materials are used. On transport, private car ownership needs to end and the shared vehicles that replace it have to use less material and be longer lasting. Urban residents will also need to adopt a largely plant-based diet, mostly replace flying with less energy-intensive forms of long-distance transport, change how clothes and textiles are consumed and keep electronics and household appliances for longer.

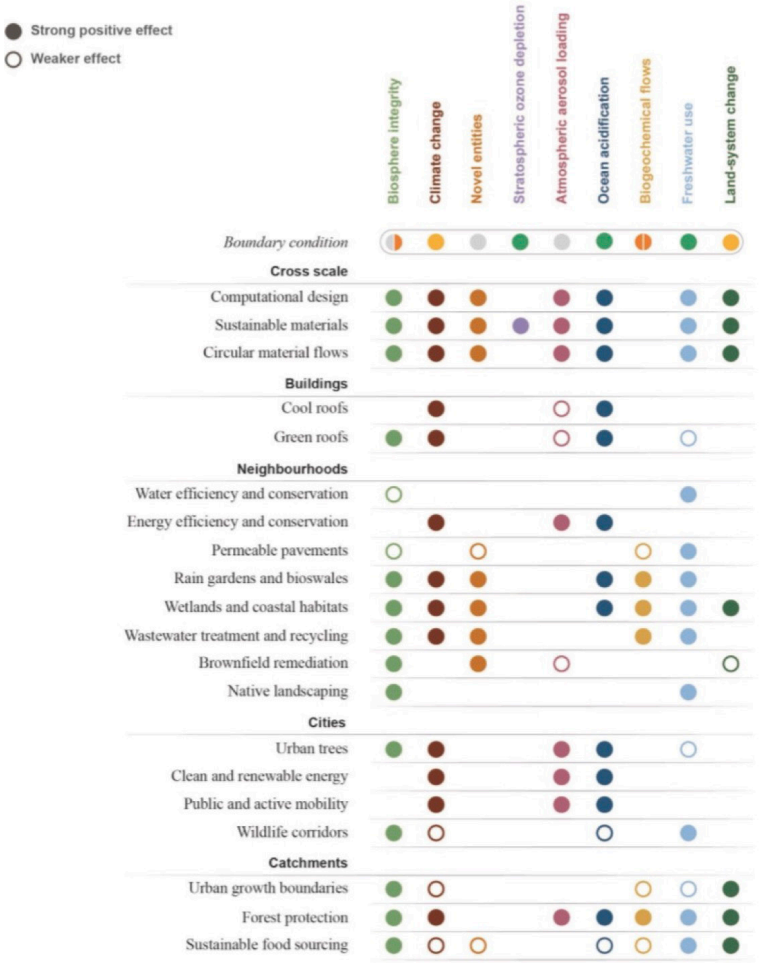
Reducing GHG emissions also requires significant behavioural changes. Individual consumers cannot change the way the global economy operates on their own, but many of the consumption interventions rely on individual action. It is ultimately up to individuals to decide what type of food to eat and how to manage their shopping to avoid household food waste. It is also largely up to individuals to decide how many new items of clothing to buy, whether they should own and drive a private car, or how many personal flights to catch every year. Furthermore elected leaders respond to consumer demands and voter priorities. Signs of broad behavioural change will therefore support low-carbon corporate and political action. It is critical that behavioural changes occur as soon as possible, and that governments and businesses support transition to more sustainable consumption through policy incentives and new business models.

Carbon pricing is also an effective mechanism to reduce the carbon intensities of products and services in a flexible and cost-effective manner (World Bank, 2019). Carbon pricing sends a price signal to consumers by making high-carbon goods more expensive, thereby triggering a positive behaviour change towards

a lower-carbon alternative. Carbon pricing would be most effective at a global level, but it can be developed incrementally, region by region and sector by sector. Several cities have already introduced forms of carbon pricing on the built environment and private vehicle. Another important policy is to address macro driver of consumption emissions: increased expenditure due to economic growth. GDP growth rates have a significant impact on emission levels in cities over time. Academics and thinkers question the viability of the dominant economic paradigm within which the global economy operate – to use the proxy of GDP as the primary indicator of development. But GDP is incomplete and lacks the ability to address environmental degradation or climate change. Alternative socio-economic frameworks do exist. These concepts attempt to encapsulate an economy that allows societies to operate within planetary boundaries while ensuring that human needs are met. Policy makers would be agnostic about economic growth; it would not be an indicator of success or failure but merely one thing to consider alongside a wider range of social, economic and environmental factors.

Regenerative actions for the built environment

Fortunately many feasible regenerative solutions exist that may potentially deliver more positive planetary outcomes to restore natural systems. Built environment interventions can address multiple boundaries and may have synergies across multiple boundaries. Some, such as preventing urban sprawl, require regional approaches or policy changes while others, such as cool or green roofs, rain gardens, urban trees and native landscaping, occur at the local or buildings scale (Fig.1)



Conclusions

Civilization is being threatened in ways it never has before, presenting new realities, new norms and new shocks. Humanity's collision with planetary boundaries requires a radical rethink of myths such as we can have infinite growth on a finite planet; markets are fair; prices tell the truth; self-interest drives ideal human behaviour; and more income equals more happiness. To achieve a flourishing life within ecological limits we have to transform produc-

Figure 1

Response of the PBs to a range of built environment interventions (modified from ARUP, 2021)

tion and consumption which requires a rapid global, national and local alignment of climate policies, new business models and society-wide behavioural change that must deliver an unprecedented level of climate action by government, business and individuals.

Landscape architects, designers, planners and engineers are in a unique position to address the risks associated with crossing Planetary Boundary thresholds. Design decisions and physical interventions influence how people travel, inhabit space, consume goods and use energy. If projects are re-thought, re-considered, retrofitted and created to minimise impact on the natural environment, the benefits will be felt for decades to come.

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Scale, Size, Time and Complexity matter

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Abstract
Planet Earth is the most important geodesign problem. Global conditions are changing in fundamental ways, greatly impacting all global communities today and in their futures. The International Geodesign Collaborative (IGC), together with the Liechtenstein Institute for Strategic Development GmbH. (LISD) and Geodesignhub Pvt. Ltd. in partnership and sponsored by Esri Inc., have launched the Global Climate Geodesign Challenge. The project's broad scope aims at creating local and global plans that reverse detrimental climate change – aiming at net negative emissions, ultimately to lower the excessive atmospheric greenhouse gas (GHG) concentrations. This is a multi-year, science-based geodesign project aimed helping global and local decision-makers make difficult strategic, climate-based decisions, which may not be in their short-term political interests, but which create enormous long-term benefits for local communities and the world at large. Ultimately, we will, together, provide models for undertaking climate-responsive spatial designs accommodating many diverse participants, using negotiated geodesign collaborations for improved local, regional and global planning and decision-making. This paper is an edited version of the transcript of the presentation by Carl Steinitz. It purposely retains the informal style of the presenter.

Introduction
My presentation fits perfectly into the climate change lecture by Lučka Kajfež Bogataj which was outstanding. The question for us as designers is: What are we going to do about climate change?

Do we really believe that the way we teach design and then have our students focus on projects like gardens and parks is going to work in a rapidly changing climate when we also will need to work in a much closer relationship with regional and global scales as designers? The answer is NO, it doesn't work. The reason that it doesn't is because we assume that our students have a one student - one project education. Every student does his or her own project. But when you go to a larger size and to a different scale, that's impossible because either we don't know enough, or we can't directly experience the whole study area. The larger the problem in geography, the less we can do the things we can do on site, live, quickly and as a single human being. Therefore, the style of teaching that focuses on one student - one project must change to many students - one project. And not only many students - one project, but also many disciplines - one project. The question is: What is the role of the landscape architects in that? It's either going to be a minor trivial role with a short time horizon or it could be a leadership role

because you start out with attitudes and attributes that most scientists don't have.

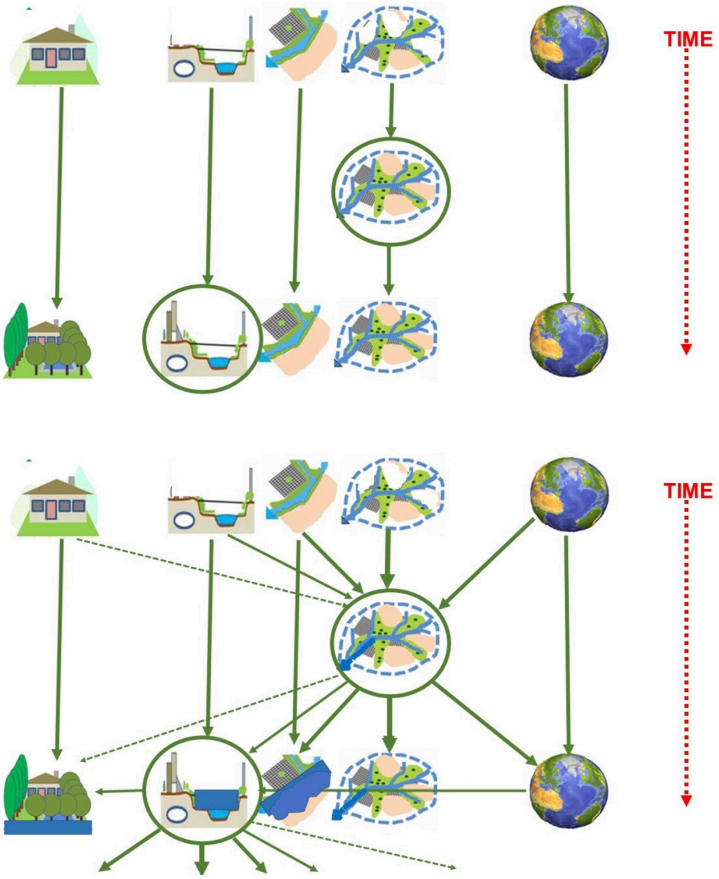
One of these is strategic synthesis, design, and collaboration across disciplines. If the problem is complicated, then you can figure out where details are more important and how to accomplish them. But without cross-disciplinary strategic design as part of your education, you're probably going to make a problem worse than create a long-term solution.

Once you realize this, the advantage that the designers have over the scientists is that you can ask specialists the questions, take advice and figure out how to do a design. The advice is not only from your own faculty. It's from the other faculties. That's how our projects have to begin: at a scale which sets the problem in a multi-disciplinary way for the problem that you can work on in a disciplinary way.... and we're missing that in our education.

Sizes, scales, times and complexities

Design occurs at and for different sizes, scales, times and complexities, and these differences matter. Design cannot work well in separated silos (and most of us in our universities are in separated silos and teach in separated projects). Different sizes, scales, times and complexities necessarily interact. In the figure below (Figure 1), the problem is up on top, the answer down below. They each have different time scales and they necessarily interact.

Over time, design must iteratively interact globally to locally to globally..... Therefore, we need linked design at more than one size, scale, and time in every project that we do.



The organization of making a design must adapt to different sizes, scales, times, and complexities.

This is a problem for a single designer, a single human being. You may have a client of a family with four children. Each of them has a different view of what the design should be. You meet with them but not too often. You pick one basic idea, you move your design forward, you make presentations for each of the client group. They are happy and they build their design. That's the basic strategy, all the rest is embroidery.

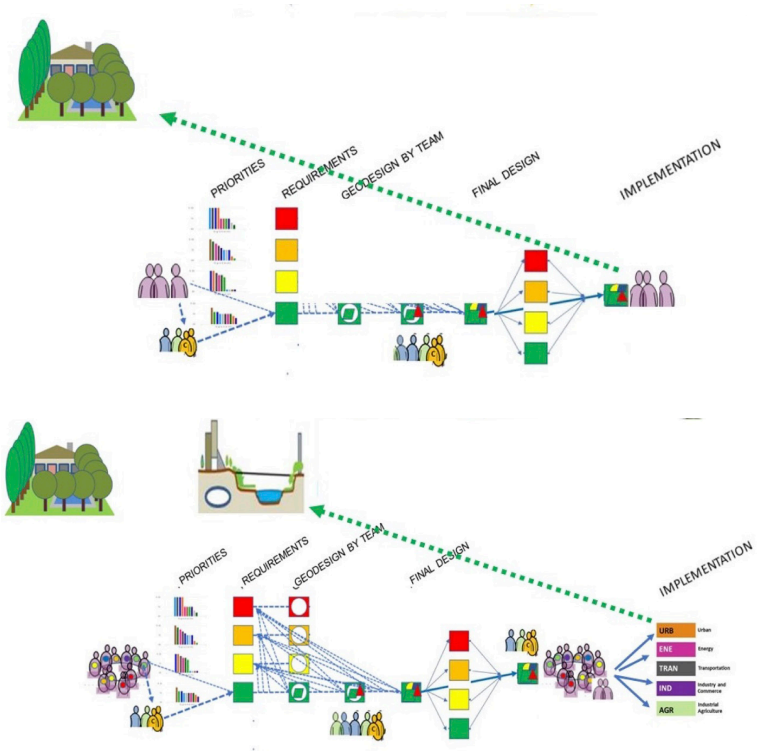
Figure 1 (above)
Design occurs at and for different sizes, scales, times and complexities. Design cannot work well in separated »silos«

Figure 2 (below)
Over time, design must interact globally to locally to globally. Therefore, we need linked design at more than one size/scale/time

As the problem gets more complicated you need a design team with consultants, but you still have the same model. You're going to design a park along the river as part of a large urban design project. But this time the project is more expensive. So, you're going to pay real attention to these people and what they want, but you're still going to take one basic idea and move it forward and present to them. But this time, you have to make or relate to designs for each of the pieces: energy, transport, industry, agriculture, whatever the main parts are. In other words, the design is not making one set of working drawings. It's also making a sub-design for each of the pieces.

The problem gets even more complicated when you might have a place that has different groups of people and they disagree with each other. Each of these groups has a different set of priorities related to transport, food, water, air, jobs, parks, houses etc.. They each have a different perspective. Here, you need a large design team. And the problem is that you must meet with them many times and you probably have to meet with them one at a time.

You start out with one idea, go forward and have many first meetings... and something goes wrong. And what you told those first people has changed, so you have to go back to the beginning. A project like designing the doubling of a city or designing the remaking of a city could be a 10-year design problem in an office. This organizational model doesn't work anymore because you have to deal with the minister of this, and the representatives of this, and the minister of this, the mayor of this. And they each want their interests to be part of the design.



What you have to end up doing is co-design. adopting a model of co-design (geodesign) and the most important design method then becomes negotiation. In other words, each of the plural clients needs a design with their own priorities and their own requirements. Then they have a process of informal negotiation, and a process of formal negotiation to get to agreeing on a final design. *The design emerges!* In other words, you don't prematurely agree on the goals, you understand at the beginning that the participants do not agree with each other. They each have their design aims and you need to figure out a method of designing by negotiation.

That's how I taught my studios (15 students - one design) in a shared design

Figure 3 (above)
Design process of a designer (with assistants)

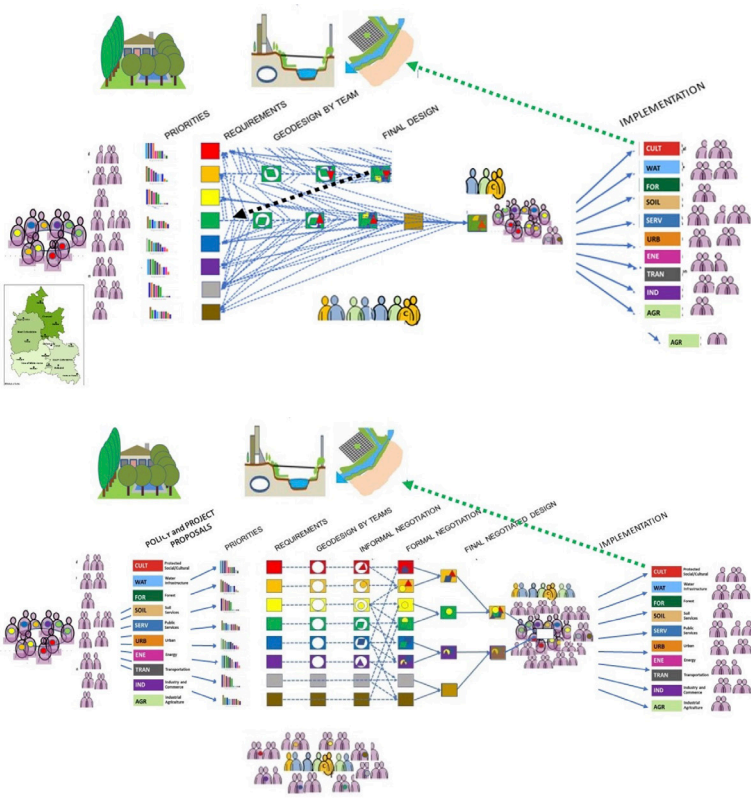
Figure 4 (below)
Design process of a design team (with consultants)

language. Each student made a preliminary design and then they had to negotiate and redesign. When they negotiate, they are really learning that a design isn't good just because you made it. The surprising thing is that, at the end of that process, they almost always said that the end design which emerged is better than what any of them had at the beginning. Why? Because they learned from the integration of the additional complexity of other people's views.

International Geodesign Collaboration

In 2015, at the annual Geodesign Summit conference, I proposed that the universities of the world that had design schools all share the same design language. In 2018, Tom Fisher, who was the Dean of the design school at the University of Minnesota, and Brian Orland, who has been Professor at Illinois, Penn State and Georgia, and I started the International Geodesign Collaboration (IGC) to focus on the design of very large landscape systems.

The IGC now has 240 universities in 61 countries, and about 500-600 people in it. We share the same design language. Our projects include water, agriculture, green infrastructure, energy transport, industry, institutions, housing, and two flexible systems that we don't define because you have different circumstance. We've all work with at least two or three scales on any project, the scale that's bigger and smaller to set the context, and the scale that we're really focused on. We work on three scenarios, early application of innovations dealing with climate change mitigation and adaptation, non-application of mitigation and adoption, and late mitigation and adoption and we judge the impact on the UN Sustainability Development Goals in our projects.



When we analyzed the first 50 designs (looking at a continental level and at the economic levels of development) , we found that the priorities selected by our academic colleagues were very different. The conclusion that we made was that a single set of global policies and projects will not be workable, and that regional and local variation will dominate decision-making for geographic, economic and political reasons.

So, the problem that you have as a designer is: Where are you? What's the set of things that you can do in your geography to deal with a global problem like climate change? The answers will be different. The Europeans in general will not solve the

Figure 5 (above)
A design process of a large design team (with consultants) and with very many meetings

Figure 6 (below)
Co-design process with a design team, with negotiation as the design method. The design will emerge

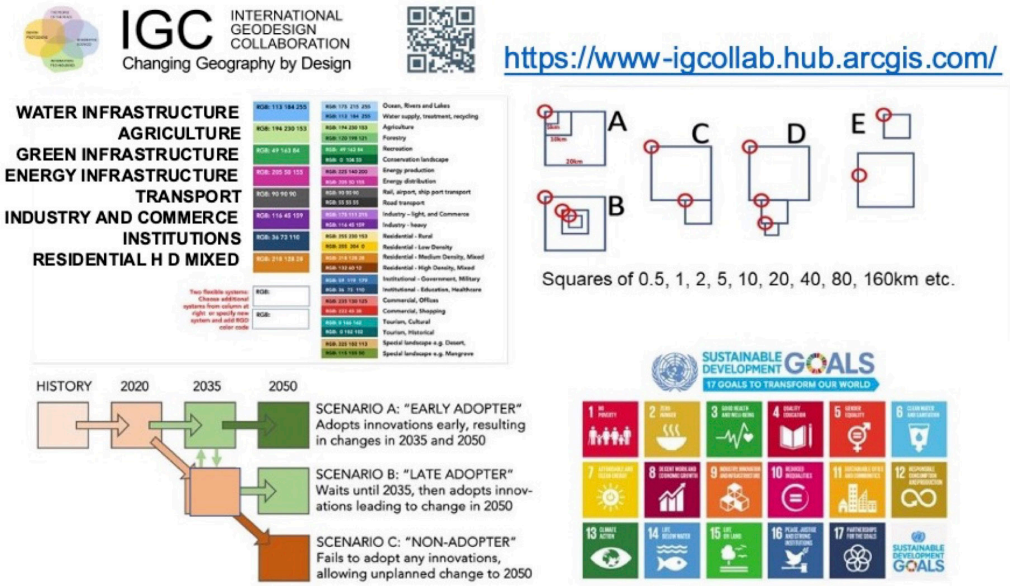


Figure 7
International geodesign collaboration requirements

same problems in the same ways as on the African continent. It is complicated and we can't copy each other. But what if the problem is the design of whole world? What if our aim is to design the whole world to respond to climate change by reversing it harmful causes?

I think the whole planet is our most important design problem and objective. The globe is going to be co-designed with the design team being the leaders of many jurisdictions, and with negotiation is the design method.

The global design

About four months ago, I was offered the support so that the IGC could make a global geodesign study. We needed to figure out a way to make a global design that must be locally implementable and global at the same time.

Over the most recent million year period, atmospheric concentrations of carbon dioxide and methane peaked at around 280 parts per million and 600 parts per billion respectively. Now they're at 420 and 1900 and rising exponentially. By 2100, 80 years from now, the temperatures might be back up to where they were 5 to 10 million years ago, long before the age of humans. That's very important because the question is, where are you and are you causing the problems or potentially solving them?

Figure 8 shows four maps that are important. The upper left is where water is scarce now and if it's brown, it's scarce 12 months of the year. On the upper right, is a map of the change in crop yield if the climate temperature increases 3 degrees Celsius. Dark red is 50% loss in the same area. Dark green is that it could get much better. Bottom left map shows that population is still growing in areas that export people because of problems of access to

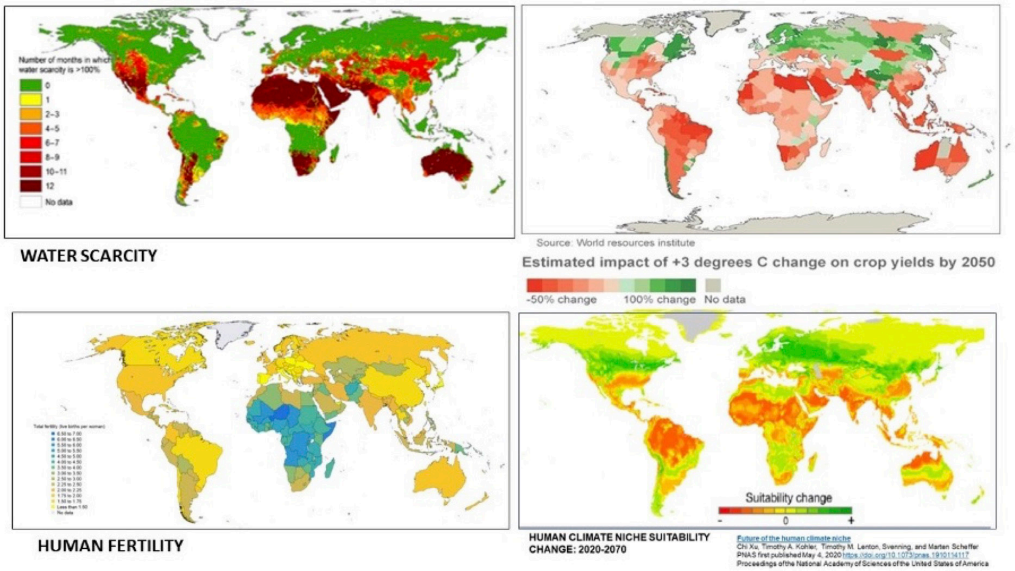


Figure 8
Four paramount maps for the global geodesign study

food and water and other economic and social issues.

The map in lower right shows an index of Human Habitat Suitability. If it's red, it's means you're a candidate to migrate. If it's green, you're going to be a receiver of migration. At an 11 billion projected global population by 2070 a billion and a half people at current practices will be candidates for migration

The global project, the problem that we're going to conduct, is a collaboration, and I invite you all to participate. The problem is not how to maintain a one point five degree celsius limit as per the Paris agreement, but a 0 degree increase over pre-industrial levels. In other words, we think that the IPCC is too timid. The real problem is, how do you get the carbon greenhouse gases out of the atmosphere? And how do you remake the surface of the Earth, the landscape and cities so that they get the carbon out before the concentrations kill the global ecosystems, including us? If you wait to 2050, which is what the US government, and the Europeans are saying, what happens between now and 2050 to make the situation worse than we're having even now.

This cannot just be Net Zero. That can't possibly deliver a stable climate because today's atmospheric CO2 concentrations already exceed the level of a long-term stable values which we had pre-Industrial revolution and certainly pre-1970s. 2050 is too far ahead. Are we going to accept a bad scenario? What does this mean for the landscapes of the world?

We propose a much more radical position and maybe a Don Quixote experiment, but I think that's the problem that you should give your students. You should give it to your students because in their lifetimes, by the time they are leaders, that's the prob-

lem that they'll have. It's not today's client and today's site. It's tomorrow's unknown client and tomorrow's site that they want to be doing schoolwork on now. It's what can you do now to lower carbon and methane in the atmosphere by 2030 so that by 2050 and afterwards things are much better for all.

We have built tools that link Esri's Geoplanner, Geodesign Hub and climate science models. We have developed a large matrix of climate mitigation actions and techniques along with carbon emission and/or sink estimates. These will guide you to climate actions that you should think about. We are going to be working on terrestrial ecosystems, including territorial waters , at local, regional and global scale as the basis of design. We offer everything free of cost as guidance to any local team in in the world.

What we're going to do is generalize from the local variants to a potentially feasible 2030 global design and ask, "What's the difference?" "How effectively can climate change be mitigated by concerted local action by 2030 so that the current things don't continue to get worse until 2050 and really kill many more people?" And if we are right, you have to change everything. We will need global action to be agreed from the top down and implemented by coordinated local actions from the bottom up.

Conclusion

We have two serious objectives. The first is to add geodesign based on the ecological units that make up the landscapes of the world to international climate negotiations. The second to change geodesign education to being more multidisciplinary and much more serious. We invite every University in any discipline to join us, but especially landscape architects because they tend to be the ones best prepared to lead this kind of work.

More details about the Global Climate Geodesign Challenge project can be found at the International Geodesign Collaboration website: https://www-igcollab.hub.arcgis.com/pages/gcgc

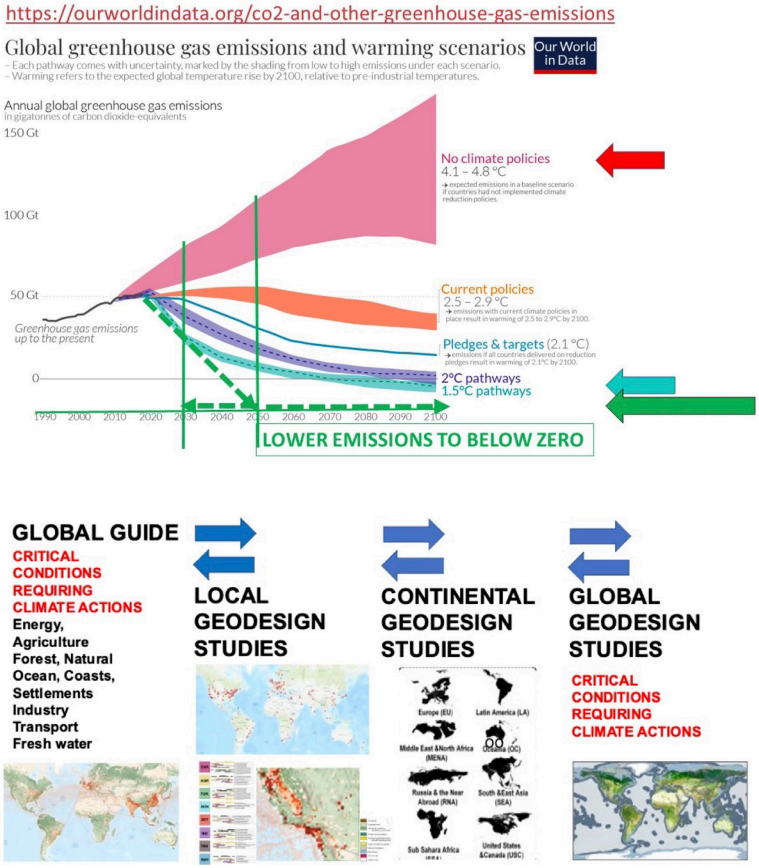


Figure 9 (above)
Global geodesign study greenhouse gas emission target

Figure 10 (below)
The Global Climate Challenge Strategy

0001
EVOLUTION AND REFLECTION

Evolution and reflection – Back in Ljubljana, and still talking about definitions…

Richard Stiles

After 50 years of professional evolution the fact that we are still hung up on definitions of the landscape architecture suggests that this is a discussion about more than just empty words. 30 years ago, the first Ljubljana ECLAS Conference in September 1992 addressed this problem, and I was lucky enough to be able to make a contribution to the discussion which was subsequently published (Stiles, 1994)[1]. The paper argued that landscape theory could provide a unifying bridge between landscape planning and landscape design, but it raised more questions than it provided answers. Viewed from today's perspective it seems that the issue is still far from resolved. Back in Ljubljana after 30 years it is perhaps time to reflect whether we have got any closer to clarifying the issue and what can be done to advance the discussion.

At the time the paper suggested that worrying about definitions did not get us very far:

> *"Defining job titles within the landscape profession/discipline appears to be a pastime of almost endless fascination to its members, but it is one which can only be of limited value, especially at the international level. This is both because of the problems caused by translation between languages and due to the varied way in which professional roles have historically become divided up in different countries."*

Of course, there is a good pragmatic case for finding and agreeing on an acceptable professional title and sticking to it, on the principle of Shakespeare's "*What's in a name? That which we call a rose by any other name would smell as sweet.*" This corresponds to Popper's 'nominalist' approach which uses a name as a convenient way to refer to a recognised entity, rather than the alternative 'essentialist' approach which start from the opposite direction by trying to focus on essence of the entity itself. My paper in 1992 favoured the nominalist approach.

The reasons behind the discussions in Ljubljana 30 years ago were, as I recall, related to establishing the legitimacy of the landscape architecture profession and the nature of its various specialisations/sub-disciplines. Establishing precise and agreed definitions was felt to be one way of achieving this both for landscape planning and design. But, perhaps after 30 years of professional evolution, there is a case for a new reflection on classifying and describing professional structures in landscape architecture and their official

[1] Stiles, 1994, Landscape theory: a missing link between landscape planning and landscape design, Landscape and Urban Planning 30, 139 - 149

designations from a different, and perhaps more pragmatic perspective.

The scientific discipline concerned with classifying things and naming them is taxonomy. Although the subject matter of taxonomy is usually the world of biology, it can be applied to many fields, also professions. This is practised by, above all, the International Labour Organisation, an agency of the United Nations – more on this below.

Irrespective of what is being classified, taxonomists are often characterised as being one of two sorts, either 'lumpers' or 'splitters'. One group tends to focus on the similarities of the entities which are being classified, grouping them more often together, while the second group concentrates rather on the differences and is consequently inclined to divide a group into smaller units.

So how would taxonomists deal with landscape professionals? Lumpers might be expected instinctively to perceive it as one unified profession called, for the sake of argument, landscape architecture, whereas splitters would tend rather to focus on the differences between landscape planning, design and management. At this stage I should perhaps declare my position as a lumper, something which has not significantly evolved since writing the 1994 paper referred to above, which argues in favour of a unified profession on the basis that the theoretical basis of landscape planning and design have more similarities than differences.

But there are also important pragmatic and practical reasons for a unified profession, perhaps the most important of which is size. In the case of a relatively small and still young profession, which needs to gain recognition and promote itself - such as landscape architecture - 'more is more': the political weight and thus the influence of a professional group corresponds closely to its combined physical weight i.e. the size of the membership which it can claim. Critical mass is certainly needed in order to gain wide influence, but this does not only apply to young professions' as discussed below. The greater the resources behind the representation of any profession, human and financial, not to mention ideas, the more effective it can be.

In the taxonomy of professions, as with that of biological species, the outcomes of the classification and naming process only represents the results of a snapshot in time. "*Nothing in Biology Makes Sense Except in the Light of Evolution*", as the great biologist Th. Dobzhansky remarked, and similarly, nothing in the taxonomy of professions makes sense without taking account of specialisation over time. Thus the longer a profession has existed, the greater one would expect the diversity of sub-disciplines to be. Reference to some other long established professions gives us the opportunity to test this hypothesis about professional evolution.

The architecture profession can be traced back many centuries, but while the claim that architects can design anything 'from the teaspoon to the city' has been attributed to various people, the profession remains stubbornly unified and has largely resisted splitting into a series of different specialist professions, except perhaps for having given rise to urban and regional

planning as an independent profession in some countries and interior design in others. The lesson here for landscape architecture appears to be that here at least there is not a necessary connection between longevity and professional diversification, suggesting that 'unity is strength'. But maybe looking at the situation with regard to an even more well-respected and longer-standing profession would also be instructive, namely medicine. As with architecture, the medical profession can trace it roots back to classical times at least, but while much has changed since the days of Hippocrates, today medics still top worldwide surveys of the most respected professions. The European Union of Medical Specialists recognises some 43 specialist sections, from anaesthetists to vascular surgeons[2]. Here too the message is similar to the case of architecture: while the medical profession has evolved an extensive structure of specialities over the years, medicine is still medicine and school leavers enrol on degree programmes to study medicine, not one of its sub-specialisms. Within the medical profession there is certainly a clear differentiation between, for example, brain surgeons and paediatricians, but in its outward dealings with politicians and the public, the medical profession presents one unified body. Landscape architecture please take note! In the language of taxonomy, we are talking here about 'sub-species' and varieties rather than independent species.

The United Nations' International Labour Organisation's taxonomy of occupations recognises landscape architecture as an independent occupation in its International Standard Classification of Occupations (ISCO)[3]. This functions both through providing categories for compiling internationally comparable statistics, as well as by providing detailed occupational descriptions covering tasks and duties. Landscape architects are classified alongside architects and town planners, each being recognised as separate groups within the overall classification of Architects, Engineers and Related Professionals.

At the time of the 1992 Ljubljana ECLAS conference the current version of the ISCO was dated 1988. Here, under Code 2141 landscape architects were grouped with architects, town and traffic planners in a category which included:

- Architect, building
- Architect, interior
- Architect, landscape
- Planner, traffic
- Planner, urban

The tasks each profession undertook were described in a common list of activities with the separate professional titles only listed at the end, as above. This might go some way to explaining why the 1992 ECLAS conference was eager to agree some more specific and detailed definitions of the various parts of the profession. But the ISCO is under constant revision, presumably to reflect the continuing evolution of the professions. Whether or not the outcomes of the ECLAS 1992 had any role to play, the next version – ISCO 08 – contained the following more detailed explanation of the tasks of landscape architects, together with a more detailed list of activities:

Landscape architects plan and design landscapes and open spaces for projects such as, parks, schools, institutions,

[2] https://en.wikipedia.org/wiki/European_Union_of_Medical_Specialists

[3] Bureau of Statistics, work unit of the Policy Integration Department (ilo.org)

roads, external areas for commercial, industrial and residential sites, and plan and monitor their construction, maintenance and rehabilitation.

However, here although it was stated that landscape architects 'plan', the description of their tasks is a very narrow one, focussing largely on the design of parks, and external spaces. Little wonder that those involved in landscape planning as a strategic activity at a territorial scale felt that they were not represented. While this was an improvement on ISCO 88, looked at from today's perspective – and perhaps even that of 1992 – it was still far from satisfactory.

But the process of professional evolution did not stop with ISCO 08, and thus the professions, taxonomists have now agreed a new description of landscape architecture with IFLA which is due for publication in the next ISCO edition. The following table compares the two definitions and illustrates the evolution which the profession has undergone over recent years.

What immediately catches the eye is the fact that both the lead statement and the tasks statements have been considerably expanded to cover planning, designing and managing natural and built environments. This certainly exhibits a very different perspective to that from 2008 and one which gives a far better reflection of landscape planning activities than previously – although given the time-lag between agreement of a new definition and the publication cycle of a new ISCO, the ISCO 08 description probably stems from several years previously. Furthermore, given that the last two ISCOs were published at 20

ISCO 08 Code 2162 Title EN Landscape architects	**REVISON AGREED BY DELEGATES TO THE IFLA WORLD COUNCIL, SEPTEMBER 2020**
Lead Statement Landscape architects plan and design landscapes and open spaces for projects such as, parks, schools, institutions, roads, external areas for commercial, industrial and residential sites, and plan and monitor their construction, maintenance and rehabilitation.	Landscape Architects plan, design and manage natural and built environments, applying aesthetic and scientific principles to address ecological sustainability, quality and health of landscapes, collective memory, heritage and culture, and territorial justice. By leading and coordinating other disciplines, landscape architects deal with the interactions between natural and cultural ecosystems, such as adaptation and mitigation related to climate change and the stability of ecosystems, socio-economic improvements, and community health and welfare to create places that anticipate social and economic well-being.
Task statement Tasks include:	
(a) developing new or improved theories and methods in landscape architecture;	(a) Developing and managing the landscape by carrying out actions and preparing and implementing projects for heritage protection, preservation of natural and cultural landscapes, rehabilitation of degraded landscapes, and new development through a process of design, planning, management and maintenance.
(b) inspecting sites and consulting clients, management and other stakeholders to determine type, style and size of proposed buildings, parks, roads and other open spaces;	(b) Conducting research and analysis to develop sustainable landscape design, planning and management practices, theories, methods and development strategies to promote green infrastructure, the sustainable management of natural, agricultural, rural and urban landscapes and the sustainable use and management of global environmental resources.
(c) compiling and analyzing site and community data about geographical and ecological features, landforms, soils, vegetation, site hydrology, visual characteristics and human-made structures, to formulate land use and development recommendations, and for preparing environmental impact statements;	(c) Carrying out feasibility studies and impact assessments to gauge the effect of development on the ecology, environmental character, cultural values and community health and welfare of landscapes.

year intervals (1988 and 2008) when the new definition of landscape architecture can be expected to appear in ISCO 2028, it will also be at least 10 years old and perhaps already out of date.

Certainly, one can reflect that this evolutionary jump in the description of the tasks and overall understanding of landscape architecture is a result both of changing perspectives within the profession itself, as well as a recognition of the expansion of the whole concept of landscape on the part of society as a whole. This is also reflected in the European Landscape Convention, which has re-focussed both the wider public and professional attention on the role and importance of landscape. One result of this has been an increased or revived interest on landscape on the part of other disciplines. Thus geographers, ecologists, architects, planners and archaeologists, amongst others, have since discovered or re-discovered their interest in the landscape as a subject for study and intervention.

Today, some 30 years after ECLAS 1992, at a time when at first it might have appeared that the Landscape Convention and the new ISCO definition of landscape architecture might have settled the question as to the nature and role of landscape architecture, it has instead come into renewed focus. The discipline is once again faced with the challenge of defining its 'unique selling proposition', not just as an internal academic exercise, but to the 'wider world' – or at least to a Europe where the Landscape Convention has raised the stakes as far as landscape is concerned.

And, despite the success of the new definition of the professional tasks for what will perhaps be ISCO 28, there is still work to do. Current discussions with the European Commission regarding a Common Training Framework within the provisions of the Professional Qualifications Directive

(d) preparing reports, site plans, working drawings, specifications and cost estimates for land development, showing location and details of proposals, including ground modelling, structures, vegetation and access;	(d) Collecting and documenting data through site analysis, including an appreciation of indigenous practices, land-form, soils, vegetation, hydrology, visual characteristics and human-made and managed features.
(e) writing specifications and contract documents for use by builders and civil engineering contractors and calling tenders on behalf of clients;	(e) Preparing landscape documentation, including drawings, specifications, schedules and contract documents, and calling tenders on behalf of clients.
(f) making necessary contacts to ensure feasibility of projects regarding style, cost, timing, and compliance with regulations;	(f) Managing digital technologies and representation of spatial systems, and client and/or community presentations related to the environment and landscape.
(g) identifying and finding best solutions for problems regarding function and quality of exterior environments and making necessary designs, drawings and plans;	(g) Engaging local communities, authorities and stakeholders by public participation in decision-making relating to projects that impact landscape.
(h) monitoring construction or rehabilitation work to ensure compliance with specifications and quality standards;	(h) Providing expert advice and advocacy on landscape matters in conflict resolution, judicial courts and commissions, competitions, media and public relations.
(i) maintaining technical liaison and consultancy with other relevant specialists.	
Included occupations Examples of the occupations classified here: - Landscape architect Excluded occupations Some related occupations classified elsewhere: - Building architect - 2161 - Urban planner - 2164 Notes Comments ISCO 88 Code(s) 2141, part	Examples of the occupations classified here: - Landscape Architect The profession of Landscape Architect may be adopted under different titles by non-English speaking countries. Some related occupations classified elsewhere in ISCO 08: - Building Architect – Number 2161 - Urban Planner – Number 2164 AGREED BY DELEGATES TO THE IFLA WORLD COUNCIL, SEPTEMBER 2020

will also call for the adoption of an accepted definition of the profession. However, the continuing debate over definitions of the profession should perhaps rather be seen as evidence that the vision and fields of activity of the profession continue to evolve. This should be viewed not as an embarrassment, but as something to be actively welcomed.

Looking back at three Ljubljana conferences; theory, practice and education in landscape architecture

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Abstract
The department of landscape architecture in Ljubljana has organised several international conferences over the last fifty years. In this paper I will analyse three of them from the viewpoint of relations between theory, theory & practice and education. The goal is to investigate how these relations have evolved and how that affects contemporary teaching and research. The research method comprises a comparative analysis of proceedings with the goal of critical analysis, reflection and accumulation of insights. The outline of the paper is built up in three parts. First, the three conferences will be analysed based on an explicit analytical framework. In the second part the results of the analysis will be put in a context of other publications and research, with a focus on theory & practice in education. In the last part the results of the two parts will be related to teaching; the different teaching modes, the role of research and the development of design thinking. In the conclusions the insight that design can be seen as a specific way of problem solving as compared to science, art and engineering, is put forward. The influence of research on design and vice versa, will offer new perspectives for teaching and for the new challenges of landscape architecture in the future. Especially the conference of 1992 has been an excellent start for theory development and definition of terms that can be used in education and research but should be followed up more explicitly also in future ECLAS conferences.

Keywords
Design knowledge, terminology, design & research, teaching design, ECLAS

Introduction
Over the last 50 years the School of Landscape architecture in Ljubljana has organised international conferences. In this article I will analyse the content of three conferences and reflect upon them from the viewpoint of the relations between theory, practice and education. I have chosen to analyse the conferences that took place in 1972 (Ogrin, 1972), in 1992 (Concepts, 1992) and in 2002 (Ogrin et al., 2002). Upon the announcement of the ECLAS conference in Ljubljana in 2022, the

content of the conference of 1972 (Ogrin, 1972) in the proceedings triggered my attention, first of all because the attention for landscape planning as a new work domain, secondly because of the relative lack of attention for design and for research. One of my research topics is the relation between theory and practice in landscape architecture which lead me to a second conference, the one in 1992 (Concepts, 1992). Highly exceptional for landscape architecture to have a conference with special attention to theory. In the 2002 conference on globalisation (Ogrin et al., 2002), I took part myself which gave me an insight into some of the traditions and characteristics of the Department of Landscape architecture in Ljubljana.

Why reflection?

In the evolution and development of any discipline, looking back at how it developed over time can be useful to provide insight into some of the backgrounds and evolution of ideas. Reflection, comparative analysis of plans and critique, are also in landscape architecture emerging more and more. In Europe the number of projects, of landscape architects and of schools have increased steadily in the second half of the last century and continues to do so in the 21st (Fieldwork, 2006; Holden, 2006; Diedrich et al., 2009; Holden, 2009; Diedrich et al., 2012; Diedrich et al., 2015; Diedrich, 2018; Diedrich, 2022; Davasse et al., 2022). Such a growth, demands for reflection and critical analysis of the past, to avoid 'navel gazing' or 'running around in circles'. Even though landscape architecture as a discipline is rather young, there are a number of interesting examples of reflection, based on different approaches. I mention here three. First of all a looking back at one's own work, like in the case of Olin (2008), Vroom (2014). Secondly, reworking, rewriting one's work and use the backgrounds to put forward an evolution, like Lynch (1981), Jellicoe (1993; 1995; 1996). Thirdly, looking back, analysing and interpreting the work of a designer by somebody else, such as Treib and Imbert (1997) did on the work of Garrett Eckbo, a Californian landscape architect. In this article I have used a fourth way, that is looking back by systematically analysing three conferences based on an explicit analytical framework.

Goal, scope and problem of the research

Goal of the research is to reflect on developments in the relation between theory, practice and education as a way to gain insight into some of the backgrounds of these developments. To limit the scope of the analysis and size of the paper, I will focus on how the results of the analysis could be useful in contemporary education. The problem statement is further elaborated into two specific research questions for this paper; 1. What were the ***relations between*** theory; theory & practice; theory & practice in education at the three conferences? 2. How did the issues of theory; theory & practice; theory & practice in education ***as such*** evolve over time?

Terms and definitions

Design knowledge: Design knowledge in this article is used as a generic term that stands for knowledge that is used in plan making, realisation of plans and theory development; comprising the body of coherent knowledge in design disciplines such as theories, descriptions of projects, design principles, types, guidelines, and cognitive strategies. Design knowledge in

landscape architecture differs from other design disciplines because the landscape as such is object of planning and design.

Pedagogy: refers to the theoretical basis of educational processes; the science of education. In the context of this article, pedagogy concerns the general principles of teaching design, the traditions of a school, its physical and cultural environment, and the educational goals defined by the school. The overall goal of education is personal development.

Didactics: refers to the science of teaching; ways of imparting knowledge. It covers the full range of activities such as teaching modes, assessment practices, human development, and curriculum development.

Training, learning, and education are used in this article to refer to basic teaching modes; training for developing skills, learning for acquiring knowledge, insight into the body of knowledge for landscape architecture and education for learning skills, acquiring knowledge and insight, in a context of values (ethics and aesthetics) needed for personal development and finding one's place in society.

Methods

Research questions, methods, research materials

The general research question is how theory and practice have influenced education in landscape architecture over the last decades. The research methods are mixed and based on the principles of case study research (Zeisel, 2006). Core of the research methods is a comparative analysis of three conferences. Such a comparative analysis always includes three steps; describing, analysing, interpreting. The research materials are based on the proceedings of the conferences. In the analytical framework, the general research question is elaborated into two specific research questions and on a focus on how the results of the analysis could be useful for contemporary education (figure 1).

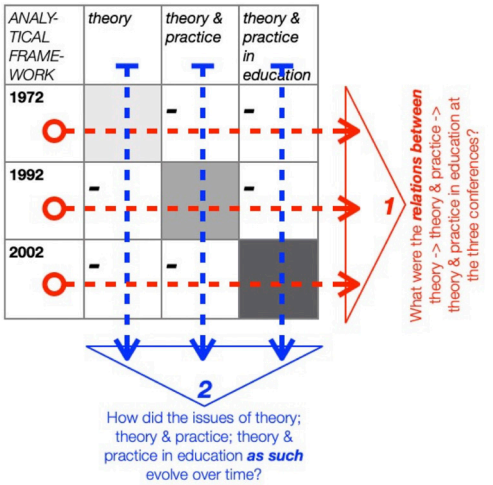

Figure 1
The analytical framework and two research questions as basis for the comparative analysis

Results of the comparative analysis

The international conference in 1972: Landscape planning – Proceedings of the International Symposium Ljubljana 29-31.08.1972 (Ogrin, 1972)

Figure 2 gives a concise overview of papers and countries that participated.

Some short remarks: Ogrin's paper is mentioned in the table of contents but is missing in my copy of the proceedings. Analysis of all papers is in some cases complicated for me because not all contributions are translated into English, my knowledge of German and Slovenian is not sufficient.

– In all papers, planning is associated

with the large scale, mostly regional; rural planning, motorway planning, planning for tourism and recreation, planning for nature conservation
- There are three papers on practice or from practitioners; Benthem (NL) presents landscape plans designed by the Dept. of landscape architecture of the Dutch Forest Service. During the 1972 conference, the plan figure of 'landscape plan' came to the front in different presentations but in the later conferences 1992 and 2002, not. In general, the plan figure of 'landscape plan' also stands for the typical landscape architectural approach in plan making. That means taking the existing landscape before intervention as point of departure and the viewpoint of the dynamics of the landscape and design as a basis for plan development (Toorn, 2008 [2]; 2014). This approach is usual for many types of projects and problem types in landscape architecture. Grebe (D) presents projects on relations to town planning. Ananogtopoulos (GR) focusses on the long-term planning in Greece.
- On theory there are two contributions; Vroom (NL) on methodology and Andersson (DK) on terminology
- In many papers there is a strong focus on landscape analysis as basis for planning. Only Hackett presents some backgrounds of analysis: why and how it can be used in planning. In most cases the planning approach is based on the development of models from which the final plan can be chosen. Implicit background of the focus on analysis seems; if you quantify, your plan will become more 'scientific'.
- Only Andersson pays explicitly attention to the role of design.

CONTENTS (titles of 14 papers)

NUMBER OF COUNTRIES IN PROCEEDINGS: 9

ENTRIES: 14
Denmark (1)
Germany (3)
Greece (1)
Israel (1)
Netherlands (2)
Slovenia (2)
Switzerland (1)
United Kingdom (1)
United States (2)

Figure 2
A concise overview of the Conference in 1972 (Ogrin, 1972)

- There is no paper referring to education or teaching.

The conference in 1992: Concepts in Landscape Architecture – Theory of the profession and its reflection in education – ECLAS 1992 (Concepts, 1992)
The conference in 1992 was an ECLAS Conference and can be seen as the first European conference dedicated to theory. In figure 3, a short overview is presented.

Some short remarks:
- The first question has been; what is landscape architecture? Stiles (1992) took the lead by distinguished between planning, design and management, a distinction which is still at the core of the ECLAS-definition nowadays. In later publications he elaborated further on the definition also from different viewpoints (Stiles, 1994; 1998; 2002). In a personal conversation he mentioned the influence of Catherine Ward Thompson from Edinburgh on the final version of the ECLAS definition. The title of Andersson's paper (1992) is clear: 'My definition of my profession this year'.
- A second question has been on the terms and definitions used in landscape architecture. Vroom (1992) gives in his paper a list of definitions that has been the start of his later book 'Lexicon for garden and landscape architecture' which was first published in 2005 in Dutch, a year later in English and in 2010 the second edition of the Dutch version was published.
- There were a few papers that referred directly to theory; Ogrin's paper (Ogrin, 1992) on ontological aspects of landscape architecture gives a coherent overview of theoretical backgrounds. Marušič's paper (Marušič, 1992) places landscape planning in the context of design and management and pays attention to the design process; an epistemological viewpoint. The two are complementary which is clearly intentional and well-thought of.
- There were three papers mentioning 'education' in the title: Filor's title is interesting; '(…) theory of the profession and its reflection in education' but he doesn't say anything specific about education. Marušič (1992); even though the term 'education' is mentioned in the title, in the text there is no explicit attention for education. Steinitz spends most attention to education but because his concept of 'design' is very much geared to design of models and linear thinking, his whole framework becomes a bit isolated from what is usually considered as design or theory.

Stoltz (1992), as representative from CELA (the US organisation of landscape architecture schools), mentioned in a review article that there was few theory, despite

CONTENTS (titles of 8 papers)

- Ontological Aspects of Landscape Architecture in its Articulation into Landscape Planning and Landscape Design
- Landscape Planning as a Systematic Approach for the Protection of the Natural Resources
- The Conceptual Complexity of Landscape Planning in Practice and Education
- A Vocabulary for Landscape Architecture
- Some Thoughts on Definitions and the Landscape Profession
- A Framework for Design Practice and Education
- Concepts in Landscape Architecture: Theory of the Profession and its Reflection in Education
- My definition of my profession this year

NUMBER OF COUNTRIES IN PROCEEDINGS: 6

ENTRIES: 8
Denmark (1)
Germany (1)
Netherlands (1)
Slovenia (2)
United Kingdom (2)
United States (1)

Figure 3
A concise overview of the Conference in 1992 (Concepts, 1992)

the theme of the conference. He was surprised about the diversity of opinions, interpretations of the participants.

The conference in 2002: Globalscape – Landscape planning in the era of globalisation – Conference proceedings (Ogrin et al., 2002)

Around the millennium globalisation was seen as a universal force, the term 'global village' (McLuhan, 1962) became well-known. There were much more participants at the conference from a large number of countries and schools, also outside Europe (figure 4).

Some short remarks:

- Landscape planning was still a core issue in most papers, albeit in the context of globalisation
- In the papers, the term 'landscape planning' is used interchangeably by some authors with 'environmental planning' and 'spatial planning'.
- Public participation is sometimes juxtaposed to expert knowledge. The role of landscape perception and user experience, sometimes in the context of aesthetics or ethics, is becoming more important.
- New analytical tools and techniques for landscape analysis; GIS and other computer applications.
- The majority of the papers dealt with the rural landscapes, mostly on the regional scale. There were relatively few papers on issues in the urban landscapes, maybe the effect of globalisation was considered to be more serious in the rural landscapes.
- Most of the papers and participants of the conference were concerned about the effects of globalisation on the landscape because of the fear of standardisation and the loss of identity. Identity, meaning and character of the landscape were used interchangeably.
- The European aspects got special attention including the landscape convention and nature conservation as 'global value' (Natura 2000). The landscape as a cultural system also got ample attention.
- Theory was largely absent in most of the papers, sometimes it was even lacking where it was needed; for instance in the ever growing use of computers. In general, reflective papers such as in the 1992 conference were missing.
- On the relation to education, Stiles presented student projects in Austria on local & global landscape changes as case studies. Prominski showed

CONTENTS (7 main sections and 38 papers in proceedings)

- IN THE ERA OF GLOBALISATION: VISIONS
- IN THE ERA OF GLOBALISATION: CHANGES AND CHALLENGE
- NATURE CONSERVATION AS A GLOBAL VALUE
- LANDSCAPE PLANNING: DEVELOPMENTS IN THE FIELD
- METHODOLOGY: OPPORTUNITIES
- PUBLIC PARTICIPATION AND VALUES
- LANDSCAPE CULTURE AND IDENTITY

NUMBER OF COUNTRIES IN PROCEEDINGS: 14

ENTRIES: 38
Austria (2)
China (1)
Croatia (1)
European Union (1)
Germany (4)
Israel (1)
Italy (1)
Japan (1)
Netherlands (3)
Norway (2)
Slovenia (13)
Sweden (1)
United Kingdom (4)
United States (3)

Figure 4
A concise overview of the Conference in 2002 (Ogrin et al., 2002)

student work from TU Berlin on new concepts for landscapes around Berlin as case studies, but left out the design part of the work. Toorn presented a paper explicitly on theory & practice in relation to education in which projects on water as design material in Dutch landscape architecture are used as case studies for precedent analysis. The results in the form of design means at different levels could then be used in teaching but were not presented.

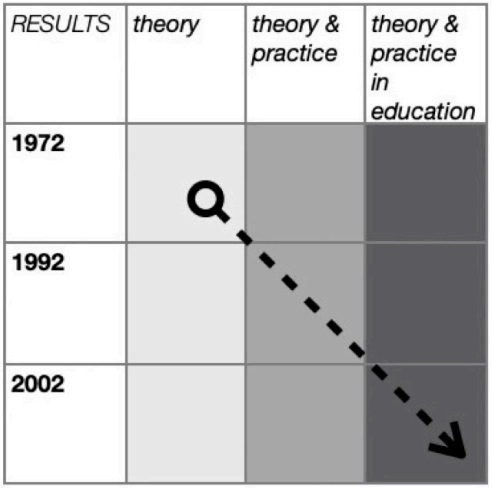

Figure 5
What could be the use in contemporary education based on the results of the analysis?

Discussion
How could this information be useful for contemporary education? In three steps we build up the information from the three conferences towards application in contemporary education (figure 5).

Theory
From a theoretical point of view, planning seemed to be developing from 'rule-based' to 'model-based'. Implicitly, planning was viewed as the 'scientific branch' of landscape architecture because of the dominant attention for analysis, it looked more 'scientific'. Theoretically, the design aspects of planning were completely lacking, which was strange and inconsistent with the definition of landscape architecture that emphasises the interrelations between planning, design and management. Stiles as participant of the 1992 conference presented his view on the definition of landscape architecture. As member of the ECLAS committee, he worked on defining landscape architecture for ECLAS as a commonly agreed definition. However, there were also inconsistencies compared to what Stiles had presented among some ECLAS members; even Ogrin mixed up definitions, for instance he considers 'landscape planning' and 'landscape design' as two disciplines while he viewed 'landscape architecture' as a profession. In his article in Landscape and Urban Planning in 1994, he elaborated further on ontology; he considers planning and design as different domains, also in theoretical sense (Ogrin, 1994). In the ECLAS conference in 2000, he works out the distinction between landscape architecture, architecture, land art (Ogrin, 2000).

The issue of theory was successfully put forward in the 1992 conference, but did not develop further in the next conference. The 1992 conference introduced the first steps in analysing the theoretical aspect of the relation between object and subject in the triplet ontology, epistemology, methodology, bound together in a consistent terminology (figure 6). Ogrin, Marušič, Stiles, Vroom were all in their own way, keen to put forward the importance of such a theoretical approach and set the first steps. Ogrin's focus on ontology is exceptional; I have not found any publi-

cation related to landscape architecture from that period, that deals with ontology. In the sequence of the three conferences, the accumulation of design knowledge has been missing. It is remarkable to see that also in other publications on theory in landscape architecture this triplet is lacking while it is quite commonly used in philosophy of science in other disciplines. For instance Vroom (2006) in his 'Lexicon' does also not include ontology, epistemology, methodology. There are a few exceptions of the use of these terms in that period, such as Schön (1992) where he puts forward 'design ontology' during the design process in which a designer 'constructs' his/her concept that implies idea & material, space & time as a unified idea. In the use of 'methodology' Herrington is one of the few who uses the term correctly for instance in her article on McHarg's science (Herrington, 2010). Overall, we see a gradual development of the insight that design can be seen an autonomous way of problem solving based on specific knowledge; design knowledge (Cross, 1982; Rowe, 1987; Prominski, 2008)

Theory & practice

In the first conference (1972) practice was prominently present in most of the papers and practitioners were also presenting, while in the last conference (2002) researchers were dominating in presentations. Traditionally site/landscape analysis can be seen as a form of research in landscape architecture, see for instance how Le Nôtre applied new knowledge and technology into a careful and precise site analysis that enabled him to make optimal and intelligent use of the conditions of the site in his plan making (Farhat, 2003; 2008; 2013). However other forms of formal research had not been part of regular practice. In all three conferences, the focus was predominantly on landscape planning which was viewed as a new work domain. Curiously enough there were no references to the systems approach, that was emerging in that period in planning in general but also in landscape architecture (Churchman, 1968; Chadwick, 1972; McLoughlin, 1972; Meadows, 2008; Berger, 2009; Murphy & Hedfors, 2011; Alpak et al., 2018; Berquist & Hedfors, 2018). In the second conference (1992) the focus was on theory and terminology but practice was in the background.

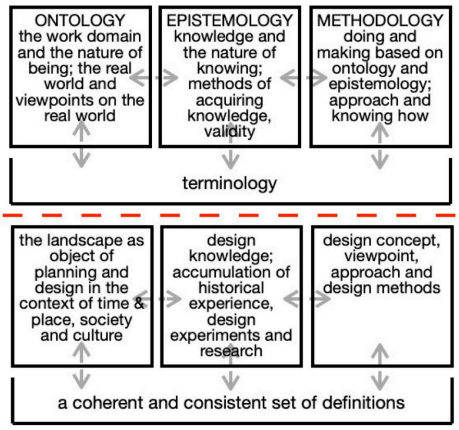

Figure 6

In philosophy of science ontology, epistemology and methodology are the main terms to describe, analyse and compare the body of knowledge with other disciplines (above the red dotted line). Ontology, epistemology and methodology are interrelated, that means the one influences the others. Terminology and definitions are relevant for all three. This scheme is here transposed and elaborated as a theoretical framework for design knowledge in landscape architecture

For Steinitz, planning is scientifically based with a focus on linear thinking, the conceptual aspects of design were and still are for him, not interesting. Where Filor (1991) presents a diversity of projects in which also social aspects play a role, the projects of Steinitz mainly focus on analysis of the physical aspects of the landscape as a basis for planning. Steinitz' viewpoints did not change during the three conferences, instead he made more use of the abundant new potentials of computers.

The presentation of his keynote in Ljubljana was for me like hearing his viewpoint on research and design of 50 years ago, only with newer and more powerful computers. I was very disappointed to learn that he had not kept track of developments outside his own domain of landscape analysis and GIS. In those fifty years not only the whole view on the concept of 'scientific' and the scientific method had changed fundamentally but at the same time the viewpoints on the concept of 'design' had changed from the time on that Cross launched his publications on 'designerly ways of knowing' in the 80s. At about the same time Schön (1987) published his study on 'Educating the reflective practitioner' in which he explicitly put forward an integrated approach to teaching design in general, to – what he calls 'artistry'. He also referred to Ryle and Polanyi referring to the quantitative and qualitative aspects. Apparently, during that time Steinitz kept stuck to his viewpoint on design that he had presented in his 1995 article; the dual view of design either as individual artistic activity based on intuition or design as the so-called 'scientific' approach in landscape analysis with quantitative methods, modelling and implicitly linear thinking of landscape development at large. His dualism sometimes gets a character of antagonism, even though he mentions about (…) *eventually integrating its two meanings*. In Ljubljana at the 2022 conference, he repeated his famous viewpoint on design: *design is negotiating*. By the way, Steinitz' juxtaposition is very similar to the distinction – and separation – between urban planning and urban design, while the term 'urbanism' does not at all integrate the two. Urbanism is rather vague in what it stands for and is being used as one of the many '-isms' that change constantly. I haven't analysed this but there must have been more than twenty types of 'urbanism' over the last fifty years. Marušič (2002) gives a comprehensive overview of landscape planning and its origins; he explicitly mentions the role of design thinking in landscape planning next to input from science and engineering.

On globalisation, nowadays there are also other aspects of the loss of identity, for instance in the guest lecture of Michael Jakob at Harvard in 2018 on standardisation in design, he shows the influence of the BIM software on standardisation in the landscape (Jakob, 2018). Weilacher (2008) gives an interesting example of the relation between theory and practice in the work of Latz.

Theory & practice in landscape architectural education; BSc, MSc, PhD programs

Since the millennium, the introduction of the Bachelor/Master system in Europe has fundamentally changed the educational landscape for all disciplines. Even in the 2002 conference, this issue was not touched upon. We will take the introduction of the BSc/MSc as a first issue to show how the results of the analysis of the three conferences could be of use in contemporary education (figure 7). The BSc/MSc implied two important issues. First, to enable students to exchange between different European Universities, the teaching language had to be in English. It caused for many teachers a major obstacle because teaching in English, if you are not a native speaker, is not so easy – certainly not at a Master's level.

What role does theory play in landscape architectural education? In the Bachelor's the focus of teaching is on learning 'how' and in the second place on learning 'why'. Theory is largely implicit in the form of use of archetypes, use of perception theories in learning to see and in visualisation and visual thinking, but is not taught as such. Research takes only place in site analysis, an introduction to types and analysing plans.

In the Master, the focus of teaching is on learning 'why' and in the second place on 'how'. In most Master's programs there is a course or seminar on 'History, theory, methods'. It is taught the first three semesters with a different focus in each semester. Research is explicitly part of studio teaching and students learn to analyse a problem in the start of a project by developing a first concept based on program and site analysis in the available time. Research plays also a role in the thesis that students work on in their last semester; developing their own research approach and outline.

A second issue was the introduction of research as an integral part of the whole Master's program around the millennium (Toorn, 2008 [1]). By now, we usually distinguish between three types of research in landscape architecture; research in design, design as research/research as design, research on design. A distinction that is similar to the one Milburn & Brown (2003) made; research before, during and after the design process. The different types of research could also be part of the BSc/MSc framework in education. In the BSc, the focus should be on basics of methodology and design approaches, learning to see and learning to do design experiments. In the MSc, attention should be paid to how to apply different methods for a program/assignment onto a site and on application of research on design into the design process such as research on evidence (Brown & Corry, 2011) or precedent analysis (Toorn & Guney, 2011). In the PhD, the triplet of ontology, epistemology and methodology should be the core of all research projects.

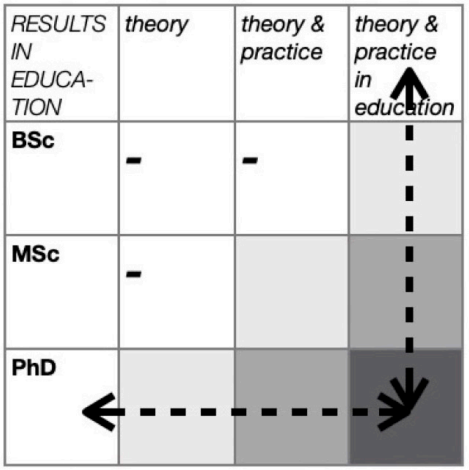

Figure 7
The BSc/MSc system as a framework for application of results of the analysis in education

In all three conferences research was considered to be an almost separate work domain. This was identical in most departments of landscape architecture all over Europe (Toorn, 2022). The issue of 'being scientific' was always in the background. The implicit idea among designers was that input from other disciplines was 'scientific' and consequently was improving the quality of the design process and the plan. In the second half of the last century this idea gradually faded away towards a more integrated approach of the design process where design and research mutually and constantly influence each other during the whole design process, resulting in an iterative approach. Here we

put forward two new developments that emerged and formed the basis for new insights on the concept of 'scientific'. First from the side of science and philosophy of science through the publication of Ryle (1946) on the distinction between knowing 'what' and knowing 'how'. Secondly from the side of design and designers through the publication on 'designerly ways of knowing' by Cross from the 80s on (Cross, 1982).

The new challenges for landscape architecture in the context of climate change will require new knowledge but at the same time there is also the existing knowledge that has to be applied in a new context (Lenzhölzer & Brown 2013). All interventions in the context of climate change will not only require a thorough knowledge of the landscape as a natural system but will also demand for knowledge of the systems approach and insight into systems thinking (Meadows, 2008). Energy transition, improving water management and the creation of comfort and healthy environments for people will put an even stronger focus on knowledge of the landscape as a natural system (Catalogue, 2021). Traditionally this knowledge is not new for landscape architecture but the focus on the systems approach will be explicitly needed. Especially for the existing knowledge, the accumulation of earlier experiences into a body of knowledge is required. Such a body of knowledge that is coherent and abstract, comprises a theory and a theoretical framework.

The use of the computer and digital technologies in landscape architecture is slowly getting in balance; that is, using it as a tool in the process of plan making instead of a goal. One of the interesting developments is for instance the renewed attention for hand drawing in practice for the conceptual part and in education as a means of learning to see and to develop visual thinking during the design process (Gazvoda, 2002; Toorn, 2009; Have & Toorn, 2012; Gazvoda, 2019).

Conclusions

In none of the three conferences, the relation with education was touched upon, albeit the issues were all relevant for education and a large part of the participants were educators. It does not mean that knowledge and insights from the conferences has not been used but it was not visible in the papers of the proceedings.

In the 1992 conference, theory development was introduced in a consistent way but there was no follow-up in the 2002 conference. Theory in landscape architecture is practice-driven but the relation between theory & practice and the input of practitioners was declining in later conferences. The theoretical and design aspects of planning were lacking in all conferences. Around the millennium in the BSc/MSc system, research became a core issue in education. For all design disciplines, the relation between design and research requires special attention from the viewpoint of pedagogy and didactics. A theoretical framework will also be needed to meet the new challenges for landscape architecture in the context of climate change.

Conferences do have an important role in the accumulation of design knowledge in landscape architecture that could also be an input in education. In ECLAS conferences, theory and theory development should get more attention, for instance in the selection criteria for abstracts and

papers by requiring explicitly the use of a coherent set of definitions and terms. The three conferences show the pivotal role of individuals in initiating issues they consider to be important; in all three conferences the same people played a key role. It seems to have been a network of participants with strong personal relations and similar research interests.

In Europe it is remarkable to see how much small countries in terms of population or land surface contribute to the development of landscape architecture as a profession and a discipline; Slovenia is one example.

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The New Landscape Declaration: The Actor-Network Theory From Call to Action

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Abstract
In 2016, LAF (Landscape Architecture Foundation) released The New Landscape Declaration, which brought together a diverse group of world-leading landscape architects to assess the past and hold a mirror to the future. This initiative, which went beyond the manifest rhetoric and quickly reflected on the action, was the first starting point of this research. After The New Declaration, was unavoidable to wonder how the dynamics in landscape architecture theory and practice have changed in terms of theory and practice. Actor-Network Theory, suggested by Bruno Latour in 1980s will be a critical method for creating the actor-discourse- practice scheme. By analysing these discourses within the discourse-analysis method, it is aimed to initiate a discussion on how this relationship constitutes an input to today's landscape architecture theoretical infrastructure. As a final goal, we hope to re-visit the theory of landscape architecture by looking at the landscape that emerges from the coincidence of these two methods and to take a critical look at the relationship between theory and practice we have constructed as contemporary landscape architects.

Keywords
New landscape declaration, theory and practice in landscape architecture, actor-network theory, discourse analysis, methodologies in landscape research

Introduction
The landscape hosts a set of events and phenomena in its environment. Thus, the concept of landscape is dynamic. It creates a harmony intertwined with a living environment and culture, sometimes disrupting the harmonies and enabling new kinds of unity. In this context, it has both a fixed and a variable structure. Landscape, like any concept, is primarily an idea, but it is extremely complex. Due to the multi-component nature of the landscape phenomenon, it is very difficult to define it empirically by sequencing certain keywords (Kaplan, 2009; Kaplan, 2017; Swaffield, 2002; Weller, 2001). Most of the calls for specific theoretical orientations for the discipline between 1950 and 1980 proposed the explicit advocacy of universal theoretical models. According to Meyer (1991), "Landscape theory is specific, not general. Like feminist criticism, landscape architectural design and theory is what is known through observation or experience, or what is immediate and sensory - what

everyone knows". Critical theory advocates such as Meyer (1991) and Corner (1991) have emphasised the fundamental connection between theory and the social and political context in which it is constructed and applied. One of the main contributions of critical theory to landscape architecture studies is its emphasis on the social and cultural dimensions of landscape. This approach provides landscape architects with a more holistic understanding of landscape and enables them to create spaces that reflect the needs and aspirations of diverse communities.

Manifestos in Landscape Architecture as Critical Actions

Although the definition of landscape changes according to different socio-physical components, it is possible to say that through years, the profession developed a heroic reflex to save the world, especially with the increase of socio-ecological crises. Manifestos are important practices that call for action in times of crisis because they provide a clear and compelling vision for change. The use of critical theory in landscape architecture manifestos enables a critical examination of the social, cultural, and political context of landscape architecture and provides a framework for addressing important issues.

The Declaration of Concern by McHarg et. al (1966) is a manifesto that marks the beginning of the environmental movement in landscape architecture. In the "Declaration of Concern", landscape architecture is shown as "the key professional discipline for solving environmental crisis" (Erbaş Gürler, 2017). The authors argue that the environment is under threat from human activities and that landscape architects have a responsibility to protect and preserve it (McHarg et. Al., 1966). "An Apocalyptic Manifesto", published by a group of researchers from Iowa State University in 2005, heralded that the 2000s would be productive in terms of discourse production in the profession. Arguments are made that there are divisions between academics and practitioners, and that most of the projects produced in offices are repetitive (Erbaş Gürler, 2017; Hohmann&Langhorst, 2005). Hohmann and Langhorst (2005) say that these problems permeate and become chronic, stating that the symptoms show that landscape architecture is not only problematic but also sick. The manifesto calls for a radical rethinking of the profession. The use of critical theory in this manifesto is essential for exposing the power relations and hidden assumptions that underpin landscape architecture. This provocative statement, which is a successful example of critical theory, has achieved its goal and counter-responses have begun to be produced from the professional community.

The most notable response to this pessimistic statement comes from United Kingdom; Robert Holden and Tom Turner have published An Optimistic Manifesto, which directly targets the "Apocalyptic Manifesto" and takes an optimistic attitude towards it (Holden&Turner, 2015). Manifesto argued that landscape architecture should be placed on three basic pillars in terms of ecology, society and aesthetics. Although Hohmann and Langhorst agree that landscape architecture is conservative on an organizational scale (those who practice the work, offices), they argued that the profession is not conservative on an individual scale and underlined that pro-

fessional researchers have made many intellectual contributions, especially in the last 50 years.

The New Declaration: Not Just a Call but an Action

The 50th anniversary of the first Landscape Architecture Foundation (LAF) conference has gathered with a conference in Philadelphia, USA to discuss the role of landscape architecture in the Anthropocene. More than 700 landscape architects for two days to discuss on their shared concerns for the landscape. Inspired by LAF's 1966 Declaration of Concern, the authors launched a new movement for 21st-century landscape architecture called The New Landscape Declaration (LAF, 2022). Underlining that landscape architects are uniquely positioned to bring related professions together in new alliances to address complex social and ecological issues, the authors made a promise to create places that serve the higher purpose of social and ecological justice for all people and all species and to take steps towards the health and well-being of societies (Gianetto, 2017). Many of the speakers pointed out how fifty years on from the first declaration we face environmental problems, with loss of biodiversity and wilderness, and global warming, and risk our own extinction when we will have exhausted the resources upon which human life depends (Gianetto, 2017). In this context, the supporters have prepared an action plan for common environmental and social concerns. The New Landscape Declaration has mobilized many individuals and organizations to provide financial and moral support to fulfil its mission to support the protection, improvement, and development of the environment. After this summit, which turned into a global action plan in a short time with the support of these organizations, we see a lot of production that feeds the landscape architecture environment both theoretically and practically.

The New Landscape Declaration differs from the three manifestos mentioned earlier in that it takes a more urgent and action-oriented approach towards addressing the challenges faced by society and the environment. While the earlier manifestos emphasized the importance of critical discourse and the need for transformative change, The New Landscape Declaration goes a step further by outlining a concrete action plan for achieving this change. It mobilizes landscape architects to take immediate action towards creating a more just and sustainable world. By publishing the New Declaration manifesto and the following action plan, LAF has established a very urgent theory-action network.

Methods

The New Landscape Declaration provides a concrete action plan for landscape architects to address social and ecological issues. Considering that, it is important to understand the theoretical underpinnings of this plan. Actor-network theory (ANT) provides a framework for understanding the complex relationships between different actors and actants shaped around this latest manifesto. Actor-Network Theory was used in the late 1980s in the field of science technology and society by Bruno Latour, Michael Callon, and John Law. Science, technology and society studies can be defined as a transdisciplinary research field that objectifies the historical, political, cultural, conceptual, and practical elements of the production

of science and technology (Mahmoud, 2015). Actor-Network Theory (ANT) is a social theory and research method that recognizes its objects (non-human) as part of the social structure. This theory attempts to overcome the modern epistemological distinction between human beings and non-humans by referring to them as 'actors' or 'actants' (Latour, 2008).

The relationship between two actors/actants and the delegation and translation of authority between them consists of four processes called "translations". These processes are:

- Problematization: The process where the actors involved and the problem are defined;
- Interessement: The process by which the Key Actor(s) engages other actors to take part in the network;
- Enrollment: The process by which rules are defined and actors are organized according to these rules;
- Mobilization: The process in which key actors take on the role of mediators and the network tries to mobilize passive actors (Latour, 1995).

Understanding the theoretical underpinnings of The New Landscape Declaration helps to evaluate its effectiveness. By examining how different actors are responding to the Declaration, we can gain insights into how it is shaping it's networks. This can help us identify areas where the Declaration is succeeding, as well as areas where it may need to be revised or improved.

Creating Actor-Network Theory of The New Landscape Declaration/Action

The New Landscape Declaration movement, which started under the leadership of LAF, was enclosed in a black box. In this context, first of all, a code hierarchy was determined in order to create the actor/actant, discourse, and practice model. Intermediaries and mediators are sub-coded under the "actor" code which refers to the human-based actors (such as organizations, landscape architecture firms, universities, etc.) and non-human actors (such as publications, meetings, projects, etc.). Discourses are divided into three sub-categories as keywords, concepts, and contexts. In the context, actors and actants are divided into intermediaries and mediators. Intermediaries are entities that have no influence on the relationship but help the relationship to spread, while mediators are entities that mediate the communication/interaction of different entities. Translations are the processes through which discourse is translated into action. This involves the enrollment of actors, the interessement of key actors to engage other actors, the mobilization of key actors as mediators, and the problematization of the actors involved and the problem they are trying to solve. Overall, understanding the relationships between actors and actants, as well as the processes through which discourse is translated into action, is crucial for implementing The New Landscape Declaration. The discourse surrounding landscape architecture is shaped by keywords, concepts, and context, which provide social and physical limits/triggers. These concepts guide the actions and products developed after the declaration.

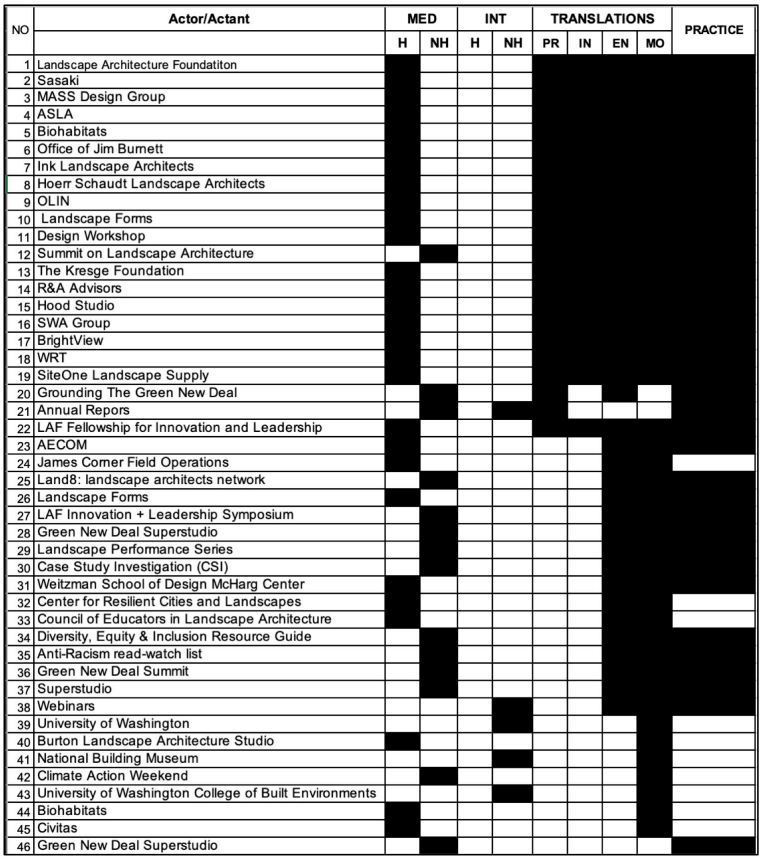
Results and Discussion

Actors as Intermediaries and Mediators of Theory to Practice

In the context of the New Landscape Declaration, actors and actants are organiza-

tions, institutions, or individuals that facilitate the communication or collaboration between different stakeholders involved in the process. These intermediaries play a central role in mediating the relationships and exchanges between different stakeholders and shaping the content and messaging of the Declaration. When The New Landscape Declaration movement was analyzed, a total of 100 lines of data were coded. There are 57 human/nonhuman actors in the process, 46 mediators and 11 intermediaries. 20 of these actors are present in the whole process from the beginning, providing both theoretical and practical contributions. Based on the information provided in Figure 1, the organizations listed as mediators and contributed to the practice are: Sasaki, MASS Design Group, Design Jones, Biohabitats, Office of Jim Burnett (OJB), Ink Landscape Architects, Hoerr Schaudt Landscape Architects, OLIN, Landscape Forms, Design Workshop, Summit on Landscape Architecture, James Corner Field Operations, Land8: landscape architects network, Landscape Forms, and LAF Innovation + Leadership Symposium.

Landscape Architecture Foundatiton and ASLA, two of the leading landscape architecture organizations, follow the process in terms of problematization and reflect the process in practice with their annual awards, reports, organizations and meetings within the scope of the movement. Many leading names of the sector such as Sasaki, OLIN, Martha Schwartz Partners, Landscape Forms have also contributed to the declaration and contributed to the process both theoretically and practically (Figure 1).



NO	Actor/Actant	MED		INT		TRANSLATIONS				PRACTICE
		H	NH	H	NH	PR	IN	EN	MO	
1	Landscape Architecture Foundatiton	■				■	■	■	■	■
2	Sasaki	■				■	■	■	■	■
3	MASS Design Group	■				■	■	■	■	■
4	ASLA	■				■	■	■	■	■
5	Biohabitats	■				■	■	■	■	■
6	Office of Jim Burnett	■				■	■	■	■	■
7	Ink Landscape Architects	■				■	■	■	■	■
8	Hoerr Schaudt Landscape Architects	■				■	■	■	■	■
9	OLIN	■				■	■	■	■	■
10	Landscape Forms	■				■	■	■	■	■
11	Design Workshop	■				■	■	■	■	■
12	Summit on Landscape Architecture		■			■	■	■	■	■
13	The Kresge Foundation	■				■	■	■	■	■
14	R&A Advisors	■				■	■	■	■	■
15	Hood Studio	■				■	■	■	■	■
16	SWA Group	■				■	■	■	■	■
17	BrightView	■				■	■	■	■	■
18	WRT	■				■	■	■	■	■
19	SiteOne Landscape Supply	■				■	■	■	■	■
20	Grounding The Green New Deal		■			■		■		■
21	Annual Repors		■		■	■		■	■	■
22	LAF Fellowship for Innovation and Leadership	■				■	■	■	■	■
23	AECOM	■						■	■	■
24	James Corner Field Operations	■						■	■	
25	Land8: landscape architects network		■					■	■	■
26	Landscape Forms	■						■	■	■
27	LAF Innovation + Leadership Symposium		■					■	■	■
28	Green New Deal Superstudio		■					■	■	■
29	Landscape Performance Series		■					■	■	■
30	Case Study Investigation (CSI)		■					■	■	■
31	Weitzman School of Design McHarg Center	■						■	■	■
32	Center for Resilient Cities and Landscapes	■						■	■	
33	Council of Educators in Landscape Architecture	■						■	■	
34	Diversity, Equity & Inclusion Resource Guide		■					■	■	■
35	Anti-Racism read-watch list		■					■	■	■
36	Green New Deal Summit		■					■	■	■
37	Superstudio		■					■	■	■
38	Webinars				■			■	■	■
39	University of Washington								■	
40	Burton Landscape Architecture Studio	■							■	
41	National Building Museum				■				■	
42	Climate Action Weekend		■						■	
43	University of Washington College of Built Environments				■				■	
44	Biohabitats	■							■	
45	Civitas								■	
46	Green New Deal Superstudio		■							■

The New Landscape Declaration reflects a process of problematization, which refers to the identification and framing of a particular issue or problem. In the context of The New Landscape Declaration, enrollment was facilitated by the LAF, which initiated and facilitated the participatory process, as well as other organizations, institutions, or individuals that contributed to the development and dissemination of the Declaration. Actants played a critical role in defining the rules and organizing the stakeholders involved in landscape architecture and design. The New Landscape Declaration reflects this process of translation, as different actants contributed

Figure 1

The Actor-Network Theory Graphic of The New Declaration process

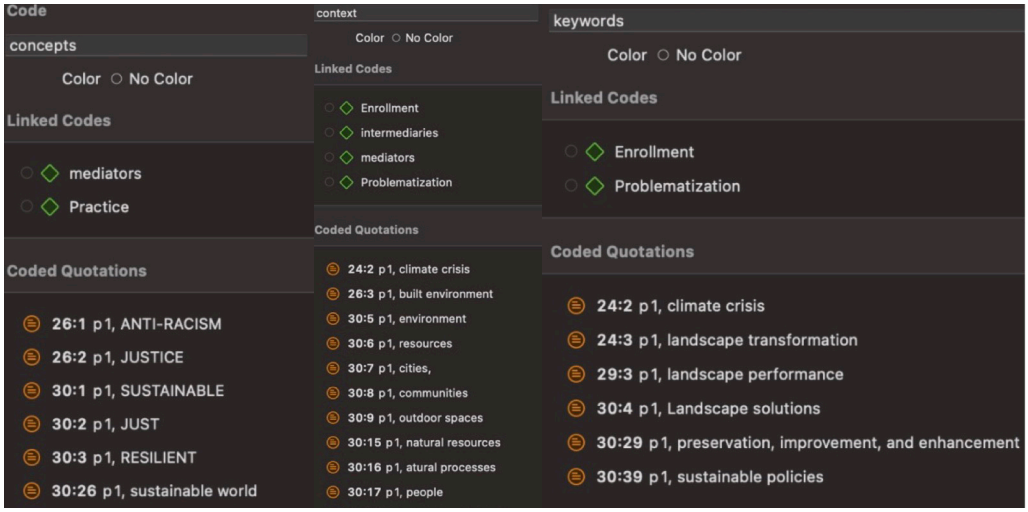


Figure 2
Discourse analyses of The New Declaration

to the development and dissemination of the Declaration. Leading landscape architecture organizations such as the American Society of Landscape Architects (ASLA), Sasaki, OLIN, Martha Schwartz Partners, Landscape Forms, and others have contributed to the Declaration both theoretically and practically.

The Network-Theory From Discourse to Practice

When we examine The New Landscape Declaration as an Actor-Network Theory with its theoretical background, we see that most of the concepts mentioned followed their way to practice. The contexts mentioned by both mediators and intermediaries can be described as the main concerns and target spaces behind the declaration (Figure 2). Most of the context and keywords are described mostly in the problematization and enrollment processes which are the problematics and rules defined.

By identifying the critical dimensions that should be addressed in a case study to critically document and evaluate projects and issues, LAF is contributing to the collective record of the advancement and development of new knowledge in landscape architecture. This approach aligns with the principles of The New Declaration, which emphasize the need for a holistic approach to landscape design. The actions taken by the Landscape Architecture Foundation (LAF) through the Green New Deal Superstudio initiative align with The New Declaration's actor-network system from theory to practice. The Superstudio was a national call and conversation aimed at translating the core goals of the Green New Deal into design and planning projects that respond to the specific needs of different regions.

The research initiatives and Superstudio organized by LAF provide a platform for landscape architects to engage with current issues and develop practical solutions that can be implemented physically. The actions taken by LAF, such as collaborating with the Weitzman School of Design McHarg Center, the Center for Resilient Cities and Landscapes, the American So-

ciety of Landscape Architects (ASLA), and the Council of Educators in Landscape Architecture (CELA) in organizing the Green New Deal Superstudio, shows a commitment to interdisciplinary collaboration and knowledge-sharing. By investing in research and organizing initiatives such as the Green New Deal Superstudio, LAF is helping to create a body of knowledge that can inform policy decisions and advocate for design solutions that are sustainable, equitable, and responsive to the needs of communities and the environment (Figure 3). As a final result, it is possible to say the actions taken by LAF serve as important networks that carry discourse to practice in the New Landscape Declaration manifesto by bridging the gap between theory and practice, promoting interdisciplinary collaboration, and advocating for sustainable policies and design solutions.

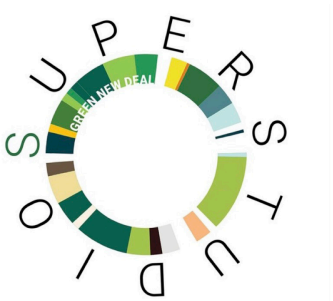


Figure 3
Poster of Grounding The Green New Deal Summit and Superstudio, 2022

Conclusion

The New Landscape Declaration is a manifesto that outlines a vision for landscape architecture in response to the challenges of the 21st century. In this context, critical theory plays an important role in shaping the discourse and practice of landscape architecture. Especially today, when the effects of global climate change are rapidly being seen, there is an organizational effort towards this phenomenon in the landscape architecture environment. In this environment where theory is intertwined with practice, formations no longer show themselves as linear relations but as networks.

Manifestos are important practices that call for action in times of crisis because they provide a clear and compelling vision for change. In today's global challenges, such as environmental degradation or social inequality, manifestos can serve as a rallying cry for a community to come together and take action towards a common goal. Manifestos have been used throughout history to inspire change in various fields, including politics, art, and design. In landscape architecture, manifestos such as The New Landscape Declaration have provided a framework for addressing urgent social and ecological issues.

The New Landscape Declaration is one of the latest landscape architecture manifestos which draws on critical theory to critique the dominant paradigms of modernist and postmodernist design and to propose a new approach that is grounded in ecological and social sustainability, cultural diversity, and participatory democracy. The actions taken by LAF serve as important networks that carry discourse to practice in the New Landscape Declaration manifesto by bridging the gap between theory and practice, promoting interdisciplinary collaboration, and advocating for sustainable policies and design solutions. The New Landscape Declaration is an important practice that calls to action in times of crisis. It reflects the critical theory and actor-network theory concepts in landscape architecture and serves as a framework for understanding the complex

relationships and influences that shape the design and management of landscapes. By highlighting the challenges and opportunities facing the profession, the Declaration provides a roadmap for creating more sustainable, equitable, and resilient landscapes that can respond to the needs of the 21st century. In conclusion, The New Landscape Declaration is an important example of how critical theory and ANT can inform the practice of landscape architecture manifestos. Through the involvement of mediators and intermediaries, the Declaration serves as a call to action for the landscape architecture profession, while also challenging dominant power structures and promoting more equitable and sustainable approaches to landscape architecture.

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The revival of Pocket Parks
How an innovation of the 1960s becomes an inspiration for today's urban development

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Abstract
In 1963, New York landscape architects Robert Zion and Harold Breen published the pamphlet 'New Parks for New York' in which they proposed the introduction of a new type of park, the 'Pocket Park'. Pocket Parks are small-scale urban parks. Because of their little footprint, Pocket Parks can be placed in the unoccupied spaces of the city structure, the urban fabric, and in this way, they provide open space directly to the local population. A large-scale green space is replaced by a multitude of miniature parks.

In this article the original Pocket Park idea will be presented. Based on the modernist concept the potential of a new type of Pocket Park for the sustainable renewal of our cities will be explored, as they open up ways to address the pressing issues of urbanization: The social drifting apart of urban society, the increasing anonymity and individuality, the decreasing biodiversity and the challenges of climate change. As a decentralized strategy, Pocket Parks can be used to respond quickly, precisely, and cost-effectively to problems in neighbourhoods. The new Pocket Parks offer a unique opportunity to bring together city and park, nature, and culture in an innovative way.

Keywords
Pocket Park, Parley Park, outdoor room, neighbourhood park, green island

Introduction
In the 60 years of the 20th century, American urban planners argued that a park should have an area of at least 3 acres (12.000m^2). Since such areas were not available or could not be financed in the inner cities of the metropolises, new parks were not feasible - according to New York city planners (Zion and Breen, 1963, p. 5). The New York landscape architects Robert Zion and Harold Breen strongly disagreed with this position. In 1963, as part of an exhibition at the Architectural League of New York, they published the pamphlet 'New Parks for New York' in which they proposed the introduction of a new type of park, the "midtown park" (Zion and Breen, 1963), which was later known as Pocket Park. Zion and Breen aimed to address the open space deficit that comes with New York's unrestrained growth. As the city expands, the distance one must travel to reach attractive open spaces increases. The Pocket Park concept aims to counter this development with a decentralized strategy. Instead of a few large parks, a

network of small Pocket Parks is to be created to counteract the lack of attractive public spaces. (Wit, 2014)

Pocket Parks of the past and for tomorrow

The Pocket Park Concept

Pocket Parks, or Vest Pocket Parks, are small-scale urban parks. Because of their little footprint, Pocket Parks can be placed in the unoccupied spaces of the city structure, the urban fabric, and in this way, they provide open space directly to the local population. Robert Zion and Harold Breen, the inventors of the Pocket Park concept described it as *„a part of space removed from the flow of traffic (including pedestrian traffic), enclosed, protected, and sheltered from noise. Preferably it is a space between buildings, benefiting from the shelter of neighboring structures; the type of space which is now most commonly used as parking lot."* (Zion and Breen, 1963, p. 6)

A large-scale green space is replaced by a multitude of miniature parks. The various facilities are dedicated to different uses; they can function as a playground, as an event space, or as an urban rest area. Instead of a monumental green space, a matrix of Pocket Parks is created, each addressing partial aspects of the park function, such as experiencing nature, being a children's play area, being a passive or active recreation space. The multifunctional park is created through the interaction of the individual building blocks. (Lauria et al, 2020) Pocket Parks can occupy the "forgotten places of the city" such as gaps between buildings, parking spaces or setback areas and thus sustainably enhance the image of a neighborhood. (Blake 2013, P.1)

Figure 1
Pocket Park Greenacre Park, New York, Sasaki Landscape Architects

Zion and Breen demanded a small park for every block of houses, in the inner cities it should serve as a resting space for the working population and the shoppers, in the residential neighborhoods it should satisfy the need for residential open space. In Zion and Breen's opinion, classical park architecture was unsuitable for this purpose, and they established their own design principles for this new kind of open space. Robert Zion and Harold Breen conceived of the Pocket Park not as an open area, but as an enclosed outdoor room: *„The Midtown Park is a room, with walls, floors, and ceiling."* (Zion and Breen, 1963, p.8)

- All seating should be transportable so that each park user can freely choose his or her seat. The flexible seating arrangement makes it possible to come together in groups as well as to relax individually
- Because of the high pressure of use on small parks, lawns should be avoided,

and the ground should be paved. The vegetation will be moved into the air space, the parks will be covered with bright trees. Additionally, the walls will be intensively greened.
- Water features are an important design element: They provide a pleasant microclimate in the park and counter traffic noise
- Small cafés and kiosks will also revitalize the parks, additionally Zion and Breen propose to provide areas for outdoor games

The design language that Robert Zion and Harold Breen created for the Pocket Park took up motifs from interior design and transferred them to public space. This allowed the creation of lively structures that generated the essential qualities of a park despite intensive use and small size: The free appropriation of space, nature experience in the city and the chance to experience sensual moments in the hustle and bustle of everyday life.

Parley Park

In 1967, Robert Zion and his partner Harald Breen were given the opportunity to create a prototypical Pocket Park in downtown New York. Inspired by an exhibition showing designs by landscape architects, businessman Willian Parley commissioned the two to design a Pocket Park in memory of his father - Parley Park (Wit 2014). On 53rd Street, a compact open space was being created between two buildings that has all the design features required by Zion and Breen. A group of trees announces the green space in the street space, a few steps lead the visitor from the hectic street into the park, which is only 4.200 square-feet (390m^2) in size. There, a world of its own is created: The sidewalk of paving slabs transforms into a lively natural stone surface interrupted by slender, picturesquely growing Gleditsia's. The trees form a light canopy over the park and put it in a meditative mood. The side walls are completely covered with greenery, creating a vertical garden all around the visitors. Chairs and tables can be flexibly placed in the space by users, and a small kiosk provides visitors with refreshments. The highlight of the design is a tall water wall that takes up the entire back of the park. The constantly changing water feature fills the park with life, provides a pleasant microclimate on hot summer days, and the sound of the water neutralizes the noise of the street. Even today, 50 years after its opening, Parley Park has lost none of its appeal. The park is highly frequented and users on social media enthusiastically rave about the green island in the city of stone.

Figure 2
Parley Park 2022

With Parley Park, Zion and Breen created a compact green space primarily for sitting and resting; their target clientele was the urban, working population. But Zion and Breen did not want to leave it at contemplative parks in business districts. They planned to apply the Pocket Park strategy to urban residential areas, enriching the parks with additional functional areas. In the 1960s and 1970s, the Pocket Park concept received a great deal of attention, but later, only isolated Pocket Parks were realized. In recent years, however, Zion and Breen's strategies have taken on a new significance, as they open up ways to address the pressing issues of urbanization: The social drifting apart of urban society, the increasing anonymity and individuality, the decreasing biodiversity and the challenges of climate change.

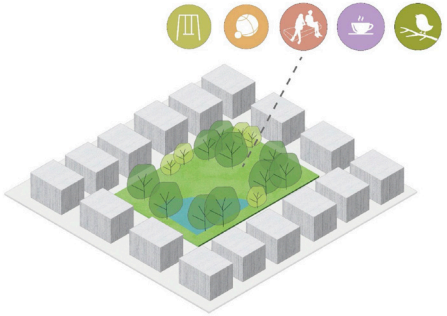

Figure 3
Traditional City Park

Figure 4
Pocket Parks

Pocket Parks for the city of today

As a decentralized strategy, Pocket Parks can be used to respond quickly, precisely, and cost-effectively to problems in neighbourhoods. While city parks form addresses for a quarter or the entire city, Pocket Parks refer to the direct neighbourhood. This opens up the possibility of responding directly to the needs and deficiencies in the neighbourhood and involving the population in the planning of the parks. Often, Pocket Parks are created on the initiative of local residents; in any case, it is essential to involve local stakeholders in the design process. In contrast to large-scale urban redevelopment projects, a bottom-up strategy can be used; either the project idea is based on existing civic initiatives, or the open space is newly developed with the intensive involvement of its future users (Casanova and Hernández 2011, p. 23-25). In this way, a high level of acceptance and identification of the citizens with the open space can be ensured from the very beginning.

In contrast to classic open space architectures, pocket parks are suitable as temporary open space. This makes it possible to generate open space qualities very quickly and cost-effectively. Ideally, the temporary installations are followed by permanent projects, but the pocket parks are also suitable as interim uses.

Robert Zion already emphasized the economic value of pocket parks *"The outright cost of the land […] would be more than repaid by the inevitable increase in the taxable value of surrounding properties overlooking the new park"* Zion explained (Zion 1991, p. 139). In fact, the increase in real estate value through the creation of

parks can be proven beyond doubt (Konijnendijk et al. 2013); due to the small area required by pocket parks, the economic value added is offset by low investment costs. Especially in the context of urban renewal projects, pocket parks can show their full economic and social potential: By transforming unused spaces into attractive public open spaces, they enhance the image and quality of life in the neighbourhood and thus increase the real estate value of the buildings surrounding the park.

One might assume that the ecological function plays a subordinate role in the Pocket Park, since only a small area is available, and the areas are used intensively. But this impression is wrong; on the contrary, the facilities can make an important contribution to urban ecology and climate adaptation. Robert Zion's and Harold Breen's Parley Park is already intensively greened, and the lack of lawn is more than compensated for by the planted walls. As a green island in the stony city, parks form cool spaces and thus contribute to the adaptation to climate change. Recent studies show that even small parks have a positive effect on the urban climate, especially when they are interconnected (Lin et al. 2017). Water features and fountains can further enhance this effect. In addition, the parks can accommodate infiltration trenches and infiltration basins and thus contribute to stormwater management (Blake 2013, P. 2).

Pocket Park perspectives

The challenges resulting from the disintegration of traditional urban structures and social systems require new ways of thinking as well as new tools for urban planning. The current problems of public space can only be solved by developing dynamic strategies for the design of public space and establishing innovative forms of cooperation between all local stakeholders (Casanova and Hernández 2011).

Figure 5
A contemporary Pocket Park: Garden of Remembrance, Marburg (Germany), scape Landscape Architects (photo: Bernd Nuetzel)

Forecasts predict that 70% of the world's population will live in cities by 2050, compared to only 56% currently (UN DESA 2018). To maintain the quality of life in metropolitan areas, we need to explore new approaches, we need to think of the city and open space together in new ways. In recent decades, urban parks have been built mainly on inner-city wastelands, like Duisburg Nord (Germany), Madrid Rio (Spain), Highline Park New York (USA). But these areas are now mostly built up and will soon no longer be available It is foreseeable that inner-city brownfield sites will become less and less available in the future. The competition for the remaining brownfield sites is increasing. For example, the German government has decided that land consumption should be reduced by 50% by 2030 (German Federal Gov-

ernment 2021). As far as possible, urban wastelands should be used for new construction projects.Therefore urban open space development in the future will come from within the existing structure, so Zion's and Breen's Pocket Park concept is more relevant than ever.

Conclusion

In developing new Pocket Parks, we should access the full potential of this open space module: Pocket Parks should be created both as temporary interventions and as permanent green spaces. Temporary open spaces should accompany urban transformation processes as a matter of course. As mock-ups, they initiate change processes and open up the discussion about new open space qualities; with "nature for a time", new fun and enthusiasm for open space can be generated (Blake 2013, p.7).

At the same time, permanent Pocket Parks should become a common feature of the city. No other instrument can address the needs of the local population more efficiently, strengthen identification with the urban district, create ecological and climatic added value, and furthermore increase real estate values (Penn 2018). Robert Zion's and Harold Breen's Parley Park has shown that a well-designed Pocket Park guarantees open space qualities at the highest level for decades. Parks should therefore be used not only for urban restoration, but also as high-quality designed outdoor spaces that form an antithesis to the stony city.

The Pocket Park concept is based on small interventions that generate immediate improvements in the local environment, in the neighbourhood. At the same time, they generate positive effects for the entire city - as part of an overall strategy. The Pocket Park concept has the advantage over conventional urban renewal programs based on large-scale measures, on the one hand, that the interventions can be implemented at a manageable financial cost and without large-scale land acquisition. On the other hand, they can be implemented at the local level and thus address the needs of the population more directly. In order for the pocket park strategy to develop its full potential, the construction of pocket parks should be integrated into an overall urban development concept and should be accompanied by intensive citizen participation. In contrast to classic planning "from above", this results in a high level of coordination and management effort (Casanova and Hernández 2014).

While Pocket Parks cannot completely replace classic, large-scale parks, they do show a way to carry quality of life into the centres of our cities in an inspiring way. City and open space do not have to remain opposites forever. The new Pocket Parks offer a unique opportunity to bring together city and park, nature, and culture in an innovative way.

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From (Mega) Regionalism Towards Planetary Scale in Landscape Architecture

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Abstract
In the era of globalisation, when all planet is urbanised and planners debate "Planetary Urbanization", economists discuss "Global City", ecologists describe the planet's biodiversity hotspots connections, and climate changes warn "global" crisis, it might be necessary to shift the paradigm of the landscape planning scale from local and regional scale to an adequate scale of challenges – Planetary scale. The Planetary scale might be neither planning nor designing. It is an interacting vision in which the integrity and interconnection of the issues are foreseen on a global scale.

Concerning some global landscape connectivity projects, the paper focuses on the importance of "planetary-scale" to properly understand relationships between landscape design, urbanisation, and ecology. The paper is based upon concepts from theories on Planetary Urbanization and the Planetary Garden, linking Landscape Urbanism, Urban Ecology and Environmental Advocacy to review the variety of scales that Landscape Architecture could address – from local to (mega)regional and global scale. The paper aims to review such important theoretical litrature to debate the potential role of Landscape Architecture in the upcoming holistic project globally.

Keywords
Planetary Garden, Urbanisation, World Park, Landscape Urbanism, Ecology

Introduction
The inception of landscape architecture is rooted in garden design; however, such an aesthetic approach has broadened into bigger environmental problem-solving, so-called- Landscape Planning. Landscape Planning seeks a series of executable procedures to solve a largely understood problem within a holistic framework. Planning demands interdisciplinarity approaches with interconnection scales, from urban to regional and global dimensions–thinking globally and acting locally. As Richard Tarnas (2006) remarked: "we must go not only high and far but down and deep".

In the face of environmental awareness, the integrity of ecosystems has become a central debate among all scientists. Interdisciplinary approaches have emerged to resolve the complexity of environmental issues. Due to the urban age crisis, landscape studies have played a crucial role

in hybridising aesthetics, ecology and the well-being of the whole system. Every square of the landscape should be productive to provide the resources; simultaneously, it should be protected to avoid further environmental catastrophe. Based on this premise, this commentary focuses on the necessity of a paradigm shift towards a planetary scale according to a trio of urbanisation, ecology and landscape architecture.

In section 2, the shift of scale and the role of regionalism in urbanisation is discussed; section 3 briefly overviews the "planetary-scale" of the most prominent biodiversity hotspots connection projects; section 4 emphasises the Landscape theoretical shift in design scale, and finally, section 5 debates the necessity of paradigm shift of scale towards a planetary scale.

Urbanisation: From (Mega)regionalism to Planetary Scale: *Where Does the City End?*

Throughout history, many sages have seen the necessity of large-scale shifting in urbanisation planning. In the ninetieth century, Patrick Geddes introduced the concept of "region" in architectural planning. Geddes' central argument was that the city and its region must be understood in a single synoptic view (Munshi, 2000), and due to such a necessity, the interdisciplinary subject of sociology was developed into the science of "man's interaction with a natural environment" (Munshi, 2000; Halliday, 1968). However, the cities' expansion occurred so drastically that their boundaries blurred into their regional contexts, creating so-called: "city-regions, urban regions, metropolitan regions, and megacities" (Schmid, 2016). As it became complicated to describe a new scale for "cities", many scholars have debated "*Where does the city end*?" (Gandy, 2014); to which geographers Amin and Thrift (2002) answered by pointing out that today, cities have a planetary scale of influence; "The city is everywhere and everything. The city's footprints are all over these places, in the form of city commuters, tourists, teleworking, the media, and the urbanisation of lifestyles. The traditional divide between the city and the countryside has been perforated."

As experts from different disciplines remark, the scale of cities goes far beyond the traditional regional scale. Economically speaking, the expansion of cities has generated a new scale of urbanisation, megaregions. Megaregions are economic actors derived from regionalism policy, as an extensive network of metropolitan regions that share environmental systems and topography, infrastructure systems, economic linkages, settlement and land-use patterns, culture, and history (Deas, Lord, 2006). Megaregions are competitive units in the global economy, characterised by the increasing movement of goods, people and capital among their metropolitan regions. "The New Megas", asserted Richard Florida (2009), "are the real economic organising units of the world, producing the bulk of its wealth, attracting a large share of its talent and generating the lion's share of innovation".

The European Union is a remarkable example of megaregionalism. Such alliances have become more common in other continents, for instance, *African Union*, *The Eurasian Economic Union* and *Arab League*.

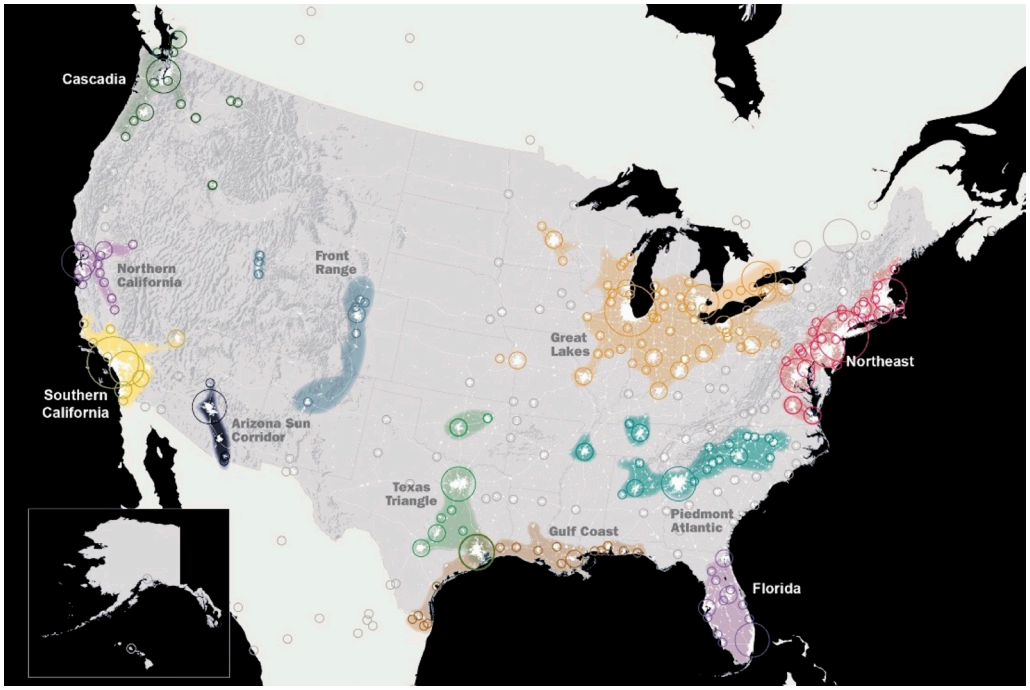


Figure 1
Author's re-elaboration of ©America 2050– eleven emerging megaregions of USA

In the USA, the megaregional planning initiative comes forth with the idea of "America 2050" (Figure 1) and focuses on the emergence of eleven megaregions in the United States. The megaregion of the USA is based on the transit-oriented development (TOD) model and landscape conservation developmental framework to provide the necessary infrastructure and manage the resource pressure of the upcoming population in the 21st century. By constructing a high-speed railway in the Northeast megaregion, the planners seek to provide housing and services along the railways where the next urbanisation will occur for an additional 15 million residences (Regional Plan Association of America, 2050).

Planners Brenner and Schmid (2014), in the book *Implosions/Explosions, towards a Study of Planetary Urbanisation*, expressed that the process of urbanisation creates the conditions for capitalism, and this is the reason for the implosion and explosion of capitalist urbanisation, that open a debate in the studies of the planetary scale of urbanisation.

They seek to advance the urbanisation project in "the hope that a new understanding of urbanisation may prove useful to ongoing struggles—against neo-Haussmannization, planetary enclosure, market fundamentalism and global ecological plunder; and for a new model of urbanisation oriented towards the collective reappropriation and democratic self-management of planetary space as the work of the human species". In the era of the Anthropocene, planners encounter the Urban Age, with the steady growth of the population and its consequence on nature.

Interestingly, architects began addressing the world as a project long before globalism and its worries. For over a century, the most predominant and visionary architects had foreseen the planet's future through planetary-scale projects to find an answer for the world's growing fragility to planet-sized risks. The book *The World as an Architectural Project* (Sarkis et al., 2020) collects fifty speculative planetary-scale projects of visionary architects who have imagined the entire planet through connected systems. Among them, the latest research project and exhibition of Joyce Hsiang and Bimal Mendis (2013), called "City of Seven Billion", collects, constructs, and presents models of the world as a totality of urbanisation and its condition as one city. The unprecedented human population growth and the vast urban topography of interconnected exchanges, flows, and systems have irrevocably affected the world through the cumulative impact of human activity. Joyce Hsiang and Bimal Mendis pointed out that as crises and opportunities transcend city and national borders, the necessity for architects to operate at the scale of the world has never been more urgent.

Ecology: Planetary Biodiversity hotspots Connectivity

The endless edge of cities has compelled experts to set a global policy to secure and conserve hotspot biodiversity and control soil consumption. The experts sought to find some arbitrary agreements. For instance, in the dissertation "A Global Assessment of the Links between Urbanization, Biodiversity, and Ecosystem Services", the experts stated the importance of conservation in urban areas since many of the world's cities are in biodiversity-rich areas, cities have a vital role in conserving these critically threatened ecosystems (Elmqvist, 2013).

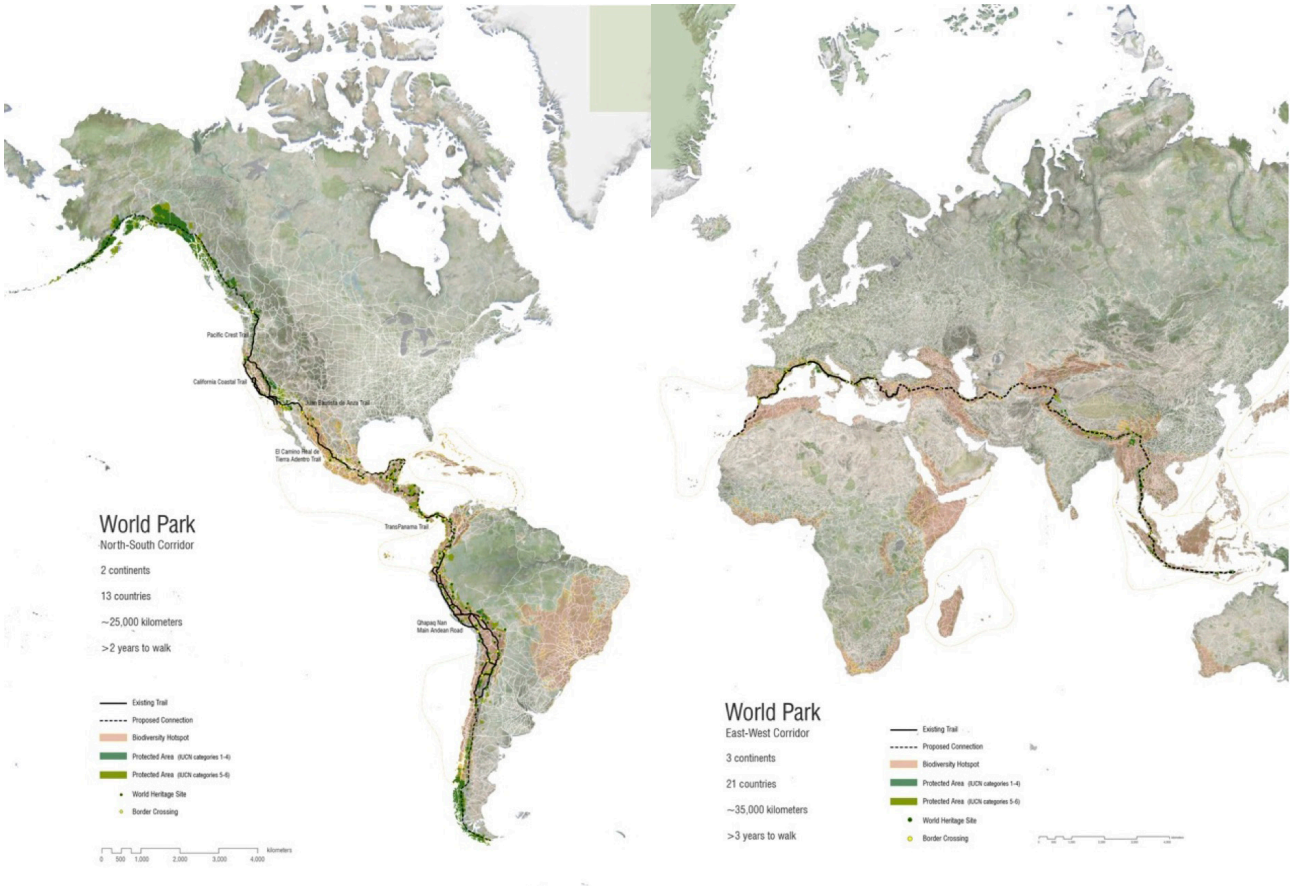
The effort to suggest and construct large-scale hotspots connectivity projects worldwide has increased noticeably. We can mention some transcontinental projects such as the European Green Belt Initiative, the Great Green Wall of Africa, the Great Eastern Ranges Initiative in Australia, Two Countries One Forest in North America between Canada and the United States, Paseo del Jaguar running from the United States through Central America into South America and Ecoregional Conservation Plan for the Caucasus running from Asia into Europe.

All various projects of biodiversity hotspot connectivity, ecological corridors and green infrastructure seek to restore and reconnect fragmented ecosystems on a planetary scale, and "the purpose of these connectivity projects is unprecedented and suggests that humanity is beginning to appreciate and attempt to manage the planet as a garden" (Weller et al. 2017).

The different global hotspots connectivity projects reflect the importance of global scale in ecology and landscape design. However, the main difficulty concerns the implications of a planetary policy and land governance through international borders.

Landscape Architecture: *Planetary Garden*

As has been highlighted in previous sections, sages from different fields have investigated the crucial role of holistic thinking and paradigm shift of scales. This section convenes the efforts of a few landscape architects who discussed the paradigm shift of scale from a local design to a planetary scale.



Gilles Clément, a French gardener, opened a debate on the scale of the garden that expands to the planet—called a planetary garden. Clément (2015) defined the garden as an enclosed place where a "treasure" is protected. Clément's "planetary garden" considers ecology as the integration of humanity, and nature is not a servitude for human beings but intimately associated with it. Therefore, the planet is a garden, and the man is the gardener who manages it on a planetary scale. "The ultimate goal of the planetary garden is to exploit diversity without destroying it, perpetuating the 'planetary machine' and ensuring the existence of the garden—and hence the gardener".

Likewise, Richard Weller (2015), the Meyerson Chair of Urbanism and Professor and Chair of Landscape Architecture and Executive Director of the McHarg Center at The University of Pennsylvania, addresses global flashpoints between biodiversity and urban growth in research titled "The World Park Project". The World Park Project is a conservation idea in line with IUCN's list of protected areas. The World Park Project attempts to link the world's most vulnerable and fragmented hotspots into

Figure 2

 Atlas for the End of the World, http://atlas-for-the-end-of-the-world.com (accessed on 8 February 2022), https://www.theworldpark.com (accessed on 8 February 2022)

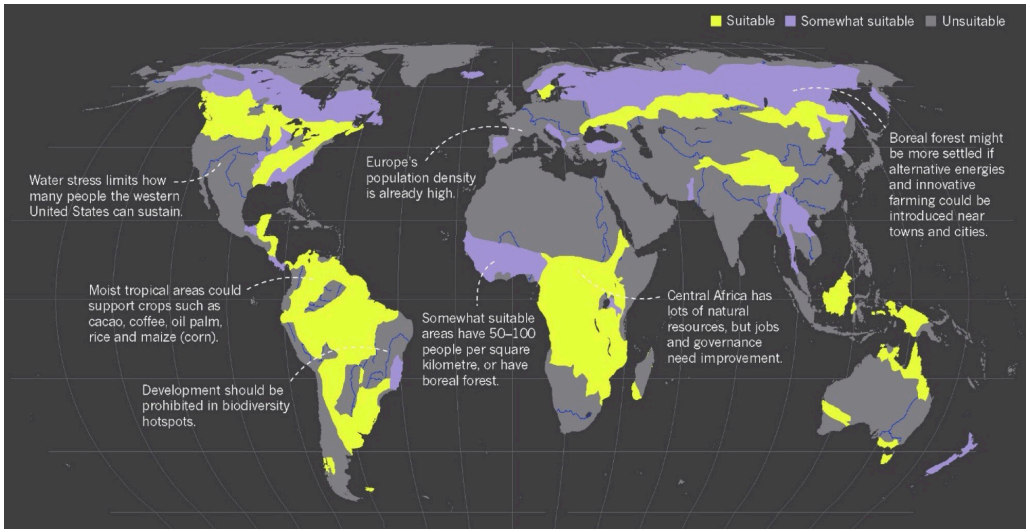


Figure 3
Author's re-elaboration of Forman and Wu (2016) habitable zones. ©Nature 537, pp. 608–611 (29 September 2016). "Habitable Zones: Places with warm and moist climates amenable to growing crops, such as grassy and forested lands in temperate and tropical regions, could sustainably accommodate more people. These include large areas of the Americas, central Africa and Asia and pockets of Oceania and Australia, but not populous or water-stressed regions or biodiversity hotspots"

one contiguous world park through two continuous trails, one running from Alaska to Patagonia and the other from Indonesia to Morocco. (Figure 2).

The expansion of cities generates an ecological footprint, causing land consumption and environmental deterioration, and it necessitates a halt to further urbanisation; however, the question of "*Where to put the next billion people* "calls for an answer. Many of the world's cities expand in biodiversity-rich areas; cities have a vital role in conserving these critically threatened ecosystems. Therefore, Forman and Wu (2016) suggested an appealing proposal to concentrate population growth on a global scale in the so-called "Habitable zone", where the climate conditions and natural resources are suitable to accommodate the upcoming population, ensuring low environmental impact on the environment (Figure 3).

Discussion—A paradigm shift in Landscape Architecture Scale

With the shortage of land, urbanisation, population growth, ecological hell, food scarcity, climate change and the age of Anthropocene—whether through cultivation, extraction, industrialisation or consumption, humans are no longer simply inhabitants of the planet; they have become its architect and creator. Amending the world as one city offers a holistic picture to find opportunities to manage our resources more accurately. The symbiosis between infrastructure, greening, food production, water system and transport are all connected into the holistic framework and should be driven by landscape architecture sensibility globally to reach the resiliency targets. The shortage of land stresses more consideration for each square of landscape that should be productive and protected simultaneously.

The question of scale is not new to landscape architecture studies; however, it does not have an exact answer for a "planetary" scale of implication. The planetary scale might be neither planning nor designing. It is an interacting visionary scale in which the integrity and interconnection of the issues are foreseen on a planetary scale. Clément's *Planetary Garden*, Richard Weller's *World Parks* and Forman and Wu's efforts to find the "habitable zone" for the upcoming population demonstrate the endeavours of the most prominent experts in landscape design and planning to open the debate on the new scale of action.

The ECLAS conference in Ljubljana, *Scale of Changes*, intended to evolve and reflect on a different scale of operation to address a wide spectrum of challenges. However, the Planetary Scale in design seems to be at the first stage of a long debate. Generally, most states have considered national borders when declaring protected areas for their nature policy protection, although thanks to megaregionalism during the past 30 years, the inclusion of transboundary cooperation as an active conservation goal has increased immensely.

Richard Weller (2015) pointed out that in the 19th and 20th centuries, the conservation of national parks was the triumph of reflection of pioneers who saw the integrity of a biotic and abiotic system; however, today, the IUCN's ever-increasing list of protected areas shows that the predominant political unit of the 21st century goes beyond the sovereign rule of national borders. It is high time that the ECLAS conference and similar events became a political stance for further debate on the importance of a "planetary making-decision scale" in design.

Landscape architecture is not merely about nature conservation; it includes human needs within environmental advocacy. Global planners emphasise the global economic trajectory to build the world city. Ecologists design global connectivity corridors for the species. Landscape architects should look for lands that do not designate functions but still have the potential to be designed and reframed to host humans and other species. The mission of creating a "habitable zone" for the upcoming population would be feasible with a holistic understanding of the world as a system, as "one garden".

Landscape Architecture has been constantly considered as a balance to the environmental consequence of urbanisation; however, it is high time to aim at emphasising its role as the driver of the urbanisation process.

Guinaudeau (1987), introduced the concept of *préverdissement*—plant today, build tomorrow. Such a concept aims to plant before urbanisation development. It is considered a combination of design and protection to reach the desired size of plants and guarantee the aesthetic quality of spaces. The concept of préverdissement might be newly adopted globally to convert the unliveable land to liveable land for the following billion people to tackle the shortage of land. Landscape architects, "as Urbanists of Our Age," could take the lead and be "responsible for the integration of civil infrastructure and environmental improvement" (Waldheim, 2006).

Conclusion

In the era of holistic visions, the reductionist vision of pure aesthetic garden design

moved towards a holistic vision of cities and natural environments. The garden as a laboratory of ways of being and living behaviours incites a new organisational scale for the whole planet. Global landscape planning is a concept whose time has come.

The primary deficiency for such global collaborations could be due to the multistakeholder, multipurpose and multijurisdictional aspects. However, the concept could be discussed in the academic studies of landscape architecture. It could be the first step to conceptualising and designing a garden for the planet. The starting point could be re-designing the Great Green Walls of Africa and China, not merely as an answer to environmental challenges but as places that could host new cities and inhabitants. Planetary landscape design is a visionary design that tackles the shortage of land, making a symbiosis between infrastructure, landscape and ecology.

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A Comparative Study Of Eco-DRR and Traditional Chinese Ecological Knowledge for Elevated Urban Temperature Disasters

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Abstract
Under the combined influence of global warming and rapid urbanization, China is facing more and more severe elevated urban temperature disasters. To protect against elevated urban temperature, nature-based solutions (Nbs) are internationally used to cope with this problem. However, Eco-DRR, as part of NbS theory, is still insufficiently researched and applied in China. To make Eco-DRR to be grounded locally in China, it is necessary to integrate Eco-DRR with Chinese TEK. We collected 7 international top cities' urban climate adaptation planning and 7 Eco-DRR cases in mountainous and hilly areas. Besides, we selected 3 representative traditional Chinese cases for comparison. At first, we drew a content analysis to form the framework of Eco-DRR for comparison research. On this basis, we research the similarity and differences between Eco-DRR and Chinese TEK by comparing site selection versus Chinese 'xiangdi'(相地), vegetation versus fengshui woodland(风水林), ventilation corridors versus fengshui(风水), and vertical greening versus courtyard garden. As a result, we found that Eco-DRR and Chinese TEK both advocate nature-based solutions (Nbs) to adapt to environmental changes, but also quite different due to their original contexts and technological development. We can learn from Chinese TEK the lessons of fengshui(风水) site selection experience and creation of microclimate environment. This study can help us build a bridge between Eco-DRR and Chinese TEK, and suggest conserving traditional Chinese vernacular landscapes and landscape heritage containing the TEK against urban heat.

Keywords
Eco-DRR, Nbs, Chines TEK, comparative study, fengshui

Introduction
Under the combined influence of global climate change and rapid urbanization, heatwave disasters have become more frequent around the world, which results in serious risk of urban heat. Elevated urban temperatures and heatwaves will make the human body feel uncomfortable, in severe cases, they may even threaten public health, energy supply, and crop yield

(McGregor et al., 2017). To protect against heat waves, nature-based solutions (Nbs) are internationally used to cope with this problem (Tong and Bao, 2022). In international policy jargon, Eco-DRR is short for ecosystem-based disaster risk reduction (DRR), referring to nature-based solutions for mitigating natural hazards and risk reduction. At present, a vast amount of studies on Nbs for urban heat exist. Reviewing the studies on current Nbs case experience, research attaches importance to the integration of traditional ecological knowledge (TEK) and Nbs approaches so that they can be appropriate and effective for local (Kiddle et al., 2021).

China is a country with very serious natural disasters, especially under the combined influence of global warming and rapid urbanization, it is facing more and more severe elevated urban temperatures disasters (Li et al., 2018). However, Eco-DRR, as part of NbS theory, is still insufficiently researched and applied in China's elevated temperature risk reduction practice. Since Eco-DRR is gradually attracting widespread attention in China, it is vitally important to integrate Eco-DRR with Chinese TEK if Nbs and Eco-DRR are to be grounded locally (Kiddle et al., 2021). Therefore, this paper comparative analyses the international Eco-DRR cases and the Chinese TEK for elevated urban temperatures. This shall facilitate the international exchange of relevant case experience to provide some helpful experience and reference.

Materials and Methods

The basis for comparison and mutual learning

In addition to meteorological conditions, elevated urban temperatures are significantly affected by the urban heat island and mountains (Holderness et al.,2013). On one hand, it is easy to form urban heat island effect caused by the change of underlying surface under rapid urbanization. On the other hand, it can also lead to elevated urban temperatures in mountain cities due to 'incineration effects'. China is also generally affected by urban heat resulting from the two factors above after rapid urbanization (Zheng, 2021). Therefore, it is helpful to study the cases in top cities and mountainous hilly areas against urban heat.

Case selection

In terms of case selection of Eco-DRR, we selected 7 cities (Table1) out of the top 25 cities in the GaWC global city ranking (GaWC, 2020), which use Eco-DRR to cope with elevated urban temperatures disasters in urban climate adaptation planning. Besides, we also collected cases on the PHUSICOS platform, which is dedicated to collecting and analyzing Nbs for disaster risk reduction in mountainous and hilly areas (Bailles et al., 2021), to add Eco-DRR cases for elevated urban temperatures in mountainous and hilly areas. We searched the dataset page of the PHUSICOS platform for cases related to elevated temperature and got 7 search results (PHUSICOS, 2021). Ultimately, we obtained 7 Eco-DRR cases in top cities and 7 Eco-DRR cases in mountainous and hilly areas for elevated temperature disasters (Table1).

Besides, we collected traditional Chinese cases and methods for elevated urban temperatures in China. To make cases comparable, the Chinese traditional cases we collected also have similar contexts and characteristics to the studied international

Eco-DRR cases, that is, the ancient cities with remarkable artificial environments and the ancient villages in mountainous areas. Finally, we selected 3 representative traditional Chinese cases (Table 1) and relevant materials of Chinese fengshui (风水) theory for comparison.

Research methods

At present, the main mitigation and adaptation strategies of urban planning against urban heat are land use, spatial structure, traffic, landscape, and architecture (Han et al.,2018), each of which is divided into a variety of specific strategies. However, Eco-DRR is the Nbs in urban disaster response strategies, which has better ecological benefits than urban planning strategies. Besides, the current research on Eco-DRR strategies for elevated urban temperature disasters is still lacking a systematic summary. Therefore, the framework of Eco-DRR for urban heat should be newly proposed.

We drew on content analysis based on the preliminary framework (Han et al.,2018) of urban planning strategy against urban heat. The essence of content analysis is to convert text material into quantitative data (Zou F.,2004), thus analyzing and inferring the text content based on these data. The operation steps of the content analysis in this paper are as follows: (1) Organize the original text materials;(2)Identify the content analysis unit and extract the included Eco-DRR implementations from each case one by one; (3) Complete all text encoding extraction; (4) Analyze the coded data and draw research conclusions. To adapt to Eco-DRR theory, we constantly adjust the content analysis unit in this framework throughout the analysis process as new content emerged. The classification of each implementation is agreed upon by each researcher to ensure the accurate understanding of every case. As a result, we summarize the Eco-DRR approaches of site selection, vegetation, ventilation corridors, and vertical greening. On this basis, we can also form the framework for comparative research.

Case type	Location	Project	Year of release
Top city	New York City	OneNYC 2050 A Strong, More Resilient New York	2019 2013
	London City	London Environment Strategy The London Plan	2018 2016
	Paris City	Paris Climate Action Plan	2018
	Chicago City	Resilient Chicago: A Plan for Inclusive Growth and Connected City	2019
	Washington D.C.	Climate Ready DC	2016
	Sydney City	Adapting for Climate Change	2016
	Barcelona City	Climate Plan 2018-2030	2018
Hilly and mountainous lands	Metropolitan Bilbao	The Bilbao Greenbelt project The Zorrotzaurre project	2018 2018
	Catalonia Region	The Life+ SUBER project The LIFE MIXforChange project Ecological restoration of the Las Motas pine forest in Alénya village	2018 2017 2021
	Huesca Province	Lila Innova: Innovation in soft fruit processing	2018
	Azerbaijan	Ecosystem-based erosion control	2020
Traditional cases in China	Jiangnan region	The old town of Tongli	2008
	Jiangxi province	Quanfang Village in Jinxi County	2022
	Yunnan province	Honghe Hani Rice Terraces	2014

Table 1
List of the Eco-DRR cases and Chinese traditional cases

On this basis, we judge the similarity and differences between Eco-DRR and Chinese TEK by comparative research method. The comparative research methods have the ' method of agreement' and the 'method of difference'(Wan and Song, 2022). The 'method of agreement' starts from the common or similar points in the case, and finds the common factors from cause to effect; The 'method of difference' is triggered from different results, analyzing logic from effect to cause. Both two comparative methods were used to analyze the similarities and differences between Eco-DRR and Chinese TEK(Skocpol and Somers, 1980).

Results

Through the content analysis of international cases, we find that the Eco-DRR strategy framework emphasizes the role of ecosystems and Nbs compared to existing strategies in urban planning (Han et al.,2018). For example, the strategy of urban planning emphasizes the adjustment of land use to affect the scale and underlying surface of the city, forming an urban road traffic and spatial structure that is easy to ventilate, thereby alleviating the heat island effect; while Eco-DRR focuses on making use of Nbs such as topography, vegetation, and water. In this study, we adjusted the urban planning framework for urban heat from the perspective of Eco-DRR, and formed an Eco-DRR strategy framework to cope with urban heat.

We ultimately divided the Eco-DRR implementations into 4 approaches: site selection, vegetation, ventilation corridors, and vertical greening by thematic analysis. On this basis, we found 4 categories of Chinese TEK in traditional Chinese cases corresponding to the Eco-DRR approaches: 'Xiangdi'(相地[1]), fengshui woodland, construction with fengshui, and courtyard garden, which have many things in common although in different cultural contexts. We compare the Eco-DRR in international cases with the TEK in traditional Chinese cases from the 4 aspects summarized above. We list the approaches and implementations for comparison in Table 2, and discuss one versus one as followed.

Eco-DRR		Chinese TEK	
Approach	**Implementations**	**Approach**	**Implementations**
Site selection	Create cities on the plains next to the mountains; build villages halfway up the mountains.	'Xiangdi' (相地)	Take the flat land surrounded by mountains and dense forest, with water flowing through as an ideal location.
Vegetation	Protecting woodland, planting trees and optimizing urban green spaces	Fengshui woodland(风水林)	Protect the woodland for water conservation and wind prevention
Ventilation corridors	Construct ventilation corridors through blue-green networks	Construction with fengshui	Make use of laneway, river and courtyard spaces to conduct natural wind
Vertical greening	Green building roofs and facades	Courtyard garden	Create garden in courtyard to improve the microclimate in courtyards

Table 2
Comparison of Eco-DRR and Chinese TEK

Site selection versus *'Xiangdi'* (相地)

We found that Eco-DRR and Chinese TEK are both embedded in the site selection. In the international cases of Eco-DRR, sites are carefully selected to improve their resilience to the climate. For example, The metropolitan Bilbao runs along the Bilbao estuary, surrounded by two mountain rang-

[1]Originally a colloquialism for Chinese exploration and selection of garden areas, the book "Yuanye" written by the late Ming Dynasty gardener Ji Cheng has a chapter on "Xiangdi" dedicated to exploring selected garden sites(-Ji, 2011).

es that run parallel to the waterway, where they reach 700m. In many pastures of Azerbaijan, the villages are spread over the valley plains, with rivers running through, and steep hills have been stabilized with terraces and fruit trees. Similarly, Chinese TEK also pays attention to 'Xiangdi' (相地) before site selection, which means carefully evaluating the natural environment and conditions such as terrain and water (Ji, 2011). For example, Hani Terraces in China form a landscape pattern of a "forest-village-terrace-water system" for climate adaptation (Gao and Fu,2014), as the accumulation of TEK to adapt to the natural environment for a long time. Furthermore, China has developed TEK to fengshui (风水) theory, taking the flat land surrounded by mountains and dense forests, with water flowing (Figure 1) through as an ideal location (Shang, 1992).

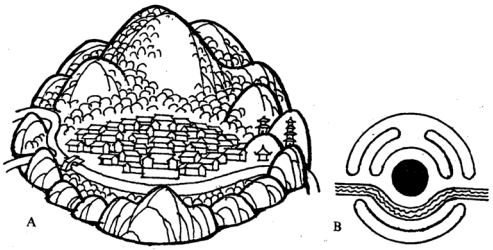

Figure 1
The spatial composition of the fengshui (风水) pattern and basic model (Image from fengshui Theory Research)

Name	Planting location	Ecological effects
Shuikou woodland (水口林)	Site entrances where rivers flow into villages and towns	Conserve water sources and protect against wind
Longzuo woodland (龙座林)	Mountainside, the foot of a mountain backward villages	Protect from wind, purify the air and maintain biodiversity
Dianjiao woodland (垫脚林)	Riverside or lakeside in front of villages	Conserve water sources and protect against wind
Zhaiji woodland (宅基林)	Inside a house or courtyard	Provides shade and regulates the microclimate

Table 3
Types of fengshui woodland (风水林) and ecological effects

Vegetation versus *fengshui woodland* (风水林)

Vegetation is widely used as Eco-DRR to mitigate the urban heat island effect. The cities we studied, such as Sydney and Chicago, are responding to elevated urban temperatures by planting trees and optimizing urban green spaces. Most cities value the implementation of increasing and optimizing urban parks and open spaces. For example, The London Green Network proposes to integrate the current green space system, and the Bilbao Greenbelt project expands and connects the city's green areas for urban temperature regulation. Woodland conservation in the mountains is also a concern, not only forests but also fruit trees. In contrast, Chinese TEK also concerns with the use of plant greenery and woodland. This kind of TEK appears in many ancient Chinese towns with complete public green spaces and open spaces(Li, 2008), and is also reflected in the concern of fengshui woodland (风水林) (Gao and Fu,2014). Chinese TEK summarizes several types of Fengshui woodland with different ecological effects as shown in Table 3.

Ventilation corridors versus *fengshui* (风水)

Open spaces are also used to increase urban ventilation to alleviate urban heat. Although it is limited by the current situation, causing huge differences in the ways different cities use urban ventilation. The use of urban ecological infrastructure (blue-green networks) to construct urban ventilation corridors(Figure 2(A&C)) has been widely admitted in China(Fang et al.,2021). Coincidentally, The simple meaning of Chinese fengshui (风水) is 'wind and water', indi-

cating Chinese TEK also concerns natural ventilation and water flow. In hot summer, the wind speed of ancient Chinese village streets and alleys will increase due to the narrow pipe effect. Natural ventilation can be formed by organizing the courtyard space connected to the street and alley (Wang et al, 2022). In addition, most of the houses built along the water also face the river (Li, 2008) to make the cool natural wind on the water's surface through the house (Figure 2(B)). The organization of the courtyard space takes advantage of the difference in spatial scale to form a wind pressure difference, resulting in changes in air density and flow speed. The horizontal and vertical wind conduction effect is jointly generated through the patio, alleys, and courtyards in traditional houses (Figure 2(D)), so that the natural wind passes through the indoor space of the house in an organized manner, thereby taking away the moisture and heat.

Vertical greening versus *courtyard garden*

In addition to urban green spaces, vertical greening such as green roofs also attracts widespread attention. Barcelona and New York have strengthened the construction of green roofs through decrees or plans to improve the coverage of greenery (Tong and Bao, 2022). Green roofs and facades can improve buildings' climate resilience and rainwater stagnation (Figure 2(E)). On the other hand, ancient Chinese often use plant greening to construct gardens in courtyards, which is conducive to improving the microclimate and promoting natural ventilation (Li, 2008) due to the limitation of the technology. Similar to vertical greening, ancient Chinese buildings also often cultivate climbing plants on pitched roofs or walls (Figure 2(F)).

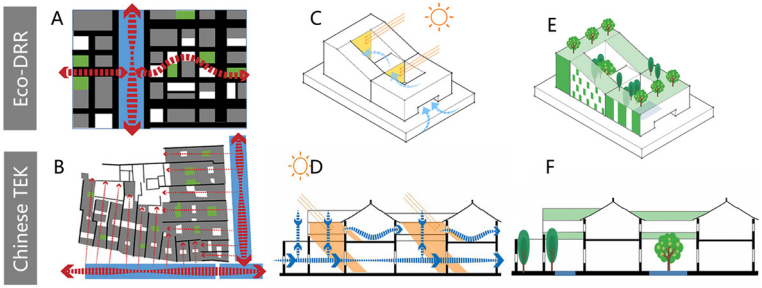

Figure 2

Comparison illustration of Eco-DRR and Chinese TEK. (A) Urban ventilation corridors. (B)Construction with fengshui (风水). (C) Ventilation. (D) Conduct wind with courtyards. (E) Vertical greening. (F) Courtyard garden and climbing plants on pitched roofs

Discussion

In our research, the Eco-DRR strategy framework emphasizes the role of ecosystems and Nbs in DRR compared to existing strategies in urban planning (Han et al.,2018), which demonstrates ecological wisdom in the face of elevated urban temperature disasters. Ecological wisdom is discovered, strengthened, accumulated, and inherited by people in the process of long-term interaction with nature. In China's long history of coexistence with nature, the Chinese have accumulated profound traditional ecological knowledge (TEK). The TEK is carried in traditional Chinese vernacular landscapes and landscape heritage, forming the traditional Chinese cultural landscape, which is worth landscape conservation.

Similarity

Eco-DRR and Chinese TEK both emphasize the role of ecosystems, and advocate nature-based solutions (Nbs) to response to environmental changes, such as the approaches through the landform, vegetation, and ventilation. There is no coincidence of what they are in common. Chinese TEK is carried in the Chinese vernacular landscapes, reflecting the real human-land relationship. It contains rich experience and wisdom in environmental adaptation, also known as "art of surviv-

al" in the face of natural disasters (Zhang L.,2018). In this perspective, what Eco-DRR advocates coincides with the traditional Chinese concept of nature of "the unity of heaven and man"(天人合一) and "Taoist nature"(道法自然). Although Eco-DRR and Chinese TEK were born in different contexts, they both reflect the advanced wisdom of respecting and living in harmony with nature. These similarities can help us build a bridge between Eco-DRR and Chinese TEK, which is conducive to their integration and the localization of Eco-DRR in China (Kiddle et al., 2021).

Difference

The differences between Eco-DRR and Chinese TEK are related to cultural context and technological development. Eco-DRR is an advanced international theory of urban resilience and disaster prevention, arising from the combination of Nbs and DRR theory (Estrella et al.,2013), focusing on the use of spatial planning and ecological engineering against urban heat; However, Chinese TEK comes from the ecological wisdom accumulated by ancient Chinese who have interacted with nature for a long time, contained in Chinese traditional landscape. We have learned from Chinese TEK that the fengshui(风水) site selection experience and creation of microclimate environment are of great reference value for the response to urban heat. Although there are limitations of the times in Chinese TEK due to the change in social background and technological conditions, it still has the commonality beyond the times in this era.

At present, Yu Kongjian and many other Chinese scholars have proposed to protect Chinese vernacular landscape, understand the "art of survival" of ancient Chinese, and focus on the research of Chinese TEK (Zhang L.,2018). Especially, The " TURENSCAPE " led by Yu has conducted lots of research on traditional Chinese water management wisdom, based on which many water adaptive landscape planning and design works in response to flood disasters have been born. However, the current research on Chinese TEK for urban heat is still limited, thus more attention should be paid to Chinese TEK to adapt to urban heat contained in vernacular landscape(Wang et al, 2022; Li, 2008) and landscape heritage(Gao and Fu,2014) in the future. This will help expand our horizons of Chinse TEK on the response to elevated urban temperature disasters, which can also enrich the theory of Eco-DRR to a certain extent.

Conclusion

This paper compares international Eco-DRR cases with Chinese TEK for elevated urban temperatures. We found that Eco-DRR and Chinese TEK both emphasize the role of ecosystems but are also quite different due to original contexts and technological development. Chinese TEK has taught us that the fengshui(风水) site selection experience and creation of microclimate environment are of great reference value for urban heat. We can learn that Chinese vernacular landscape is an intangible heritage with profound TEK, which not only has cultural and symbolic significance, but also has vitality for conversation and regeneration. Eco-DRR and Chinese TEK complement each other, on the one hand, contemporary landscape planning and design can continue to learn TEK to improve the locality of Eco-DRR; on the other hand, there is contemporary

value in the conversation of landscape heritage and regeneration of the vernacular landscape. This research can help build a bridge between Eco-DRR and Chinese TEK for urban heat. In the future, it is suggested that more attention should be paid to Chinese TEK to adapt to urban heat contained in Chinese vernacular landscape and landscape heritage, which is also conducive to the localization of Eco-DRR in China.

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Planting Design: Current Practices and Research Trends

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Abstract
Planting design is one of landscape architect's most complex tasks. For a long time, plants were perceived and manipulated as static tools valued solely by aesthetics or utility. However, recent climate and urban environmental problems have proven the decisive role of vegetation in mitigating these issues, pushing plant design towards new approaches that go beyond the primary concerns of form and function. A systematic literature review is an appropriate research method to understand how planting design has evolved and adapted to address these novel paradigms. The main goals were to (1) evaluate the state-of-art about planting design, (2) identify principles and theories shaping planting design proposals, and (3) assess which problems planting design is currently addressing. The literature search was performed in 2021 in Taylor & Francis Online, Scopus, and ISI Web of Science Core Collection using a pre-tested search string and following the guidelines provided by the CEE (2013). The review process of chosen literature involved the analysis according to the year, the publication journal, the geographical location of the studies, and the thematic focus. Bibliographic maps of the co-occurrence and frequency of different terms inside each database record, were also produced using VOSviewer software. Results showed that planting design publications increased substantially after 2011. Additionally, planting design's primary focus shifted toward issues related to urban space's ecological, social, and economic spheres. Concerns with climate change, ecosystem services and disservices, and biodiversity shape the current research trends in planting design.

Keywords
Planting Design, Public green spaces, Urban environment, Vegetation, Climate change

Introduction

Planting design is more than a successful combination of different plant species (Dunnett and Hitchmough, 2004). It emerges as the most relevant practice in the construction and definition of landscapes as it combines technical knowledge and artistic vision to respond to user needs, makes

better use of space, and increases functional, aesthetic, and ecological qualities of the landscape, at the same time as it provides visual pleasure (Robinson, 2016). For a long time, plants in gardens were mainly perceived and manipulated as static tools governed by pre-established technical procedures, where aesthetics were valued more than their characteristics of living, growing, and changeable organisms. However, recent urban, climatic, and environmental problems have reinforced vegetation's instrumental role in solving or mitigating these problems. The proper use of vegetation in planting design allows its potential as a living and transforming material, both for the environment and for people, to be evidenced with the same strength as its aesthetic and visual effects, assuming a leading role in the spatial and ecological dynamics of cities. Thus, plants are no longer viewed just as elements of the landscape's spatial and visual composition but are now recognized as the essential regulating elements of urban metabolism (Kingsbury and Oudolf, 2016). Considering the emerging environmental and ecological demands in the current global scenario, planting design needs to assume new approaches that go beyond form and address the fundamental issues of function. There is an urgent need for new planting paradigms that contribute to the improvement of public landscapes while responding to new and diverse challenges such as the promotion of fauna diversity, including pollinator concerns, the integration of spontaneous vegetation overcoming old-fashioned species origin barriers, and more sustainable maintenance including more rational use of water resources.

Therefore, a systematic review of planting design seems relevant to understand how planting design has been evolving and adapting over the years to address rapid changes in the urban environment, producing guidance for the professional practice of Landscape Architecture. The objectives of this systematic review were to (1) evaluate the state-of-art about planting design; (2) identify the main planting design principles stated in the literature; and (3) assess the key planting design research trends.

Methods

This systematic review was performed following the guidelines from the Collaboration for Environmental Science (CEE, 2013) and included two stages: literature search and literature review (Figure 1).

Literature search

The literature search was performed in Taylor & Francis Online, Scopus, and ISI Web of Science Core Collection using the following search string: ("planting design" OR "planting scheme") AND "landscape architecture". The search period corresponded to "all years" until 2020. The research string was intentionally wide to capture as much literature as possible. Records retrieved from each search were combined and stored in Mendeley's referencing software, where duplicate records were removed, resulting in a total of 126 unique records.

The inclusion and exclusion criteria were applied by screening each record individually at two stages. Firstly, the title and abstract were examined to identify potentially relevant publications and then, at the second stage, full text was reviewed. For

a record to be considered relevant, it had to discuss and explore planting design, especially presenting its elaboration process, principles, theories, and/or providing case studies or examples from different geographical contexts. This additional elimination step resulted in a database of 27 relevant records. As fewer records were obtained, additional research using the same search term was also performed in Google Scholar to catch more references. The available full texts of the first 100 hits were evaluated, and the relevant records not included in the initial database were added. The snowballing method was also used, which analyses the list of references of the selected publications (CEE, 2013). After this search, several additional records were added, resulting in a final database of 51 publications (Figure 1).

Literature review and data analysis

The content of each publication was reviewed, and the information provided by each record regarding the parameters under analysis was classified and organized in an Excel working sheet. In this process, the analysis was guided following the objectives of this work.

To meet the first objective (to evaluate the state-of-art about planting design), we started by analyzing the publications according to (1) year of publication, (2) type of document (e.g., article, thesis, book), (3) publication Journal, (4) geographical area of study, and finally, the (5) theme addressed. A growth curve graph was built to analyze the quantitative dynamics over the years (Figure 2). The information about the type of document and the publication Journal was compiled in pie charts depicting the percentage of each result

Figure 1
Literature search and literature review process

(Figure 3). The geographical location of the research presented in each paper was displayed on a map, with each continent's expression represented by the intensity of the circle's color (Figure 4). Only the studies that provided details on the specific location (n=40) were included on the map. Studies conducted on multiple geographic areas without specified locations (n=11) were not included.

The information collected and classified in the excel working sheet was used o identify principles guiding planting design research and practice (objective 2). Research trends (objective 3) were obtained through VOSViewer bibliographic maps generated resorting to the frequency of terms (VOSViewer 1.6.11 software; van Eck and Waltman 2013).

Results and Discussion

State of the Art about planting design

Results showed that since 2011 there has been an increase in planting design publications (Figure 2). Planting design publications increased substantially after 2011

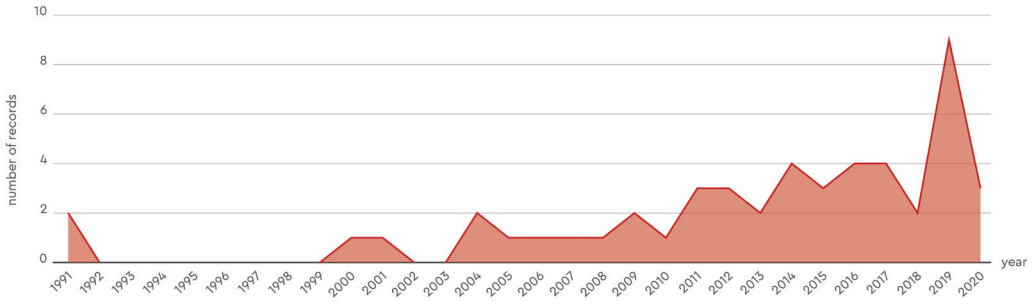


Figure 2
Number of published records per year (from 1991 to 2020)

and highlighted planting design's growing interest in landscape architecture research. The steadily increasing number of publications on planting design in the last 10 years could be related to the interest in exploring new planting design approaches and strategies under the current environmental and urban challenges context.

Concerning the type of publication, 64.7% of the records refer to Journal articles, and 15,7% to conference proceedings articles, thus showing a clear predominance of the more academic publishing circuits. Articles were more predominant in the last few years, especially in 2019, when 8 of 9 publications were articles. Journal articles (73,6%) were mainly published in Landscape Architecture Journals such as JoLA – Journal of Landscape Architecture, Landscape Research, Landscape Journal, Urban Forestry & Urban Greening, and Landscape and Urban Planning (Figure 3). This can be related to the option for a restricted search term.

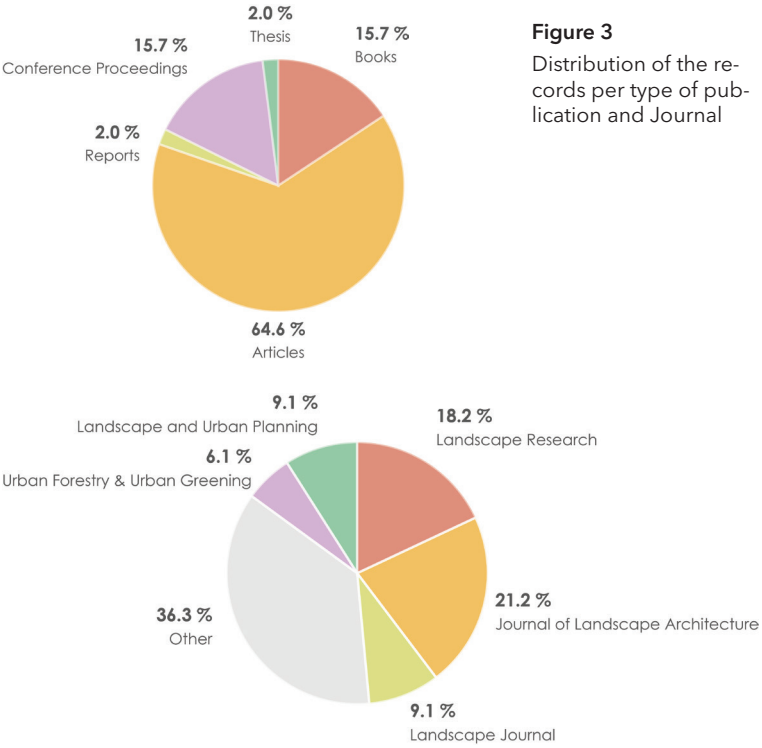


Figure 3
Distribution of the records per type of publication and Journal

Regarding the geographic areas of the studies (Figure 4), most records that provide such information were carried out in Europe (57,8% records), followed by North America (20%). Germany and the United Kingdom lead in Europe with seven publications each, but Turkey also deserves mention with four published articles.

Planting design principles

The literature review allowed for identifying the five fundamental principles underpinning the planting design process: (1) aesthetic and (2) ecological principles, which are more recurrent and widely discussed but also (3) economic, (4) social, and (5) cultural.

Aesthetic principles are linked to basic design rules such as harmony, unity, order, rhythm, balance, scale, diversity, emphasis, and other formal parameters (Robinson, 2016). They also refer to specific factors like composition (Turgut et al., 2012), seasonal changes (Eroğlu et al., 2012), chromatic variance (Daglı et al., 2016), visual quality and perception (Turgut et al., 2012). In the analyzed publications, aesthetics remains one of the most relevant planting design concerns. Still, it appears increasingly linked to the perception and people's visual response of the planting aesthetics and associated with the ecological aspects causing a change in the perceptual dimension of individuals.

Ecological principles relate to landscape ecology, including biodiversity promotion, climate adaptation (Alizadeh and Hitchmough, 2020; Hunter, 2011), species' phenological and sociological characteristics (Robertson, 1991), and ecosystem services. These principles are mostly related to a more naturalized planting design style and the structural composition of vegetation layers (Dunnett and Hitchmough, 2004; Hitchmough, 2011).

Social principles closely related to aesthetics, considering landscape visual quality and perception concerns. The main difference is that social principles refer, specifically, to planting design's social function in urban contexts. These principles are mainly characterized by directing the planting design to promote well-being, health, leisure, and overall quality of life.

Cultural principles are also related to aesthetics but focus on people and local identity, highlighting the sense of place, the feeling of belonging, and historical appreciation. The post-industrial planting design style is a fine example of the use of this principle. Frequently, cultural principles also consider ecological aspects once there is a concern about the public acceptance regarding naturalized styles, the use of non-native species that play a fundamental role in the sustainability of landscapes, and the insertion of emergent adaptive strategies to face scenarios of climate and environmental changes (Hitchmough, 2011; Hoyle et al., 2017).

Economic principles derive from ecological and sustainable planting design styles (Köppler and Hitchmough, 2015) and approaches that prioritize the cost reduction of vegetation maintenance, ensuring their long-term sustainability (Ghazal, 2019). These principles are related to planting styles that are semi-natural or intentionally spontaneous (Kühn, 2006) and create planting solutions to address resource limitations, either regarding the material or technical staff.

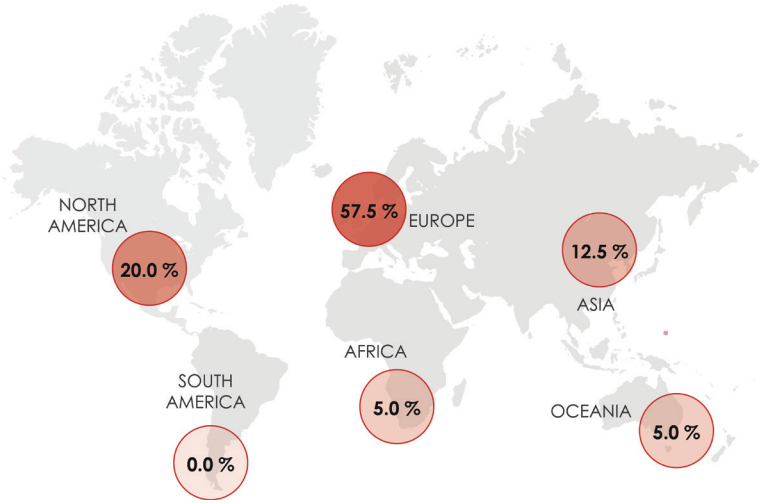


Figure 4
Geographic distribution of the studies that provided details on the location

Planting design research trends

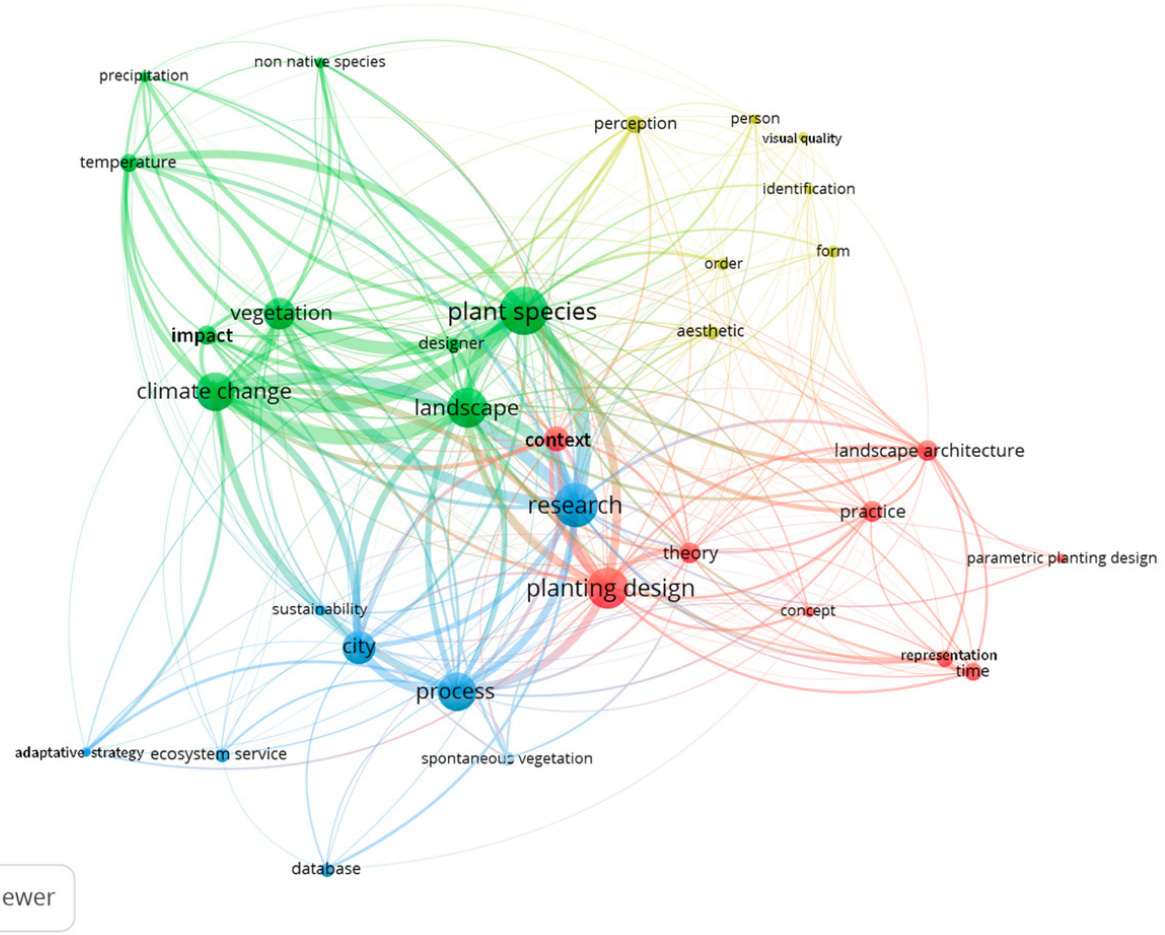
Based on the bibliographic maps results generated with VOSViewer 1.6.11, four clusters were obtained, represented in Figure 5 by different colors.

The green cluster represents a concern about the climate change impacts on the plant species and on the landscape. It corresponds to the terms "plant species," "climate change," "landscape," "vegetation," "impact," "temperature," "precipitation," "non-native species," and "designer."

In the blue cluster stand out the terms "research," "process," "city," "adaptative strategy," "sustainability," "ecosystem services," "database," and "spontaneous vegetation." The higher occurrence of these terms reveals a research trend concerned with adaptive strategies to solve emergent urban problems, like climate change, and the importance of ecosystem services in this context, including the research and the support tools to develop sustainable and eco-based urban landscapes.

Figure 5

Co-occurrence network of terms frequency map generated using VOSviewer 1.6.11 (van Eck and Waltman, 2013)



The yellow cluster brings together terms such as "perception," "people," "visual quality," "order," "form," "aesthetic," and "identification," reflecting concerns about the landscape's visual quality and perception from a personal and ingrained vision of social experiences and cultural symbols. Terms like "planting design," "theory," "representation," "concept," "time," "landscape architecture," "practice," and "parametric planting design" are displayed in the red cluster representing the professional practice and the theoretical concerns related to it, including the conceptual process, and the representation of time in planting design schemes but also the use of technology and intelligent computing.

Based on these results, we verified that the planting design's main research trends are: 1) Adaptive Planting design in the climate change context, corresponding to the green and blue clusters, which are very closely related; 2) the aesthetic and visual perception of planting design; and 3) the learning, teaching, and technical planting design process. It also emerges that these trends are intimately related to the planting design principles earlier identified and that there is a strong correlation between the planting design and social and environmental emerging issues.

Conclusions and Future Research

Based on the examined literature, a comprehensive scenario of research and publications about planting design was provided, as well as an evaluation of the main planting design principles and concerns driving planting design solutions.

There has been a growing interest in planting design in the last ten years, exhibited by the increased number of publications and the wide range of different types of publications and Journals spread by the globe. Most of the analyzed publications were articles published in Journals of great relevance and coverage in the Landscape Architecture field.

Planting design has been evolving and adapting over the years to address rapid changes in the urban environment. Aspects such as climate change adaptation, eco-based planting styles, concerns about landscape visual quality and perception, and the technicalities related to the planting design process represent the current research trends about this subject.

Regarding the design principles, the literature revealed that planting design has been turning to issues related to the cities' ecological, social, and economic spheres, highlighting the potential use of vegetation to reduce costs, improve ecosystem functioning and connect people to nature. In this sense, the selection and combination of plant species will play a critical role in climate change adaptation and mitigation, which will also be extremely important to guarantee people's well-being and quality of life. It's also important to highlight that the current planting design challenges are not only restricted to environmental and urban problems but also the teaching and learning process. Integrating the ecological theory into planting design practices often needs further experimentation. Concerning the systematic literature review process, we concluded that the search string was very targeting ("planting design" OR "planting scheme" AND "landscape architecture"), excluding other relevant terms such as "urban greenspaces," "nat-

uralistic design," "plant species fitness," "urban landscape" "landscape design," or "urban garden design." For this reason, the number of records obtained was very restricted and may explain gaps in the evolution of planting design publications over the years. Future developments of this research should include a broader search string and a deeper understanding of the weight of planting design publications and research interest within the Landscape Architecture field.

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A systematic review of expert methodologies for landscape visual quality assessment

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Abstract
Visual quality assessment has gained greater importance over the years and is a relevant tool to improve people's quality of life. These assessments can be accomplished through several methods or a combination of them. However, it is unclear what the main methodologies available are and the main trends occurring. A systematic review was developed to identify the main expert approaches and methods. The search was performed in the Scopus and ISI Web of Science databases and followed a 4-step screening process, which resulted in 79 records for analysis. Records were categorised according to the year of publication, geographic location (continent and country), landscape type, the framework adopted, and methods used. Records show an increase in recent years (1976 to 2021), especially around 2010. Europe and Asia have more records on the issue (44 and 20 records, respectively), and natural areas are the most studied type of landscape (34%), followed by rural areas (24%). Most authors developed their own frameworks (85%) using as main methods the photo survey and a combination of mixed methods. Although some methodologies still use *in situ* assessments, the main trend is utilising software, such as GIS (Geographic Information System), digital simulations or photo surveys of online distribution. The assessments made by experts continue to be of great importance for authorities and public entities and show great potential for future scientific research. Although this review has identified very positive trends, it is important that research still strives to achieve more valid, objective and reliable assessments.

Keywords
Scenic quality, expert paradigm, landscape assessment, systematic review, mapping methods

Introduction

Landscape plays a role of great relevance, performing fundamental social, environmental, cultural and economic functions. The higher its quality, the more benefits and quality of life it provides for the population (La Rosa, 2011). Therefore, to improve the well-being of people, competent government institutions are increasingly

investing in strategic means for planning and managing landscapes, aiming to maintain their character and visual quality. Visual quality assessment has also gained a renewed relevance after the European Landscape Convention, which emphasised the importance of characterising and monitoring landscapes at the country scale (COE, 2000). These visual assessments can be divided into three main approaches (Daniel, 2001; Zube et al., 1982): 1) the expert's approach, based on the opinion of professionals, commonly applied in the area of landscape architecture and environmental management; 2) the public approach, based on public perception, usually applied in research projects and academic work; 3) The mixed approach, based on the junction of public perception and expert opinion, applied on both management and research. Here we focus on the expert approach since there is a lack of contemporary reviews of these methods available for practicioners (Kvan, 2013; Daniel, 2001).

Methods (200)

Two methodological phases were adopted in this systematic review, namely Literature search and Literature review (Figure 1).

Literature search

After defining the theme, with the aim of systematisation, a search expression was developed to search the literature on the subject: landscape AND (visual OR "scenic beauty" OR "visual quality" OR "aesthetic quality") AND (assess* OR eval*) AND (expert* OR objectiv* OR specialist*). The Literature search was carried out in three steps: 1) Identification, search in the databases Scopus and Web of Science and exclusion of duplicate results, 2) Screening, selection of records through the title and abstract, 3) Eligibility, selection of records through the full paper. From the 503 records stored in EndNote software, only 79 records were expert approaches and satisfied the criteria for the Literature review. Records that didn't satisfy the criteria were, for example, public perception studies, visual impact assessments of built structures, image analysis and spatial simulations, watershed pollution assessments or soil-related studies.

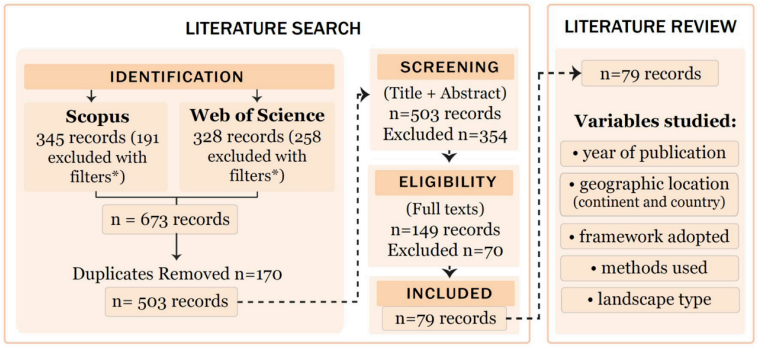

Figure 1
Methodological framework divided in two main phases: Literature search and Literature review

Literature review

The 79 publications were analysed and classified in a detailed Excel table according to 5 variables: the year of publication, geographic location where the study took place, the framework adopted, methods used and type of landscape evaluated. Information was also collected regarding whether or not an evaluation protocol was applied and the types of respondents involved (only Expert evaluations or Expert evaluations and Public opinions).

Results

Studies across time, continents and countries

A considerable evolution of research on the subject in recent years can be observed (Figure 2). The number of studies remained

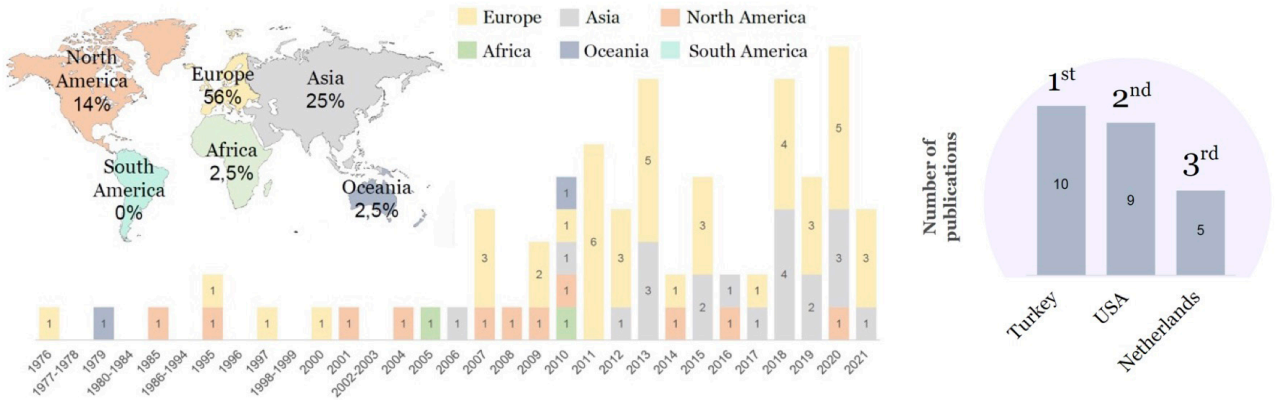

Figure 2
Left graph: Evolution of publications over time (1976-2021) by continent;
right graph: The top three countries with most publications on the subject

relatively constant, with minor variations, from 1976 to 2006, while some periods did not register any publication. There was a notable rise from 2010 onwards concerning the general number of publications. However, quite variable numbers can be seen from 2007 to 2021. The year with the most publications was 2020, totalling 9.

Regarding the continents that presented the most studies related to the subject, there is a consistency in the publications from Europe, which also presents the most considerable amount, with a total of 44 (56%), and publications that cover the entire period of analysis (1976 to 2021). Asia has the second largest number of publications on the subject, with a total of 20 results (25%), which begin to appear only after 2006. However, from 2012 onwards, there has been a notable rise and constancy in the number of studies published from this continent. The third continent with the highest number of publications on the subject was North America, with 11 publications (14%), which were more regular between 2001 and 2010. Africa and Oceania presented only two results each (2, 5%), with his last publications in 2010.

The three top countries with publications on the subject are: Turkey ranked first, with a total of 10 published studies, followed by the United States, with nine publications and, finally, The Netherlands in the last place on the podium with five publications. It should be mentioned that only documents in English were considered, possibly biasing the number of articles retrieved, as some of the research in this area may be published in other languages.

Framework adopted

Frameworks were classified as Authors' or Standard frameworks in the first phase. Authors' frameworks were created by the authors or adapted from standard frameworks (i.e., Tzolova (1995), Palmer and Hoffman (2001). While, Standard frameworks were already tested and formally applied by institutions or entities (i.e., BLM). Authors' frameworks had a total of 67 results (85%) since, in most of the analysed publications, the authors adapted the framework to their goals and study area (Figure 3). A smaller amount (15%) corresponds to Standard frameworks, which appeared in 12 documents.

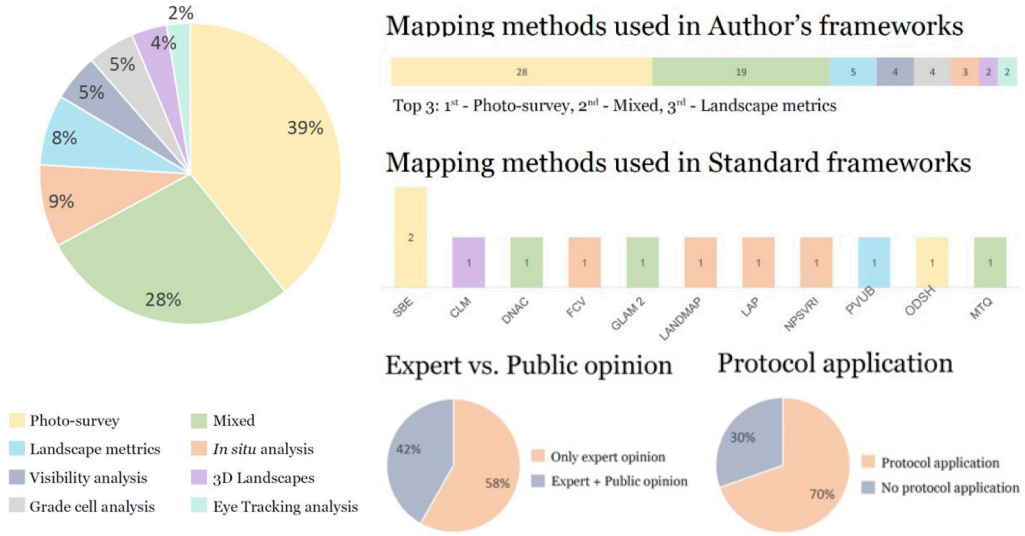

Figure 3
Left graph: Types of mapping methods used based on Nijhuis et al. (2011); right bars: Types of mapping methods used in Author's frameworks and Standard frameworks. Standard Frameworks identified: SBE - Scenic Beauty Estimation Method (USA); CLM - The contemplative landscape model; DNAC - Management plan (DNAC, 2002); FVC - Forests Commission of Victoria (Australia); GLAM 2 - Mapping attractiveness of the Dutch countryside; LANDMAP – Landscape Assessment Decision Making Process; LAP - The Landscape Assessment Protocol; NPSVRI – The National Park Service Visual Resource Inventory; PVUB - Parks Victoria and Univ. of Ballarat (Australia); ODSH - Official Designations of Scenic Highways (Caltrans, USA); MTQ – Visual analysis method by Ministry of Transport of Quebec; right graphs: Percentage of studies relying on Expert evaluations or Expert evaluations and Public opinions and percentage of studies applying a protocol.

Methods used
Mapping methods were classified into eight categories according to Nijhuis et al. (2011): i) photo-survey, application of surveys or questionnaires through landscape photos; ii) landscape metrics, quantification of landscape pattern indicators; iii) *in situ* analysis, on-site evaluation; iv) visibility analysis, three-dimensional visibility calculated through raster cells; v) 3D landscapes, i.e. photomontages, simulations or 3D visualisations; vi) grid cell analysis, which calculates landscape properties based on grid-shaped polygons or raster cells; vii) eye tracking, which uses equipment to study the movements and fixations of the eyes, while the observer visualizes and interprets the landscape; and viii) mixed analysis, uses two or more of mentioned methods.

The most prevalent mapping types are Photo-surveys (39%) and Mixed methods (28%), followed by other methods, such as in situ analysis, landscape metrics, visibility analysis and gridcell analysis. The least used methods are 3D landscapes and eye tracking analysis. Other analysis methods were also used, but with fewer occurrences. In the category of Standard Methodologies, in situ analysis was the most applied, followed by mixed methods.

With regard to the Types of Respondents, the class with the highest occurrence was the one that presented only the expert perspective (57%). Nevertheless, there is a tendency towards the Mixed-use of respondents (43%), using both experts and public opinion, which several authors suggest is a more holistic view (Wartmann et al. 2021).

Type of landscape analysed
Landscapes were classified into six types: natural, rural, urban, heterogeneous, cultural and coastal. Natural landscapes consist of forest landscapes, swamps, deserts and riparian areas. While rural landscapes are devoted to agricultural production, pasture, or with low human

presence. Urban landscapes are framed by settlements or urbanisations. Heterogeneous landscapes have more than one type or indiscernible character. Cultural landscapes are characterised by events or important elements of some period of history or complex historic landscapes that evolved from a strong human-nature interaction. Finally, Coastal landscapes are maritime landscapes or near the coast.

Natural Landscapes are the most studied among the analysed publications, representing 34% of the total (Figure 4). Rural Landscapes and Urban Landscapes follow, with 24% and 17% of the studies, respectively. The least studied are Multiple Landscapes (11%), Cultural Landscapes (8%) and Coastal Landscapes (6%).

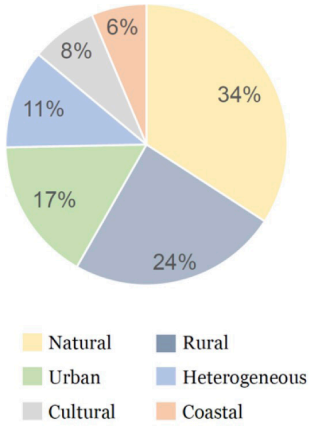

Figure 4
Types of landscape analysed according to six main landscapes: natural, rural, urban, heterogeneous, cultural and coastal

Discussion

Trends in research

As highlighted by Palmer and Hoffman (2001), there is a strong tendency for studies that are based on already established methodologies but undergo several adaptations or improvements according to the situations or specificities of the places where they will be applied, for example (Wu et al., 2019; Tveit, 2009; Clay & Smidt, 2004). The growing trend for author's frameworks might be due to some important factors:

1. researchers often find limitations in operationalising standard frameworks, as they are dependent on information or data that might not be available for their study area, nor fit their goals, or hard to adapt to a different type of landscape or type of participant/evaluator;
2. landscapes around the world are also very heterogeneous, thus one set of indicators that works for one landscape might not be adequate to characterise a different type of landscape;
3. some of the research had the goal of including public opinion, which most of the standard frameworks do not consider;
4. several studies combine a diverse array of methods, including new ones still being tested and developed, such as eye tracking analysis.

Generally, an LVQ methodology involves several steps. Some include *in situ* analysis, where the expert(s) fill in evaluation forms or protocols checking each indicator or landscape attribute on that particular landscape. However, the trend is towards the use of photographs, now largely used as a way of representing landscapes, in the application of (online) photo surveys and software and digital resources, such as GIS (Geographic Information System). With the enormous technological development of recent decades, studies of the landscape using technology have become increasingly computerised and, little by little, the need to travel to the field has

diminished. Even though it is questionable whether this is a good trend. Some authors point to the use of computer simulation and optimisation to aid landscape planning and management. For example, Weitkamp et al. (2011) analyse the development of a new generation of realistic and technologically advanced tools for LVQ assessment. This software developed can generate quantitative information and assist in landscape management plans, guaranteeing the best cost-benefit of different scenarios.

Research gaps

The research gaps identified are the study of coastal, cultural and heterogeneous landscapes. These landscapes face severe threats in the face of land-use change, and their social and economic importance justifies the monitorisation of their visual assessment. Regarding the least applied methods, some are quite recent and are still finding support, such as eye-tracking analysis. However, not all of the least used methods are recent. For example, the grid cell analysis dates back to the 60's and 70's, so some of these might have proven to be comparatively ineffective for assessing visual quality.

Conclusion

Landscape visual quality assessment is getting increasingly complex, particularly assessments done by technical experts. While old expert approaches (60's to 90's) were deemed unreliable and had low validity, modern research is more thoughtful on these reliability and validity concerns. The recent studies tend to depend more on software, such as ArcGIS or Fragstats, in which the landscape evaluation is a more transparent process, easier to recreate, and evaluation results are more easily explained and communicated. Nowadays, research relies on a robust and thorough theoretical basis and is finding new ways to include public opinion, attaining more holistic studies. Hence, expert assessments continue to be of great importance for authorities and public entities and show great potential for future scientific research. Although this review has identified very positive trends, it is vital that research still strives to achieve more valid, objective and reliable assessments.

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Assessing the Perceptions, Preferences and Attitudes of Users of Urban Green Spaces: A Systematic Review

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Abstract

In recent years, the importance of incorporating public opinion in the design of urban green spaces has become increasingly crucial, namely in the Landscape Architecture field. As a result, designers and planners are more and more interested in understanding the perceptions, preferences, and attitudes of urban green spaces users in order to create proposals that meet their needs, concerns and desires. There are several methodologies available for assessing perceptions, preferences, and attitudes, such as questionnaires, interviews, and participatory meetings. However, it can be difficult to determine the most appropriate method for a given study or goal. This paper aims to fill this gap by analysing published literature on this topic through a systematic literature review. A total of 677 references published between 1992 and 2020 were collected from Taylor & Francis Online, Scopus, and ISI Web of Science Core Collection. After applying inclusion and exclusion criteria, the final database resulted in a total of 218 relevant references. The review found that most studies focus on perception and use questionnaires or combined methods, conducted in-person, addressing simultaneously various types of green spaces, and focusing mainly on aesthetic and sensorial qualities and vegetation.

Keywords

Urban green spaces, Public opinion, Assessment methods, Systematic literature review, Questionnaires

Introduction

Understanding the perceptions, preferences, and attitudes of users towards urban green spaces is crucial for creating effective and sustainable urban green spaces. Green areas in cities are vital for urban dwellers' well-being, providing benefits such as physical and mental health and social cohesion. By gaining insight into how users perceive, prefer, and feel about urban green spaces, designers and planners can develop proposals that are better aligned with their needs, values, and

preferences, resulting in more successful and beneficial urban green spaces for all.

The study of perception, preferences, and attitudes of users of urban green spaces is a growing area of research in the field of landscape architecture, urban design and planning, and environmental psychology. Nevertheless, there are some misunderstandings regarding these terminologies that need clarification, to which some authors have contributed, such as Liebe et al. (2021), Chaiklin (2011), and Zube et al. (1982). **Perception** have been understood as the process of interpreting the messages of our senses to provide order and meaning to the environment. Users' perceptions of urban green spaces can include visual, auditory, and tactile cues, as well as more abstract concepts like emotions and ideas. By understanding users' perceptions, landscape architects can create urban green spaces that are better suited to users' demands. **Preference** refers to the act of choosing one thing over another. This can be based on personal tastes or values and can change over time as our experiences and understanding of the world evolve. For example, users may prefer one type of green space over another, such as naturalistic or formal styles. By understanding users' preferences, landscape architects can create urban green spaces that are more likely to be used and enjoyed. **Attitudes** have been described as the set of emotions and beliefs we hold towards a particular object, person, thing, or event. Users' attitudes towards urban green spaces can be influenced by a variety of factors, including past experiences, cultural norms, and socialization. Attitudes can be positive or negative and can affect how users interact with and respond to different types of urban green spaces. By understanding users' attitudes, landscape architects can create urban green spaces that are more likely to be accepted and supported by the community.

Together, all these dimensions (perception, preferences, and attitudes) can shape how users behave, care, cherish, and preserve the urban green spaces in their proximity. A wide range of factors can affect how users of urban green spaces interact with and experience the environment, so it is pertinent to understand these factors by directly inquire the users of the space, being mindful of their points of view and expectations. Therefore, it is very important in the context of Landscape Architecture to investigate these processes and work with this perspective, so that the developed proposals can actively respond to the needs of their future users. Being aware of users demands ensures the success of the urban green space and constitutes a powerful tool for negotiation with decision-makers.

With that in mind, the aim of this paper is to review and synthesize the current state of research regarding the perceptions, preferences, and attitudes of users towards urban green spaces, with a focus on the adopted methodologies. By providing a comprehensive overview of the existing literature, this work intends to contribute to increasing knowledge about this subject and to determine gaps that can inform future research and practice in the design and management of urban green spaces.

Methods

Literature search

This systematic review was conducted following the guidelines provided by the CEE (2018) and performed in Taylor & Francis Online, Scopus, and ISI Web of Science Core Collection, between July and October 2020, using the following search string: ("landscape preference*" OR "landscape perception" OR "public perception" OR preference* OR attitude* OR perception) AND ("landscape architecture" OR "landscape design" OR "landscape planning" OR "urban planning" OR "urban design") AND (park* OR garden* OR "park* and garden*" OR "square*" OR "public space*" OR "public urban space" OR "public urban green space*" OR "public urban greenspace*" OR "green space*" OR "urban green space*" OR greenspace* OR "urban greenspace*") AND (survey* OR "public survey*" OR method* OR questionnaire* OR interview* OR visualization* OR simulation*) AND (urban OR "urban area" OR "urban landscape*" OR city OR cities OR "city landscape*"). The time span of the search corresponded to "all years" until June 2020. Records retrieved from each search database were combined and stored in the referencing software Mendeley where duplicate records were removed, resulting in a total of 539 unique records.

Inclusion/exclusion criteria were applied by individually screening each record at two distinct stages. First, the title and abstract were examined to identify potentially relevant records, and then the full text was reviewed. To be considered relevant, the record had to evaluate the perception, preferences, or attitudes of users of public urban green spaces such as parks, gardens, squares, tree-lined streets, etc. Hence, we excluded any record that was not focused on urban areas and public spaces, as well as records that did not have the full text available or records written in a language other than English or Portuguese, resulting in a database with 202 relevant publications. To ensure a comprehensive review of the literature on the subject, additional searches were conducted in Google Scholar using the same keywords. The full text of the first 50 hits were reviewed and any relevant records that were missing from the database were added.

Literature review

The full text of each record from the final database (n = 218) was reviewed to address the objectives of this study. To evaluate what has been the focus of the research about the perception, preferences, or attitudes of users of public urban green spaces, records were classified according to the following categories and corresponding questions (Figure 1):

- Year: what is the year of publication?
- Journal: where was the record published?
- Type of evaluation: what is the evaluation focus (perception, preferences, or attitudes)?
- Geographic area: In which country the study took place?
- Type of Green Space: In which type of green space (e.g., parks, gardens, squares, tree-lined streets, etc.) the study took place?
- Theme: Which themes the study address (e.g., safety, biodiversity, recreation, etc.)?
- Type of contact: How users were con-

tacted (e.g., face-to-face, postal, online, etc.)?
- Method: What instrument and methods were used to collect users' data (e.g., interviews, questionnaires, combined methods, etc.)?

To facilitate analysis, the information provided by each record regarding the parameters under analysis was organized in an Excel working sheet. We highlight that many of the mentioned questions can easily have multiple answers. There are also situations where the information is simply absent. For instance, in terms of geographic area some studies were not carried out in a specific location.

Statistical analysis

The collected data were analysed using the open-source software R 4.2.3 (R Core Team, 2023). To determine if there is a relationship between the adopted methodologies of the collected records and the type of studies (particularly in terms of the type of evaluation, type of green spaces, theme, and type of contact), a correlation analysis between the variables was performed. Statistical significance was calculated using the chi-square test and a confidence interval of 95%.

Results

The final database consisted of 218 records spanning 29 years of publications, from 1992 to 2020. It was noted that there has been an increase in publications on the topic in the last five years, indicating a growing interest in studying the perception, preferences, and attitudes of users of urban green spaces as shown in Figure 2.

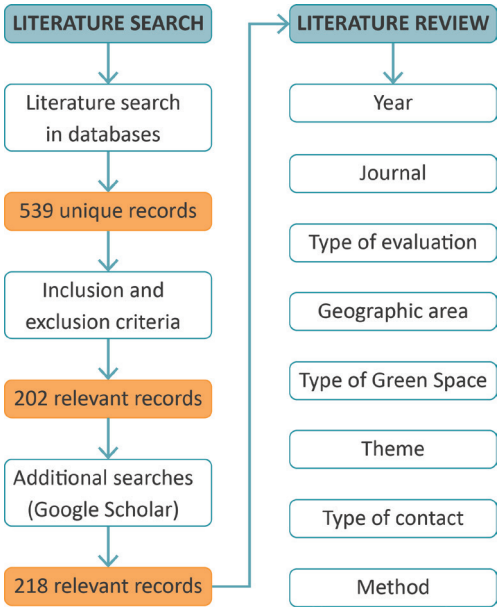

Figure 1
Literature search and literature review process

The records in the database were published in a total of 83 different journals, such as "Sustainability", "Landscape Research", "Environment and Behavior", "Cities", and "Science of The Total Environment". These journals cover a wide range of areas of knowledge, including natural sciences, human sciences, and arts. "Landscape and Urban Planning" (18%) and "Urban Forestry & Urban Greening" (17%) were the journals with the highest number of records.

In terms of the type of evaluation (Figure 3), most of the records focused on "Perception" (42%), as seen in a research article that studied public perception of spontaneous vegetation on brownfields in urban areas in Dresden and Leipzig (Mathey et al., 2018). "Preference" studies (23%) also had a significant representation in our database, such as a study that examined stressed individuals' preferences for ac-

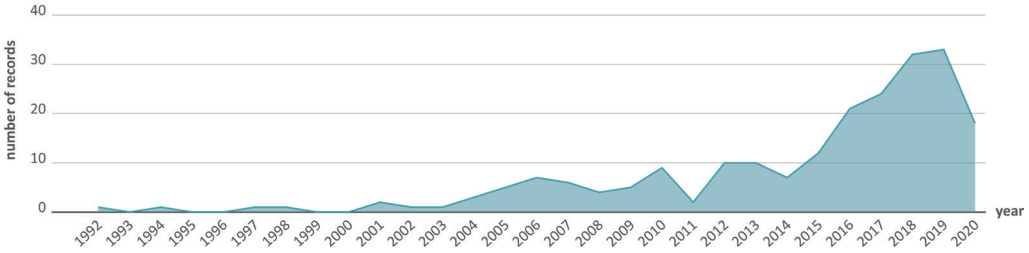

Figure 2
Number of published records per year (from 1992 to 2020)

tivities and environmental characteristics in green spaces (Stigsdotter and Grahn, 2011). Research focused on more than one type of evaluation was also present in our database, albeit research focusing on the three types of evaluation was absent.

Most studies were carried out in Europe (42%), particularly in the United Kingdom (6.8%) and the Netherlands (5.5%). For example, Hoyle et al. (2017) conducted research in the United Kingdom to evaluate the public's perception of non-native planting in the designed urban landscape. Additionally, there was a considerable number of studies conducted in Asia (29%), specifically in China, which represented 14.2% of the studies in the database. For instance, a recent study carried in China aimed at understanding older adults' outdoor thermal perceptions (Yung et al., 2019).

The results of the classification of the records according to the remaining analysed categories are represented in Figure 5. It was possible to verify that most publications studied "Various" types of green spaces simultaneously (41%, Figure 5a). Additionally, a great number of publications focused solely on "Parks" (29%). Regarding publication themes (Figure 5b), 22% of the publications focused on evaluating the "Aesthetic and sensorial qual-

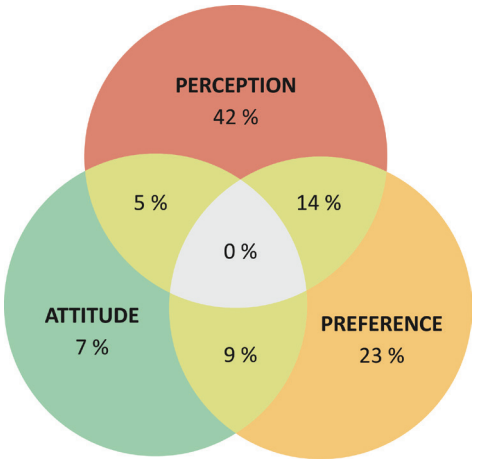

Figure 3
Distribution of the records in the final database in terms of type of evaluation

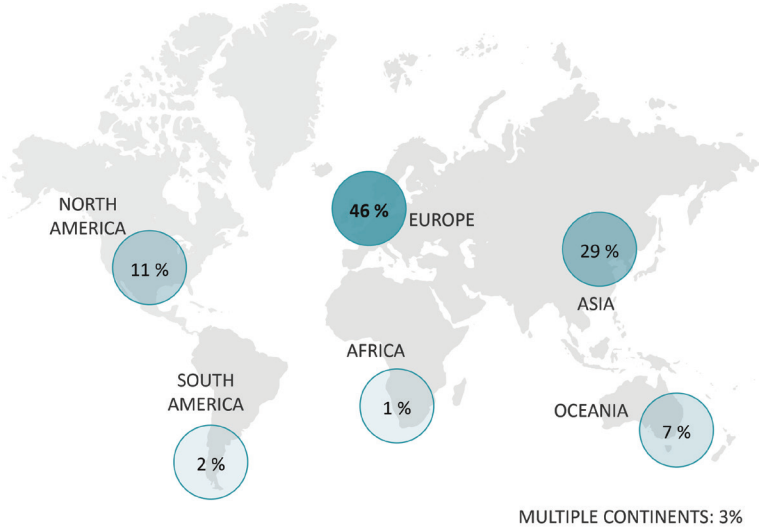

Figure 4
Geographic distribution of the studies that provided details on the location

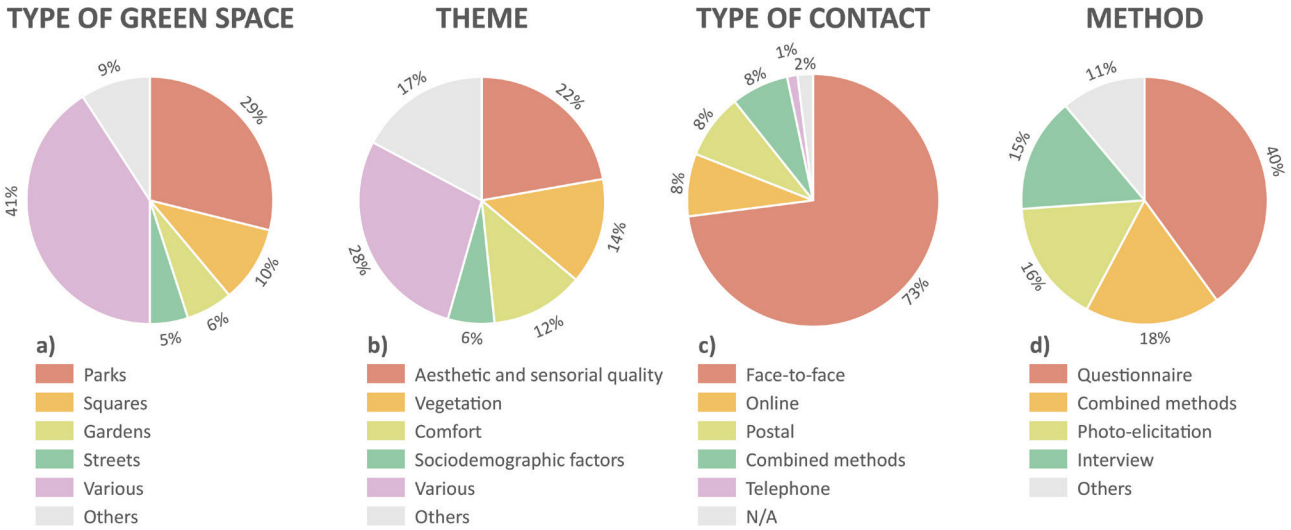

Figure 5
Distribution of the records in the final database in terms of a) type of green space; b) themes; c) type of contact; and d) method

ity" of urban green spaces. For instance, a study developed by Ma et al. (2020) assessed the effects of design proportion and distribution of colour in urban and suburban green space planning to visual aesthetics quality. We also highlight records focused on urban green spaces' "Vegetation" (14%) and users' "Comfort" (12%), but a wide range of themes were found on the final database. From Figure 5c, it is observed that in the majority of the studies, urban green space users were surveyed "Face-to-face" (73%). Other forms of contact included "Online" interactions (8%), "Postal" surveys (8%), or a "Combination of methods" (8%). Finally, regarding the method used to collect data from urban green space users, most studies applied "Questionnaires" (40%). "Combined methods" (18%) and "Interviews" (15%) were also used in some studies. "Photo-elicitation", a method of interpretation through visual images (photographs, photomontages, drawings, videos, etc.), was used in 16% of the analysed records.

Since we also wanted to explore, based on the literature review, if there is a method that is more appropriate for the goals or focus of the study, we additionally performed chi-squared tests ($\chi 2$) to determine a correlation between some of the analysed variables and the methods used in the studies (Table 1).

From Table 1, it is possible to verify that there are significant correlations between the adopted methods of the studies and all the analysed variables, except regarding the type of contact. Although most of the studies applied a "Questionnaire" (40%, Figure 5d), studies focused on evaluating preferences used more often the "Photo-elicitation" method (34%). Few studies analysed both perception and attitudes (5%, Figure 3), but in most of these studies, the "Interview" method (54.5%) was adopted. Regarding the type of green space, it was possible to verify that when analysing "Squares", most studies used combined methods (42.9%). "Photo-elicitation" was mostly used to evaluate "Gardens" (35.7%)

VARIABLES	METHOD					χ^2
	Question-naire	Interview	Combined methods	Photo-eli-citation	Others	
TYPE OF EVALUATION						***
Perception	**40.2%**	16.3%	18.5%	8.7%	16.3%	
Preference	22.0%	12.0%	20.0%	**34.0%**	12.0%	
Attitude	**73.3%**	13.3%	6.7%	6.7%	0.0%	
Perception + Preference	**50.0%**	0.0%	20.0%	20.0%	10.0%	
Preference + Attitude	**65.0%**	15.0%	10.0%	10.0%	0.0%	
Attitude + Perception	0.0%	**54.5%**	36.4%	0.0%	9.1%	
TYPE OF GREEN SPACE						**
Parks	**44.4%**	9.5%	20.6%	17.5%	7.9%	
Squares	28.6%	9.5%	**42.9%**	19.0%	0.0%	
Gardens	21.4%	28.6%	0.0%	**35.7%**	14.3%	
Streets	27.3%	18.2%	9.1%	**45.5%**	0.0%	
Various	**40.0%**	17.8%	18.9%	7.8%	15.6%	
Others	**57.9%**	10.5%	0.0%	10.5%	21.1%	
THEME						***
Aesthetic and sensorial quality	**45.8%**	12.5%	6.3%	20.8%	14.6%	
Vegetation	33.3%	13.3%	6.7%	**40.0%**	6.7%	
Comfort	30.8%	7.7%	**53.8%**	0.0%	7.7%	
Sociodemographic factors	**50.0%**	28.6%	14.3%	0.0%	7.1%	
Various	**41.7%**	15.0%	13.3%	16.7%	13.3%	
Others	**39.5%**	18.4%	28.9%	0.0%	13.2%	
TYPE OF CONTACT						ns
Face-to-face	**34.0%**	18.2%	21.4%	14.5%	11.9%	
Online	**44.4%**	0.0%	11.1%	33.3%	11.1%	
Postal	**58.8%**	11.8%	17.6%	5.9%	5.9%	
Combined methods	**64.7%**	0.0%	0.0%	17.6%	17.6%	
Telephone	33.3%	33.3%	0.0%	33.3%	0.0%	
N/A	**75.0%**	0.0%	25.0%	0.0%	0.0%	

Table 1

Relationship between the adopted methods and the type of studies (type of evaluation, type of green space, theme, and type of contact)

Significance levels: ns $p>0.05$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$

and "Streets" (45.5%). Finally, in terms of the theme of the record, studies focused on "Vegetation" aspects were mostly analysed through "Photo-elicitation" (40%), while studies focused on "Comfort" mainly adopted "Combined methods" (53.8%).

Discussion

Our study proved that there is a growing interest in understanding users' perception, preferences, and attitudes towards urban green spaces in recent years. This research growth can be attributed to the increasing importance and pertinence of incorporating users' perspectives into the design, planning, and management of urban green spaces. However, a clear relationship between the type of studies and the adopted methodology was not able to be fully established since most of the studies applied questionnaires. This highlights the need for further research and performance of more complex statistical analysis of the database, performing multivariate analysis and expanding detail in the classification of the records (e.g., in terms of themes, research goals, or target audience).

Despite this, the information collected in this systematic literature review is valuable in understanding patterns and trends on this topic, ultimately allowing us to present insightful findings. For instance, many publications on this subject can be found in various journals, with a significant number being published in journals relevant to the Landscape Architecture field (i.e., Landscape and Urban Planning and Urban Forestry & Urban Greening). This emphasizes the significance of this topic for landscape architects in both practice and scientific research.

We noticed a trend on publications focused solely on perception, with less attention given to studying users' preferences and attitudes. There are some misunderstandings regarding this terminology that needs further clarification, meaning that the terms used in the different publications may not be the most accurate. As mentioned in the introduction section, perception, preferences, and attitudes have different meanings, and are all relevant for studying. Future research could expand on these research gaps and conduct studies more focused on users' preferences and attitudes, such as to determine which aspects urban green space users prefer or if they are willing to accept and support changes in the design, planning, and management of urban green spaces in the upcoming years (e.g., more ecologically friendly design).

Europe is at the forefront of publications on this subject, with the majority of studies being conducted in various types of green spaces. However, research in South America and Africa is underrepresented in this systematic literature review, accounting for only 3% of the analysed records. This could be due to bias as the records were collected exclusively in English or Portuguese.

The aesthetic and sensorial quality of urban green spaces is the trendiest theme in the final database, which includes considerations of soundscape, quality attributes, attractiveness, contemplativeness, sensory dimensions, visual preferences, and psychological restoration. Additionally, the vegetation of urban green spaces is also a recurrent theme, examining aspects such as plant species selection and combina-

tion, planting typologies, and the emergence of spontaneous vegetation. Furthermore, there is a significant number of records focused on users' comfort. These findings suggest that these are some of the most important factors that influence people's enjoyment and appreciation of urban green spaces.

In most studies, respondents were inquired face-to-face and through questionnaires, highlighting the prevalence of these methods in the field. The advantages of presential inquiries are widely known, since face-to-face interactions are more likely to result in a high response rate as there is an opportunity to explain the study and ensure that the respondent understands the questions. On the other hand, questionnaires offer cost-effectiveness and ease of analysis through standardized questions and the ability to survey a large number of participants at once. The advantages of these approaches could explain why they were the most used, but it is important that researchers are aware that the methods selection largely influences the study design and findings, and there are methods that are more appropriate in specific circumstances. We were able to determine some correlations which can help researchers to better understand the best way to inquiry users and to collect more meaningful data. For instance, preference studies selected the "Photo-elicitation" method significantly more, which may be explained by the fact that interpretation through visual images can facilitate users' preference decisions. "Photo-elicitation" was also significantly more used in small-sized or more confined spaces such as gardens and streets. In wider areas such as parks, researchers were more keen to apply questionnaires. Studies focused on "Vegetation" resorted significantly more often to image analysis as well, probably because it is an easier way to communicate with laypeople about specific plant species or composition dynamics. We also noticed a pattern on studies focused on users' "Comfort", as these studies used significantly more often "Combined methods". In this case, studies used a questionnaire or interview (or both) combined with noise or microclimate measurements, suggesting that beyond the users' analysis, some experiments also demand an analysis of the urban green spaces characteristics.

The outbreak of Covid-19 has likely altered people's relationship with urban green spaces and the methods used in related studies may have shifted as a result. Future research should consider extending this study to encompass the years following the start of the pandemic to investigate potential changes in methodology and study focus. For instance, has the pandemic led to an increased focus on people's health and well-being in these studies? This could provide valuable insights into how the pandemic has impacted people's relationship with urban green spaces, and how to design such spaces to better meet the needs and preferences of users in the post-pandemic world.

Conclusion

In conclusion, this systematic literature review has shown that the inclusion of public opinion in the design process of urban green spaces is an important consideration for designers and planners. The review of 218 references revealed that most studies focus on perception and use questionnaires conducted in-person and

addressing various types of green spaces simultaneously. However, there is still a need for more research to determine the most appropriate method for a given study or goal. It is important for designers and planners to continue to strive for understanding the perception, preferences, and attitudes of urban green space users in order to create proposals that align with people's needs, beliefs, values, and predilections.

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Heritage Practices and Contemporary Landscapes in Spain: Reflections after 20 years of the European Landscape Convention

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Abstract
The adoption of the European Landscape Convention (ELC) in 2000 stimulated landscape research. It also encouraged a reorientation of its approaches towards a more heritage-based approach. Landscape is identified by the ELC as a key component in forming the "identity" of a community. On this basis, the Convention advocates that this community should see its "aspirations" reflected in its landscape. After 20 years, six research groups have promoted the Spanish Cultural Landscapes Research Network, an initiative within the framework of the 'Plan Estatal de Investigación Científica y Técnica y de Innovación', to analyze this issue in depth in Spain.

During the academic year 2020-2021, this network promoted a public dialogue program entitled 'Ensambles: Contemporary Landscape and Heritage Practice'. This forum of 7 dialogues reflects on the challenges for research after the journey traveled. Academics, scientists, technicians, engineers, architects, artists and managers confront critical arguments on contemporary landscape and heritage practice in a context of redefining the relationship between humans and nature. We present here the topics that were debated, whose character was broad and open to a wide range of disciplines. They were the following: Teaching, Landscape Models, Communities, Representation, Geoinformation, Project and Anthropocene. In total, there were more than forty participants.

Such meetings have opened new avenues for scientific, technological and humanistic research, as well as for creative practices. New approaches are opening up that link landscape as heritage to the major challenges of our time, such as global climatic and socio-economic change, territorial imbalances, digital interconnectivity, democratic quality, the loss of meaning of urban environments or, more recently, public health.

Keywords
Cultural Landscape, European Landscape Convention, Heritage, UNESCO

Introduction

On October 20, 2000, the European Landscape Convention (ELC) was opened for signature and ratification by the member states of the Council of Europe. The justification for the ELC was based on herit-

age theses: it identified landscape as the foundation of the "identity" of communities and defended on this basis that they should see their "aspirations" reflected in it (Council of Europe, 2000). For the first time, when talking about landscape, the biodiversity of a natural park was not prioritized over the socio-cultural value of an industrial site, or the preservation of the historic city over the qualification of the yet to be built periphery. The Convention opted for a totalizing approach that left behind any hierarchy between territories in favor of a "comprehensive policy" capable of encompassing all types of environments (Council of Europe, 2018). This meant recognizing landscape as one of the key concepts of contemporary European urbanity. Twenty years later, forty states have joined the European commitment.

This major international agreement on landscape issues did not come about spontaneously. In the last quarter of the twentieth century, there was a desire to define principles for understanding and managing landscapes. Discussions on the Convention date back to 1994, shortly after UNESCO included "Cultural Landscape" in its Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO, 1992). Even earlier, IUCN, the International Union for Conservation of Nature, had defined the category of "Protected Landscape" and combined it with other protected areas in a complex system of territorial protection (Foster, 1988; Phillips, 2005). Against this background, the novelty and fundamental contribution of the ELC lies in the way in which the landscape to be protected is understood. So much so that its drafting is accompanied by a new philosophy for its protection: whereas UNESCO and IUCN proposed the delimitation of unique spaces of great cultural value, the Convention adopts a non-discriminatory position (Déjean-Pons, 2006). In other words, in contrast to the delimitation of sites of outstanding value, it considers the protection of European culture as a physical reality that manifests itself in different forms and with different intensities along its entire geographical continuum (Bruun, 2016).

In this sense, the adoption of the ELC has had a strong impact on landscape policies at local, national and international levels. In a recent interview, the Executive Secretary of the Convention, Maguelonne Déjeant-Pons, assessed its impact very positively: on the one hand, government agendas have gradually incorporated landscape as a fundamental axis of development and have drafted laws, established awards, created university degrees and established observatories and cooperation networks; but above all, governments and populations have accepted that landscape is a common, democratic and democratizing good (DéjeantPons, 2019). For this reason, many voices point out that the ELC has gone beyond its results and has laid the foundations for a new conceptualization (Scazzosi, 2004).

Similarly, landscape policies in European countries are increasingly linked to cultural heritage policies: a recent study concluded that the protection and promotion of cultural heritage prevails among the main objectives of a high percentage of existing landscape organizations, laws and regulations (García-Martina et al., 2016). This is because landscapes are now valued as a diverse and complex form of heritage, with a full range of cultural and natural val-

ues. The European Landscape Convention justifies this phenomenon, at least in part, by explicitly formulating, together with the European Territorial Strategy, a strategic alliance between landscape, cultural heritage and spatial planning. In Spain, the situation is reinforced by the existence of the National Cultural Landscape Plan (Consejo de Patrimonio histórico, 2012).

Thematic Network on Cultural Landscapes Research

These ideas have complex implications at both conceptual and operational levels, and have led to a prolific body of landscape research. Moreover, it has had a decisive influence on heritage policies, pushing for a change in attitudes: attention is no longer paid exclusively to objects and places that are considered more "authentic" or "valuable", and we begin to speak of an "everyday heritage" (Harrison, 2015). After two decades of experience, 6 Spanish research groups have promoted the "Red Temática en Investigación sobre Paisajes Culturales", an initiative to analyze in depth the state of the art in the country. The network seeks to consolidate a space of critical knowledge to question the hypotheses under which the landscape is conceptualized today, to detect trends in the topics of study and to discuss the methods used to achieve a transdisciplinary integration between teams.

The research network is part of the so-called Dynamization Actions of the State Program for Knowledge Generation and Scientific and Technological Strengthening of the R&D&I System, within the framework of the Spanish State Plan for Scientific and Technological Research and Innovation 2017-2020. In its 2018 call, the program granted aid to specific consortia to promote the complementarity of existing research capabilities and resources between research groups and managers from different institutions. In this way, it sought to contribute to the generation of synergies and the creation of networks in strategic and novel areas for the Spanish science, technology and innovation system as a whole. Two types of networks were proposed: thematic networks, made up of researchers in the same or similar thematic areas of knowledge, and strategic networks, made up of Spanish managers or researchers participating in European research initiatives.

The "Network for Research on Cultural Landscapes" is of the first type and is made up of researchers with extensive professional experience in collaboration. In fact, the network consolidates a previous and smaller one: the Network for Research on Cultural Landscapes in Spain (2014-2016), also supported by the State Program. Three of the driving research groups of the current consortium were part of this network. Three universities have joined the current consortium and the disciplinary profile has been broadened. Today it includes social and natural scientists, humanists, engineers, architects and artists, members of six research groups from five universities:

- Coordinator: Cultural Landscape Research Group, GIPC (Polytechnic University of Madrid; IR: Francisco Arques Soler).
- Grupo Arquitectura, Historia, Ciudad y Paisaje, ARQHCIPAI (Universidad de Alcalá de Henares; IR: María Ángeles Layuno Rosas).
- Grupo Desarrollo Territorial de Castilla

La Mancha, DETER (University of Castilla La Mancha; IR: María del Carmen Cañizares Ruiz).
- Geovisualization, Singular Spaces and Heritage Group, GESyP (Polytechnic University of Madrid; IR: Tomas Herrero Tejedor).
- Grupo Laboratorio de Paisaje Arquitectónico, Patrimonial y Cultural, Lab. PAP (University of Valladolid; IR: Darío Álvarez Álvarez).
- Socioecological Systems, Landscape and Local Development Group, ADAPTA (Universidad Complutense Madrid; IR: Francisco Díaz Pineda)

In any case, the network has sought to be open to the entire research community and to landscape and heritage policies, and the activities carried out have confirmed this. Its ultimate goal is to consolidate a space of shared knowledge between experienced teams.

The funding of the network covers a period of two years starting in January 2020. Unfortunately, the start of the network coincided with the start of the global pandemic situation, but this did not affect the achievement of its objectives, as most of them have been adapted to telematic working methods. The activities of the network are divided into four blocks of work: Creation of synergies. The study and protection of the landscape is approached by each discipline from different points of view. This difference is particularly marked between, but not limited to, nature and heritage teams. However, there are opportunities for common discussion and even cross-pollination of methodologies if the nature-culture and past-future dichotomies are overcome. The objective of this block of work was to clarify the conceptual tradition of each discipline, based on the definition of the natural-cultural value of heritage, and to reformulate landscape policy as a set of heritage practices attentive to the value of the past in the present, especially for its potential for constructing alternative futures.

Technology assessment. The identification, evaluation, intervention and management of cultural landscapes is a professional challenge that digital data environments can help to solve. The objective of the network is to present methodological applications based on geoinformation to achieve more accurate, rapid and easily extrapolated documentation using inexpensive means. It also aims to share information between groups and integrate data related to biophysical components as well as cultural, socio-economic and intangible phenomena and the spatial interaction between them. Geoinformation is confirmed as a critical opportunity for conservation because it allows long-term simulations and the consideration of criteria not currently included in decision-making frameworks.

Internationalization. The objective is to place the Spanish experience in a position of international relevance by participating in the main existing landscape networks, showing the national specificities in the field of study and contributing to the strengthening of the scientific, technical and training capacities of the teams. Among the most important networks with which we have collaborated are the European Council of Landscape Architecture Schools (ECLAS) and the International Association for Landscape Ecology (IALE).

Research challenges. During the 2020-2021 academic year, the network organized "ENSAMBLES: Contemporary landscape and heritage practice", a transfer forum open to the general public (https://ensambles.eu/). It included presentations by academics, scientists, technicians, engineers, architects, artists and managers from 13 Spanish universities, 2 European universities, 1 public research organization, 4 public administrations, 2 cultural institutions and 5 companies from the culture, environment and heritage sectors. Organized in seven sessions divided into two blocks, the aim was to discuss the research challenges 20 years after the adoption of the European Landscape Convention and to align them with the Sustainable Development Goal of the United Nations 2030 Agenda, which calls for "redoubling efforts to protect and safeguard cultural and natural heritage".

Futures questions

As a result of the work on the different objectives, and agreed in the forum of the Ensambles, the network has been able to conclude a series of questions understood as challenges for landscape research in the coming years. These questions can be classified in a constellation of 7 groups, interrelated and open to extension.

Training of professionals. There is a consensus on the objective of training university landscape specialists through transdisciplinary curricula. The European Landscape Convention itself explicitly refers to this task. However, most university courses are still highly disciplinary, making it difficult to understand landscape as a complex reality. What is the contemporary conceptualization of landscape on which we want to work and train professionals at the university level, and how do we propose to do it?

Models of action. The models of action in landscape are changing with the recognition of increasingly complex heritage phenomena. They now concern ordinary landscapes in which the daily life of human societies develops, such as the urban periphery, the peri-urban space or the rural environment. This forces us to overcome the dichotomy between the protected and the unprotected and to operate in the interaction between management policies, ecosystems and certain human activities understood as heritage values. What are the concepts and tools used by the new models of action to organize, preserve, manage and create landscapes?

Creation of identities. In the last decades, participation has been very important in landscape policies. Today, however, we know that actions based solely on the consultation of the population are not sufficient to stimulate a sense of ownership in the present, which plays a truly decisive role of responsibility in the future. Moreover, given that the links between place and identity change over time, how can the community's perception be combined with expert knowledge of the past? Who should decide which landscape is worth protecting, and how?

Representation and non-representation. Images, or ways of imagining, actively contribute to the construction of landscapes. They drive an associative process that gives landscapes multiple dimensions beyond the material. Today, however, the mediating role of representation is being

questioned and post-representational or non-representational lines of research are being consolidated. How can we approach today the intrinsic and always bidirectional relationship between representation and landscape?

Geoinformation and new landscape data. The methods of studying the measurement of landscape are changing. Today, geoinformation and digital environments redirect the heritage problem towards the spatiotemporal knowledge of the cultural fact, whether material or immaterial. And it is clear that the current digital technology influences the territorial perception of the heritage context. How does it define the image of the territory on the traces of its historical construction? What are the advances available for the documentation of the landscape and what challenges do they pose?

Landscape and heritage creation. Landscape policy involves actions to order or preserve the landscape, but also to intervene and transform it. Landscape architecture faces this creative task by meeting functional and experiential demands. How to create landscapes that are both sustainable in their indicators and significant in their collective experience? How to project the future landscape in an ever-changing environment?

Responsibility in the Anthropocene. The processes that characterize the Anthropocene have shaped landscapes in conflict, as well as those we value today, including the so-called natural ones. The contemporary landscape is therefore representative of the set of processes that define our geological or geohistorical epoch. And so perhaps it is time to reflect on its cultural character and alternative visions for the future. How can the landscape of the Anthropocene be patrimonialized? What are the arguments and counterarguments behind this idea?

Conclusion: Towards a new ethics

In asking these critical questions, the network does not seek answers, but rather speculates on new avenues for scientific, technological, and humanistic research and creative practices. Not without controversy, these new approaches move away from the classic policies of cultural heritage conservation and link landscape as heritage to the major challenges of our time, such as global climatic and socio-economic change, territorial imbalances, digital interconnectivity, democratic quality, the loss of meaning of urban environments or, more recently, public health. In this sense, it seems appropriate to recall once again the challenge posed by Bruno Latour when he invites us to ask "what it means to be morally responsible in the Anthropocene" in order to look from there to the future, problematizing the critical link between landscape and heritage (Latour, 2012).

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0002
RELATION BETWEEN DESIGN AND PLANNING

Transformative Resilience - a chance to reunite landscape planning and design?

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Abstract
The concept of transformative resilience can be a driver in transdisciplinary processes bringing together landscape planning and landscape design. Combining processes of generating, structuring and spatializing knowledge on landscape functions and designing visions for sustainable landscapes on different scales benefits from the creative use of mappings. The text aims at contributing to the discussion on the relation between landscape planning and design and draws its conclusions from the reflexion on the transdisciplinary research project "Green fingers for a climate resilient city".

Keywords
Resilience, landscape planning, landscape design, mapping, green fingers, transdisciplinary

Introduction
A look into history shows that landscape planning and landscape design have a complicated relationship, characterized by phases of closeness and cooperation and those of distance and demarcation. The collective plan for Berlin (Kollektivplan für Berlin) by Sharoun et al (1946) shows for example a phase of closeness and merging: Landscape planning and urban design are presented in one coherent vision for the city of the future. However, recent examples from many German cities show that the formal landscape plan and informal master plans that are based on designing are not developed together. So, today, the relationship is rather characterized by misunderstanding and insecurity. Planners and designers know that both parties are needed for successfully coping with the great transformation (Schneidewind and Singer-Brodowski 2014; Schneidewind 2018). But they have grown apart. There is landscape planning, the orderly, rational, controlled one, that always has its figures right, but that lacks creative visions from time to time. And there is landscape design, the inventive, intuitive one, that often seem to have its head in the clouds. The hypothesis of this contribution is that transformative resilience can help to revive the relationship of landscape planning and design. According to Schmidt, Hahne, Kegler and several other authors, resilience describes the capacity and velocity of a system to cope with disturbance (Hahne and Kegler 2016; Schmidt 2020). Many authors emphasize that only analysing bouncing back effects and aiming at restoring a landscape that had been

disturbed, falls short. Global drivers such as climate change and land use change make it impossible to bounce back in many places anyway. The notion of transformative resilience describes a process of socio-cultural change that is characterized through mutual learning and aims at „bouncing forward" and designing new landscapes (Kegler 2014; Meerow and Stults 2016).

The discipline of landscape architecture, with its position at the intersection of natural science, social science, and creative practice, has the great potential to invent this bouncing forward. It can make suggestions as to what a bouncing forward can look like. To be able to do this, it is necessary to bring together the competences of landscape planning and landscape design. It needs both the orderly, strategic of landscape planning and the concrete, tangible, sometimes daring of design. So, the task to invent the bouncing forward can be an occasion to stimulate the cooperation of the two. The question is how.

The fact that Kegler focuses on the transformation process makes resilience a task of planning culture and process-design. That's why transdisciplinary processes are helpful settings for working on transformative resilience. Transdisciplinarity is understood as a critical and self-reflexive research approach, which integrates different interdisciplinary scientific and extra-scientific insights to co-produce new knowledge to tackle complex problems (Jahn, Bergmann, and Keil 2012, 8–9). This "research must be created through processes of co-production in which scholars and stakeholders interact to define important questions, relevant evidence, and convincing forms of argument" (Kates et al. 2001, 2). Therefore, competences of landscape planning and landscape design (as well as process design) are needed. As transdisciplinary processes involve relevant actors, for example in administration and politics as well as landowners, with the aim of implementing and stabilizing results, it is necessary to make the concepts for the bouncing forward accessible for everybody involved. Complex topics must be made clear. Here, again, is the question how.

Methods

The question of how landscape planning and landscape design come together in transdisciplinary processes and invent the bouncing forward will be demonstrated through the research study "Green fingers for a climate resilient city, Osnabrück". It is linked to a larger research community working on projects all funded by the German Ministry of education and research (BMBF). As analysing the interconnection between the processes of planning and designing depends on deep insight and participation in the transdisciplinary process, only the one project in which the author of this paper was intensively involved was selected. The findings are based on reflections with members of the research team and the involved actors.

The university city of Osnabrück with its roughly 170.000 inhabitants is a prosperous, growing hub in a semi-rural region. Osnabrück's eleven green fingers run as a star-shaped system along hills and valleys and consist of agricultural land, forest, community gardens and recreational areas. They incorporate different functions for climate-resilience and are

therefore discussed as a special type of green infrastructure (Rößler 2015; Hansen et al. 2018; Maes et al. 2019; Pauleit et al 2020). Often reaching from city centre to urban fringes, they can provide space for stormwater retention, urban agriculture, biodiversity, and recreation. In addition, the Green Fingers are important cooling retreats during periods of summer heat and, with appropriate topographic conditions, corridors that provide fresh air to neighbourhoods. According to Pierer and Creutzig (2019), a star shaped city structure with Green Fingers can be seen as a prototype for climate resilient ways to settle.

The idea of the Green Fingers in Osnabrück dates to 1928 when the head of the municipal planning office Lehmann drew the first map of a system of interconnected green spaces. Since then, the Green Fingers played different roles in spatial planning. Nowadays, in the context of climate change, they are on top of the agenda of some political parties and several associations, again. This is also due to the fact, that Osnabrück is growing and that there are plans to build 3000-5000 new housing units, some of them in the Green Fingers. The research questions of the project "Green fingers for a climate resilient city" were: Which existing spatial functions and landscape qualities need to be preserved or developed to coop with climate change? Which practices need to be changed to establish a planning culture of working efficiently together on climate resilient city planning and design? Accordingly, the first goal of the project is to generate, structure and spatialize knowledge on the Green Fingers to maintain and develop a climate-resilient structure for the city of Osnabrück. The second aim is to successfully establish a process of transformation that helps to make this knowledge fruitful for the city's transformation and to experiment with a new planning culture. Both aims had been combined as components of the transdisciplinary research process. A working group of politicians met twice a year and worked on principles of climate resilience, discussed scenarios and a spatial vision. A working group "key actors" assembled farmers, members of the working group of politicians, a formed citizens-council and of different organizations such as nature conservancy groups, hunters' representatives, citizens associations, cultural initiatives and Osnabrück's youth league. This group contributed with its local knowledge and discussed scenarios and the spatial vision.

To gain knowledge about the green finger system, the research team investigated qualities and sensitivities of spatial structures that enable adaptation to climate change. In addition to identifying and assessing the various landscape functions (von Haaren et al. 2019), the degree of conservation of landscape character (Schmidt 2022) was used to assess the biophysical (or spatial) aspects of landscape resilience. So, well-known practices of landscape planning were applied. Landscape design practices were used to find a spatial vision working as a guideline for the transformation of the star-shaped city with its Green Fingers. The research team designed four scenarios based on the knowledge that had been generated and spatialized both by the research team and the involved actors. Scenarios are seen as 'plausible descriptions of how the future might develop, based on a coherent and

internally consistent set of assumptions ("scenario logic") about the key relationships and driving forces' (Nakićenović and Swart 2000; Griewald et al. 2017). After that, the spatial vision was designed, the so called green-blue network of high resilience green spaces.

Results

How did landscape planning and landscape design interact in the Green Finger project? What inspired this interaction during the transdisciplinary process? The analysis of the process shows that a crucial tool in the transdisciplinary process was visionary mappings (fig. 1).

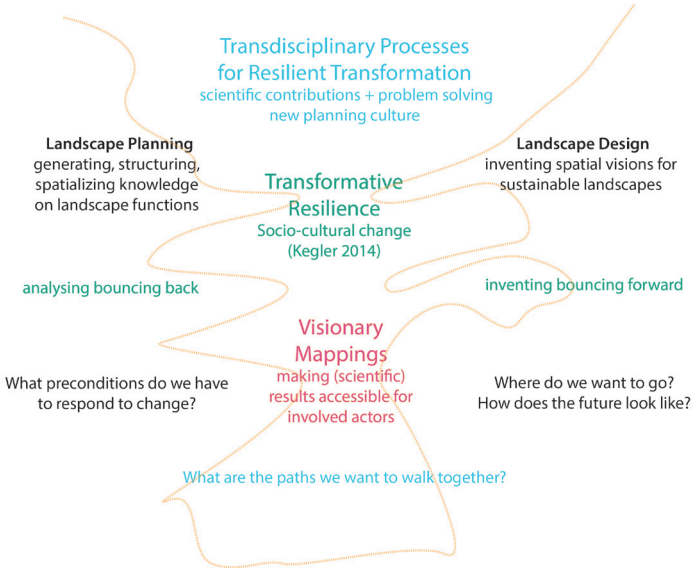
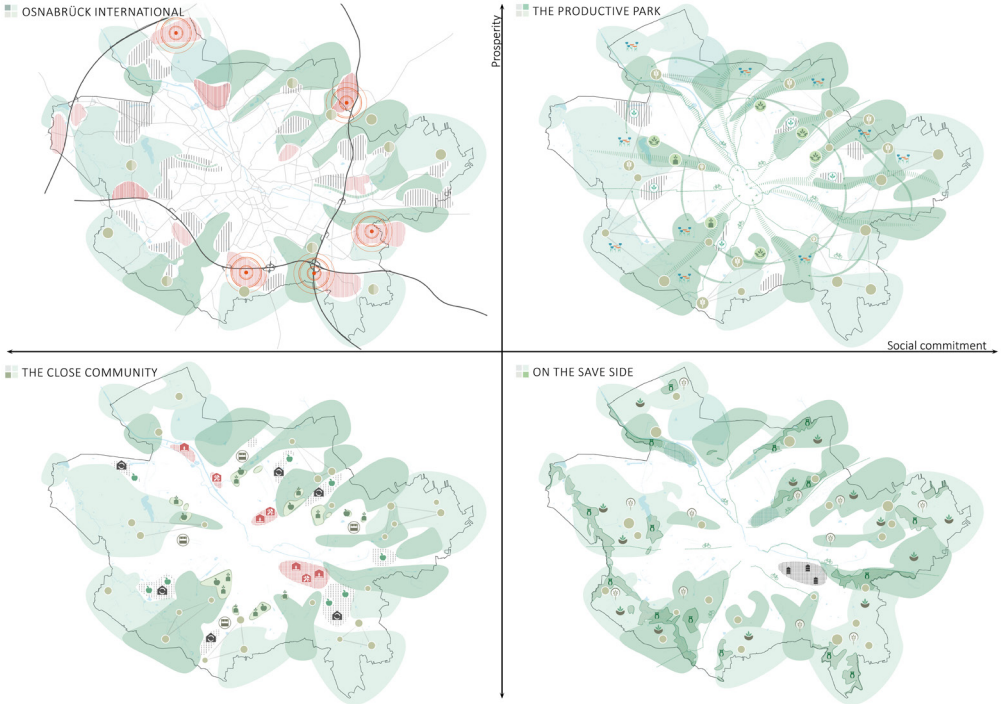


Figure 1
Transformative Resilience reuniting Landscape Planning and Design

To be able to create these mappings, on the one hand, all the data and facts about landscape functions provided by landscape planning are needed. This includes areas with special suitability for biodiversity, urban agriculture, cold air generation, cold air transport, flood retention, local recreation, etc. The overlay of all these functions was an important aspect of the mappings. In many places, the green spaces identified through layering are congruent with the existing Green Fingers. Landscape planning could thus help answer the question "What preconditions do we have to respond to change?" and thus help analyse the bouncing back.

On the other hand, landscape design could contribute ideas on how green fingers could develop in the future. New green spaces could be identified and new connections between green spaces could be found. Unlike classic GIS maps, the mappings highlight structures and elements that are relevant for sustainable landscape development from the perspective of the stakeholders involved. Landscape design comes into play when deciding which elements should be emphasised in the mappings. The figure of the future urban structure could be found through sketching and drawing. New relations in this fabric can be revealed (Langner 2009, 2019). The process of designing helped to invent the bouncing forward and answer the question "How could the future look like?"

In the Green Finger project visionary mappings have been used in inventing and illustrating scenarios for the future of green fingers as well as a spatial vision (see fig. 2,3). The spatial vision complements the previous spatial delineations and depicts the connections between the identified multifunctional green spaces. This robust system is the safety net for climate adaptation in Osnabrück. By highlighting discussed topics, identified structures and interconnections, the mappings inspired the discussions of the working groups.



OSNABRÜCK INTERNATIONAL

SETTLEMENT DEVELOPMENT
- residential areas
- business parks
- intercommunal business parks and logistic centers

OPEN SPACE STRUCTURE
- green fingers
- residual structures
- complementary landscape areas
- flood plains

AGRICULTURE
- agricultural companies
- sideline agriculture

THE PRODUCTIVE PARK

SETTLEMENT DEVELOPMENT
- residential areas
- green residential areas

OPEN SPACE STRUCTURE
- green fingers
- complementary landscape areas
- green connections between the green fingers
- connections to the city center
- allotment garden as community garden
- allotment garden student housing
- urban cycling network
- flood plains

AGRICULTURE
- agricultural companies
- agriculture network
- regional brand
- blossomy landscapes

THE CLOSE COMMUNITY

SETTLEMENT DEVELOPMENT
- vacant business parks and industrial areas
- subsequent use by handicraft enterprises
- subsequent use by start-up companies
- old, partly vacant residential areas
- self-sufficient gardens
- energetic renovation

OPEN SPACE STRUCTURE
- green fingers
- complementary landscape areas
- allotment garden areas
- self-sufficiency
- residential arbors and tiny houses
- flood plains

AGRICULTURE
- agricultural companies
- small cooperatives
- local minimarkets

ON THE SAVE SIDE

SETTLEMENT DEVELOPMENT
- vacant business parks and industrial areas
- conversion to residential areas with multi-storey housing
- conversion to open space

OPEN SPACE STRUCTURE
- green fingers
- complementary landscape areas
- protected areas
- cycling tracks
- flood plains

AGRICULTURE
- agricultural companies
- heat-resistant crops
- alternative cultivation techniques

Figure 2
Mappings of scenarios, HS Osnabrück (Project Green Fingers HS OS)

The spatial vision met the challenge to translate the complex interconnections of different functions and topics into mappings that were intuitively accessible for all the stakeholders. The spatial vision was deliberately presented vague instead of exactly by plot, because this made it possible to concentrate on the vision in all its roughness and discuss the system of resilient green spaces instead of detailed plans for smaller parts of the Green Fingers. The fact that the open spaces are highlighted and foregrounded helped to change perspectives from a view on the built city that is a growing into the open spaces to a view on a city that is shaped by its Green Fingers. The mappings helped to generate new mental images of "the city of green fingers", understood as a multifunctional, strategically managed network of different green spaces and elements contributing to sustainable city structures with high-quality, biodiversity-rich urban ecosystems.

The mappings were combined with written stories which increased accessibility for workshop participants without a professional background in planning because they could imagine playing a role in the stories and scenarios. Discussing the stories and mappings and the outlined futures provoked immediate and strong reactions. Questions such as "What would your role in such a future be?" or "What would be the most important things to do in this scenario?" brought up by the moderator helped to prevent a discussion centring only around the question, what the best or worst scenario would be, or which one is more likely to happen. Instead, inspired by these questions, people started to play with the mappings co-creatively and approached the professional ideas with great interest.

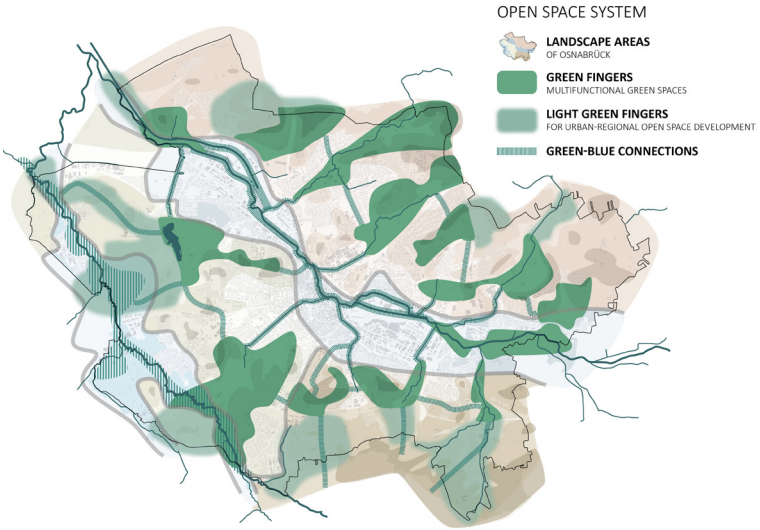


Figure 3
Spatial vision Network of Green fingers, HS Osnabrück (Project Green Fingers HS OS)

So, the mappings met the demands of the transdisciplinary process to be inclusive and accessible. The mappings are a communication tool that translate ideas into images and thus help actors involved in transdisciplinary processes to understand the complex tasks and imagine what a bouncing forward could look like. They incorporated the spatialised knowledge on landscape functions of landscape planning and the sketches of landscape designs, presented as blurry vision that helps to imagine Osnabrück as "City of the green fingers". Unlike photo collages or oblique aerial perspectives the mappings are compatible with both the formal plans of landscape planning and the products of informal design such as masterplans.

Conclusion

The reflection of the Green Finger project suggests that mappings used in transdisciplinary processes searching for transfor-

mative resilience can be one approach to reunite landscape planning and design. The mutual goal to invent the "bouncing forward" requires both landscape planning and landscape design skills.

Certainly, one cannot draw universally valid conclusions from the one example. Perhaps it can be generalised though that occasions are needed that make it clear that both competences are in demand, that success is not possible without the knowledge of landscape planning and without the creativity of landscape design. Transformative resilience is just one topic that exemplifies this. And mapping is just one tool that requires both competences. There will certainly not be one recipe to bring landscape planning and landscape design together, because it often depends on working cultures and the question if people are open to different ways to reach a common goal. It is certainly worth looking for further occasions, topics, settings, and tools, because one thing is clear: if the trench warfare cannot be overcome in the discipline of landscape architecture, then the inter- and transdisciplinary work that is rightly demanded in dealing with the great transformation will hardly be possible.

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A Location Evaluation Approach for New Pedestrian Bridges in Brisbane, Australia: Hybrid Decision Making with Space Syntax and GIS

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Abstract
Brisbane is a river city with 15 bridges, six in and around the city centre. Most recently, Brisbane City Council (BCC) announced building four new green bridges since the bridges in this area need to be increased to spread the pedestrian network throughout the city. Our study aims to demonstrate if the locations of green bridges contribute to developing the current pedestrian and bicycle network and improving access to the Brisbane River and amenities.

The study applies Space Syntax tools supplemented with Geographical Information Systems (GIS) to generate spatial analyses with qualitative and quantitative outputs. The urban syntactic parameters include integration, depth, connectivity, and choice values. Integration and depth values will be handled segmentally, with 1200 and 5000 meters referring to the average pedestrian and bicycle reach radius, respectively (Yamu, 2021). Since the results obtained from the space syntax procedures are purely analytical, GIS spatial analyses and their outcome supplement the initial findings. Where the GIS and Space Syntax outputs generally overlap, the latter is helpful to look at the situation from a broader and practical longer-term perspective. Some GIS data used in the study include, but are not limited to, population density, main pedestrian, vehicular, and bicycle axes, residential and commercial areas, topography, schools, and hospital areas.

When the current situation and BCC green bridge objectives were tested syntactically with the same parameters, it was seen that, primarily, bicycle transportation was supported in the broader area. However, pedestrian transportation is found to be not sufficient. To address this, we demonstrate possible new pedestrian routes aligning with the growth direction of the city.

Keywords
Bridge location evaluation approach, space syntax, GIS

Introduction

As the number of vehicles in cities increases, transportation and city planning experts are shifting their focus towards promoting walking and cycling routes to reduce energy consumption. This shift is essential to urban planning, aiming to reduce vehicular transportation and create sustainable

cities. Active travel, including walking and cycling, has numerous benefits, such as reducing greenhouse gases, improving air quality, moderating noise levels, and promoting better health outcomes (Potesil, Oelrichs & Veitch, 2013; Luo et al., 2020). Municipalities are creating and promoting new routes for cyclists and pedestrians, resulting in more vibrant and economically sustainable neighborhoods (Rose, 2020). However, the location of pedestrian and bicycle bridges remains a crucial factor in ensuring their sustainability and vitality, particularly in "river cities."

In city planning, separating motorized and non-motorized traffic is essential for pedestrian safety and promoting friendly transport (Hartmann, Ferrara, & Watzenig, 2018). New pedestrian and bicycle bridges are needed to stimulate pedestrian transport in cities segregated by rivers (Potesil, 2013). That situation raises our research questions. To ensure pedestrian and bicycle traffic sustainability and vitality in "river cities", to what extent is the bridge location factor crucial, and what tools and methods can be used to upgrade bridge location decision-making processes?

While some countries have strict policies for creating sustainable cities and communities (Koning et al., 2020), most have a normative approach based on factual and descriptive knowledge (Nes, 2021). Previous studies suggest that pedestrian bridge locations are crucial for pedestrian traffic sustainability and offer several benefits, including improving pedestrian networks, adding value to the city's image, and reducing carbon footprint (Zagorskas et al., 2020; Rose, 2020; Akkelies, 2021; Santilli, 2021; Wang, 2016).

To achieve our research objectives, we apply Space Syntax tools supplemented with Geographical Information Systems (GIS) to generate spatial analyses with qualitative and quantitative outputs. By doing so, we can verify and assess the outcomes through comparison. Our study proposes a practical location evaluation approach using Space syntax and GIS simultaneously, considering the demanding time frame for a proper suitability analysis process.
Space Syntax is a useful tool for understanding the travel patterns of pedestrians and cyclists, which are often ignored in transportation modeling (Rose, 2020). While previous studies on city network research have focused on other topics, Akkelies Van Nes (2021) demonstrates how multiple-scale space syntax methods can describe a compact city's spatial characteristics, including the role of bridges in the road network. In contrast, according to Zagorskas et al. (2020), pedestrian bridge studies have focused on technical specifications such as serviceability, stress, and vibration. Similarly, Brisbane City Council's (BCC) (2020) feasibility study on green bridges prioritizes cost and normative approaches when selecting bridge locations. Moreover, our proposed bridges can potentially increase the reachability of the city center, which has high integration values, while also improving pedestrian and bicycle transportation in the region. This, in turn, could lead to reduced use of motor vehicles and decreased carbon emissions, making these bridges good candidates for being labeled as "green bridges."

The study will consider the new bridges' journey length and travel time savings, economic, environmental, and social benefits resulting from travel times, ener-

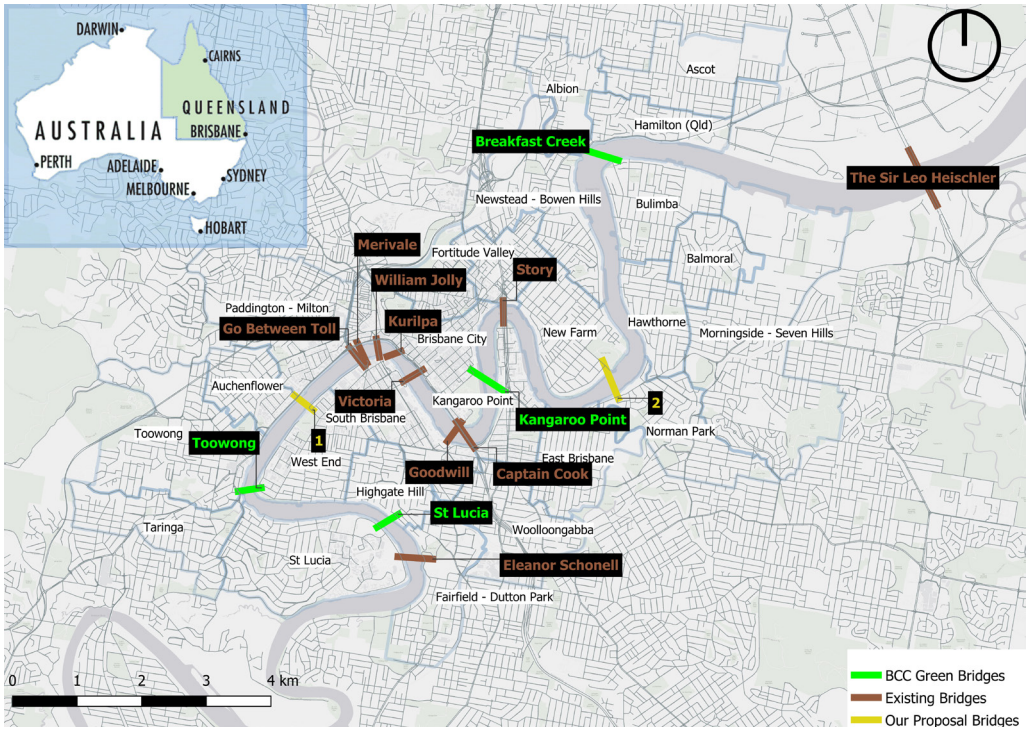

Figure 1
Study Areas, Existing Bridge and Proposed Green Bridge Locations

gy saving, carbon footprint reduction, and vehicle density. Our study's findings will be significant for decision-makers, including politicians, town planners, architects, engineers, and construction companies, in their efforts to create sustainable and livable cities.

Methods and material

The study site

Brisbane City has 15 bridges crossing the Brisbane River. 6 of them are around Central Brisbane District (CBD). Brisbane's furthest bridges are almost 30 km apart, leaving a wide river length for the remaining road lanes to serve. This situation also means that 52% of river crossings place drivers and pedestrians on roads in or near the CBD, causing economic and environmental adverse effects (Potesil, 2013). Brisbane CBD is already the most densely populated area, leading to a high concentration of bridge connections. This results in the limited ability of the CBD to expand into the neighbouring districts.

Figure 1 shows only one crossing bridge, Sir Leo Heischler, east of the Story Bridge, with the shortest distance of 11 km by car to reach the CBD. For this reason, all vehicular traffic crossing the river between these locations goes over the Captain Cook Bridge or Story Bridge in the CBD. Therefore, reaching other bridges is only safe and comfortable for pedestrian and bicycle transportation if citizens reside close to the centre and an existing bridge because most bridges concentrate in the city centre.

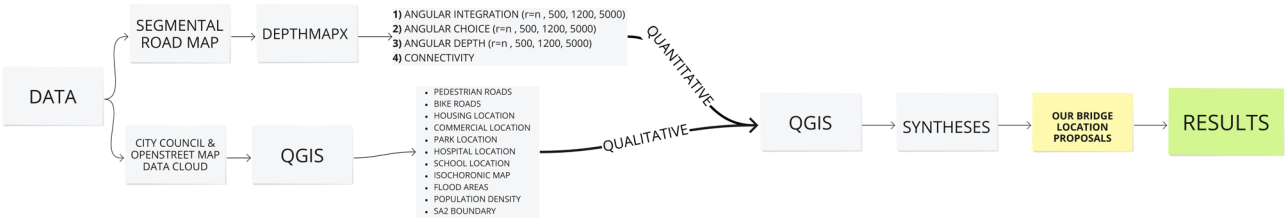

Figure 2
Method Schema, Data Analysis

A proposed hybrid bridge that would accommodate vehicles and pedestrians across the 15 km river lane aims to enhance pedestrian and bicycle transportation. However, it may increase vehicle traffic, putting pedestrians and cyclists at risk when crossing intersections with a high volume of vehicles. To ensure their safety and comfort, the bridge should be located in the city centre and close to an existing bridge so as not to cause additional strain on other bridges.

The BCC planned five new green bridges to get around the city on foot, by bike, and potentially by public transport. During the four-week consultation period, the Council gathered 3385 feedback from various sources, including residents, businesses, and important stakeholder groups. Only four of them went through; also, a portion of the individuals involved in the consultation process would rather see the investment go towards alternative projects, such as new ferry terminals or enhanced public transportation, or have *the new green bridges located elsewhere* [emphasised by the authors] (BCC, 2020). Therefore, we evaluated the four green bridge locations close to the city centre planned by the BCC to distribute the current traffic density and ease vehicle and pedestrian traffic flow. In addition, we suggest additional future bridge locations and evaluate our suggestions.

We applied a predictive approach to relieve and ensure the long-term sustainability of traffic flow as the city grows. The research methodology includes qualitative and quantitative analysis using GIS and Space Syntax tools. Open-source spatial raw data is primarily available in the BCC Data repository, and processed analyses are done in QGIS open-source GIS software.

Spatial Data sources
Figure 2 demonstrates the research process and data used. While such data are analysed in QGIS, the space syntax is used to examine pedestrian and bicycle main routes for the existing situation and with green bridge proposals by the municipality. We then compare the results to understand and evaluate the differences.

Using Space syntax and GIS as a tool for spatial analysis
To gain an in-depth understanding of the city's pedestrian and vehicle traffic, we used GIS and Space Syntax spatial analyses as the primary method of the study, generating qualitative and quantitative variables, respectively.

Although architecture and urban design researchers have attempted to address the link between urban morphological factors and pedestrian volume in urban streets, urban spatial configuration measures derived from the space syntax of the street axis lines can become too mechanical to address the effects of humanistic factors. To ensure effective planning of public policies that promote urban vitality through increased foot traffic, it is crucial to consider both space syntax metrics and relevant environmental factors while considering each zone's unique characteristics (Lee S. et al., 2020). The next section explains how space syntax parameters are analysed compared to Brisbane's existing and planned bridges.

Analyses: Space Syntax

In this study, we used the space syntax to quantitatively examine the built environment factors affecting pedestrian potential. Previous studies showed that urban spatial configuration variables used in space syntax analyses are essential pedestrian movement determinants (Baran et al., 2008; Özer, 2014). For example, Baran et al. (2008) employed the space syntax method to investigate walking behaviour in New Urbanist and suburban neighbourhoods. They discovered a strong correlation between the amount of utilitarian walking and two space syntax variables - control and global integration. Global integration among syntactic variables was found to have a statistically significant association with average pedestrian volume in residential and commercial zones. In contrast, local integration was a more important factor in the commercial zone (Lee S. et al., 2020).

Our study aimed to investigate the relationship between the impact of bridges on pedestrian movement and data obtained from space syntax analysis and geographic information systems (GIS). To identify potential bridges locations and explore scenarios for enhancing pedestrian circulation, we used key space syntax measures, namely angular segmental integration, segmental choice, and segmental depth. While previous studies have focused on these measurements for design solutions in city planning, we used them to compare different situations in our study. To calculate these values, we used "DepthmapX." Angular analysis, which measures the angles between objects such as streets, buildings, and other features in a given area to analyze their spatial relationships, is more effective than metric or topological analysis in understanding pedestrian activity (Lee S. et al., 2020).

Figure 3 segment map was created by segmenting the axis map extracted from OpenStreetMap at each street junction. Figure 3 shows the global integration mapping of the selected area within the scope of the study. We can see that the main roads and the Brisbane City area are the most integrated roads on this map. Geo-referenced road-centre lines have become more prevalent in constructing a street network model (Hiller, 2001). Integration and depth values will be handled segmentally, with 1200 and 5000 meters referring to the average pedestrian and bicycle reach radius, respectively (Yamu,2021). As in this study, local radius values can be calculated using the distance values that the pedestrian and bicycle can reach in an average of 10-15 minutes, with a segmental map obtained

in the correct dimensions. 10-15 minutes refer to 1200m for walking and 5000m for bicycling average distances.

Angular integration measures the potential for movement by assessing the angles between streets, buildings, and other objects in a given area (Lee S. et al., 2020). Segment connectivity is the basis for calculating angular integration and provides a more detailed representation of reality than axial integration (Rashid, 2017). By comparing a system to "the urban mean," angular integration can evaluate angular point depth locally, and local metrical radii within a 500m radius can indicate a neighbourhood's walkability (Nes, 2021). Our study selected radii of 1200m and 5000m to assess daily routine reachable river crossing routes rather than focusing on inner neighbourhood integration.

The *Angular Mean Depth* is a measure of the number of spaces passed through from a designated point in a system, and it is calculated by summing all possible steps that can be taken from that point (Turner, 2001). Combined with the system's actual shape, this measure is useful for interpreting and analyzing urban spaces. The terms "shallow" and "deep" are commonly used to describe the overall depth of a system, with shallow systems having low overall depth values and deep systems having high overall depth values. High depth values along the riverbank indicate that roads have more turns and distance, providing better access to all points in the area. However, road connection is just one factor to consider when making decisions. While connected segments on the other side of the river decrease the value, this information alone is insufficient for informed decision-making.

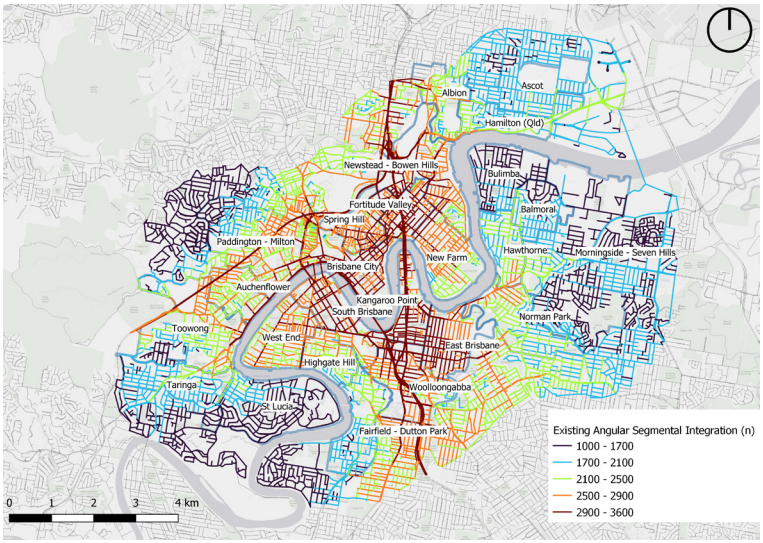

Figure 3
Angular Segmental Integration Graph (r=n), Existing Condition

Connectivity is a measure of a street's degree of connections with neighbouring streets, which is determined by the number of edges in a graph (Rashid, 2017). Streets with many connections are considered highly connected, while those with few connections are considered low in connectivity. Concerning bicycle and pedestrian traffic, highly connected areas are often found on motorised roads leading to the city center or sub-centers, as they offer multiple connections (Kerr, 2016).

Angular choice measures the level of integration of each street segment by considering the total number of directional changes relative to the other segments, while considering the segment length (Hiller, 2012). On the other hand, *Angular segment integration* evaluates the movement potential in an urban system by analyzing the number of turns required to travel from point A to point B. This study used radii of 1200m and 5000m to identify the best pedestrian and cyclist routes, respectively. The analysis determines the

degree of integration of each street segment based on the fewest number of turns needed to reach the destination (Berhie, 2017). The aim is to provide a straightforward way for people to navigate the urban system.

We aim to identify the most suitable paths for pedestrians on both sides of the river. We use specific parameters to analyse the efficiency of existing bridges for pedestrians and suggest new bridges that could enhance their experience. By comparing the results before and after implementing changes, we can measure the improvement.

Analyses: GIS
The 2021 Australian Census data and SA2 boundaries were used to determine the population on both sides of the river. The population data helped identify the densest and most disconnected regions. The population density is directly related to the main pedestrian and vehicle axes (Yamu, 2021).

When connecting to the nearest bridge, the flow density at river crossings changes based on the time of day and day of the week. The direction of pedestrian and vehicle flow must be identified at certain times, such as when people travel between their homes, schools, and workplaces. If the buildings associated with these locations are close to the riverbank and do not have pedestrian access across the river, it can result in increased vehicle traffic. The GIS map was used to assess the housing, workplace, and school concentrations. The effects of schools, universities, and hospitals on traffic flow were evaluated separately as their transportation patterns are less regular. Finally, isochronic maps were generated using a radius of 1200m from bridges to show walking or a 5000m radius and cycling time of 10-15 minutes based on average speed.

To better understand the route preferences of pedestrians and bicyclists for both existing and proposed bridges, we used a 5m resolution Digital Elevation Model to create an elevation map and used QGIS's road slope calculator to determine the slope percentages of bike paths.

By using this approach, we can assess the ability of both existing and proposed bridges to serve the city's needs. We may miss important details about a complex urban area if we only consider qualitative variables. A sole reliance on qualitative measures is not enough for a sustainable solution in a dynamic city environment. Therefore, the final evaluation of the bridges will be based on a combination of all variables, leading to a more comprehensive understanding of their state.

Results
Space Syntax Outcomes:
The Space Syntax maps show that integration results have the highest values from the city centre. West End and its surroundings centre show high connectivity values close to the centre. In other words, the West End district (seen in Figure 1) is becoming the second city centre, so the frequency of use in this area is rising. Consequently, proposing additional bridge locations can distribute pedestrian movement, offering alternative routes for walkers and cyclists and potentially reducing future traffic density in the city.

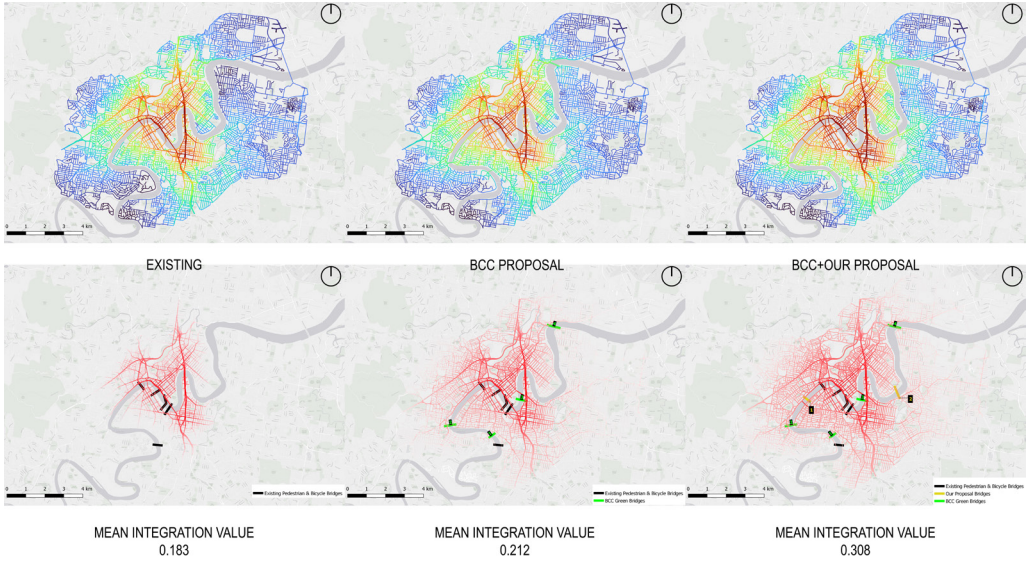

Figure 4
Angular Segmental Integration Graph (r=5000), change graph

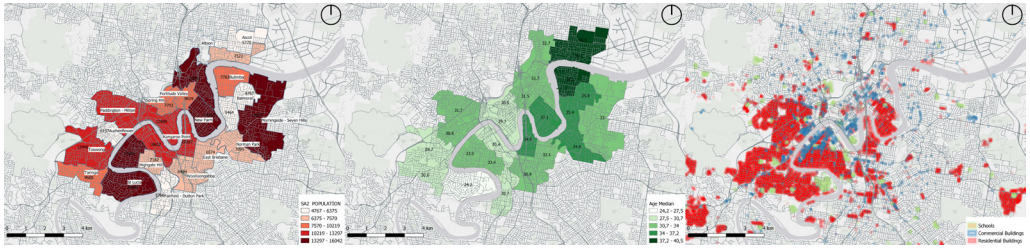

Figure 5
Population Density, Age Median, Overlay Building types

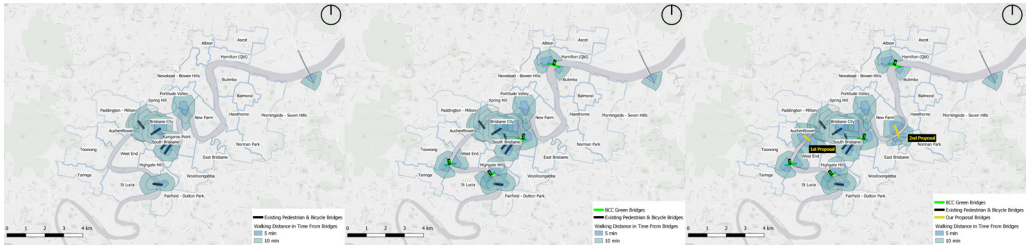

Figure 6
Isochronic mapping, Existing/BCC/BCC & Our Proposals

1200 Radii for Walking: Depth values decreased in and around the West end in our proposal, but the other side of the river shows similar values to the deepest areas. The choice results contradict the accessibility of a pedestrian movement route with possible strong angularity. This axis can be a route with continuous movement between the University of Queensland and Brisbane.

5000 Radii for Cycling: The similarity between the GIS isochronic maps (figure 6) and the depth graph (figure 7) with a 5000-meter radius for cycling is high. The St Lucia bridge's accessibility for cycling has increased, as shown by its shallower depth of bicycle transportation. West End could be a centralised and uninterrupted cycling route between the University of Queensland and Brisbane City, both north and south of the river.

Although the GIS analysis provides valuable information, the high integration values observed along the riverside are not fully captured in this analysis and demonstrate an untapped potential. To fully understand their significance, it is necessary to consider other factors.

GIS Outcomes:
The area between Captain Cook and Eleanor Schonrell Bridges, located in the West End district, has a high concentration of businesses and residences. Despite this, there is a lack of pedestrian and bicycle transportation options to cross the river, as shown in the isochronous map (Figure 6). The new bridge proposals by the Brisbane City Council (BCC) aim to reduce bicycle travel time by half, making it more accessible for the young population, many of whom are likely students near universities. The St. Lucia Bridge proposal in particular encourages new bike routes, but more efforts are needed to improve pedestrian crossings.

The figure 6 is a proposed route map created using the GIS-based ORS plugin for QGIS software. The plugin provides the most convenient, efficient, and shortest route options. Currently, it only offers a single route, but the new St. Lucia Bridge proposal adds the possibility of a second route. However, this route intersects with high vehicle traffic and cannot be considered as the recommended route. The evaluation of the area between the city centre and the University of Queensland was possible using GIS data, but the data decreases as you move away from the city centre to the west and east of the river, making it difficult to assess.

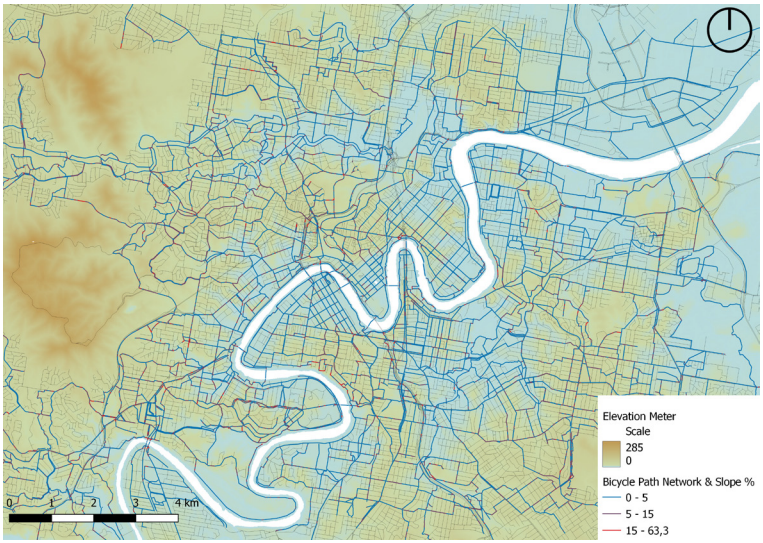

Figure 7
Slope Percentages Calculated Bicycle Network

Pedestrian route choices are significantly influenced by topography and slope factors, as illustrated by studies conducted in Hong Kong and Boston. The hilly topography and less-connected street network in Hong Kong restrict the availability of alternative routes, while in Boston, pedestrian route choices are influenced by a range of factors such as sidewalk width, street crossings, and the presence of retail and open space in addition to topography (Guo et al.,2013). Personal experience also supports this, as one of the authors who commuted to the University of Queens-

land by bicycle from West End preferred a longer but less steep route.

Space Syntax and GIS Comparison:
The space syntax and GIS analysis results indicate the need for a new bridge in the same district. Using only GIS and space syntax to analyse the BCC's planned bridges would benefit the entire city; however, both studies highlight a priority issue. The West End district is busy and has a high population density, making it a crucial location for a bridge. Combining the two methods provides a comprehensive understanding of the city's density and usage patterns. This combined approach enables a scientific examination of the existing and proposed bridges and helps prioritise bridge locations and proposals. Ultimately, both analyses show the need for a bridge connection between the West End district and the north side of the river.

Discussion and Conclusion

Our study shows that new bridge locations encourage pedestrian and bicycle traffic. Both GIS and Space Syntax show close results. The syntax side can bring a new perspective to situations where data is missing or cannot be generated in GIS. Since cities have a complex flow of networks due to their dynamic nature and culture, syntax studies can be used more effectively with qualitative GIS analysis. Where the GIS and Space Syntax outputs generally overlap, the latter is helpful to look at the situation from a broader and practical longer-term perspective.

According to isochronic and syntactic studies, a large gap exists between the University of Queensland and the city centre. Travelling at least 15 km on foot or 21 km by car is typical for transportation between many businesses in South Brisbane and the accommodations in the northern suburbs, such as Toowong Auchenflower or Paddington -Milton. A new bridge is necessary to support various transportation scenarios in the region. The BCC's green bridge can create new options since the area's connectivity value is high relative to its current state. This leads to dispersed human density in the centre due to increased connectivity.

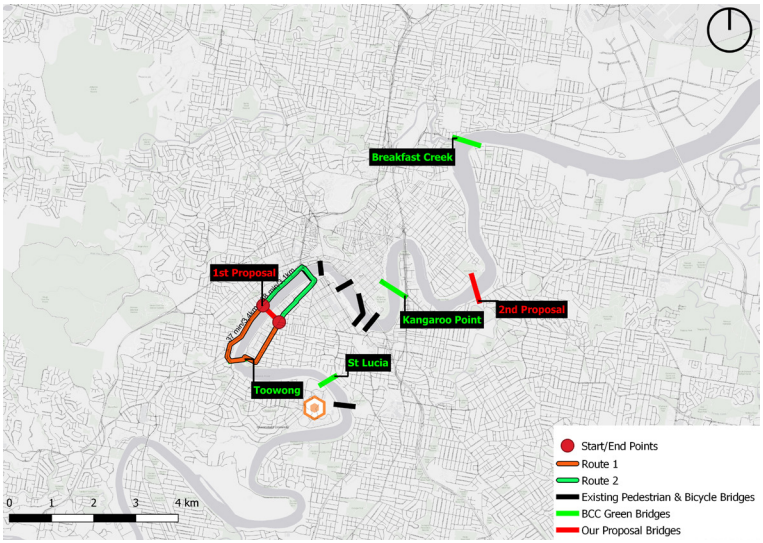

Figure 8
Isochronic route mapping

By combining space syntax and GIS analysis, researchers can gain valuable insights into how different variables interact and how pedestrian volumes are distributed across various land use areas. Urban planners and policymakers can use these insights to design public policies aimed at increasing foot traffic in areas of the city that are lacking in vitality. Integrating space syntax and GIS can help planners understand the underlying spatial patterns that influence pedestrian movement and use this information to create more effective policies

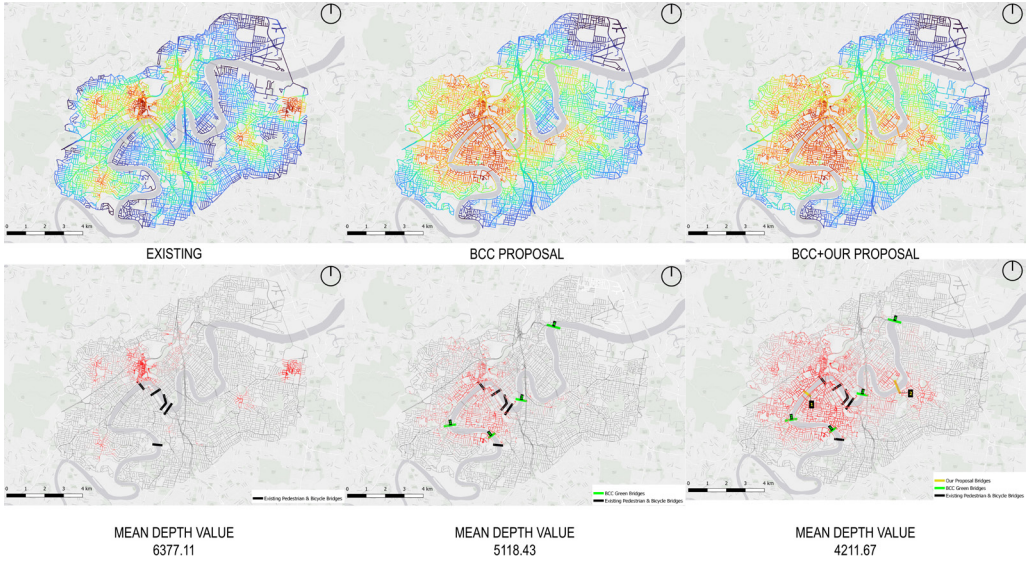

Figure 9
Angular Segmental Mean Depth Graph (r=5000), Compare Graph

that address the unique characteristics of each area. Ultimately, this approach can help to create more vibrant, livable cities that promote increased pedestrian activity and community engagement.

Brisbane bridge location decisions are based on supply-demand and standard formal studies. BCC's 2020 feasibility study on green bridges and initial surveys on the bridge locations presented shortcomings for potential pedestrianisation across the city, neglecting the possible centres. BCC's decision-making process is a much more normative approach, as Akkiless Van Ness emphasised in her article. The more advanced bridge location studies, such as suitability analysis, require generating qualitative and quantitive criteria. Later such multi-criteria are ranked by experts from many disciplines to finalise the suitability analysis. The proposed hybrid method in this study provides a shortcut and a preliminary perspective before applying a thorough suitability analysis.

By applying spatial analysis techniques such as GIS and space syntax, we identified a need for a new bridge to connect the West End district and the north side of the river. Our analysis revealed that this location was a priority due to its high pedestrian potential and density and the concentration of businesses in the area. Additionally, we found that proposing bridge locations not included in the BCC's green bridge strategy could help distribute central pedestrian movement and offer alternative paths for walkers and cyclists, which can lessen the future city's traffic density. Planners and policy makers could use these findings to guide the design of public policies related to urban vitality and increased foot traffic based on the respective characteristics of different land use areas.

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The power of composition

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Abstract
Designed form is not about creating a good appearance. Nor is it restricted to the small scale. The small scale, however, can be used as a valuable playground and laboratory for large scale landscape designs. Three case studies are compared in which similar compositional principles are used at different scales and complexities: the technical, agricultural, pedagogic social reform landscape of the Gartenreich Dessau-Wörlitz (Duke Leopold III of Anhalt-Dessau, 1760-1830), the theatrical urban design for London connecting the government centre with the landscape panorama (John Nash, 1810-1826) and the residential urban landscape of Borneo-Sporenburg in Amsterdam (West8, 1993-2000). In each we can recognize the formal principles of the picturesque garden. Not the style, image, or shape, but the formal (visual-spatial) principles: landscape fragments that are connected by a route as a scenographic succession of composed scenes or tableaux, using the existing topography as a base. Such timeless compositional principles, as the relation between form and space as the initiator and carrier of structure, are versatile enough to accommodate and generate varying uses and processes. These examples illustrate a landscape architectural position that is in its essence not about problem solving but about creating form as condition for different uses, intended and unintended, expected, and unexpected, for human and non-human practices and experiences.

Keywords
Landscape architecture, compositional design principles, scale

Introduction
In the fuzzy transition between design and planning, scale is often used as the key distinguishing factor. And whereas planning answers the questions "what, where and how much" in its attempt to optimally allocate uses to territories, design answers the questions "how" in its attempt to give form to land uses. I would argue, however, the value of design is not to give form to land use, but rather to create conditions for land use. Designed form is not about creating a good appearance, an optional add-on; not the dress, but the skeleton, so to say. In the landscape architectural transformation of landscape form the place forms the prerequisite, the inspiration even, for the programme. Through asking "how", we might condition the answers to "what, where and how much". Nor is design restricted to the small scale. The small scale of the garden or park is relevant as a laboratory for landscape design

of multiple scales and complexities, where the relationship between form and how it might condition, evoke, invite different defined and undefined land uses, can be studied, and experimented with.

Therefore, in order to stimulate invention, experimentation and landscape experience, the curriculum of the Landscape Architecture Master in Delft track starts with the garden**.** From material, horticultural and technological inventions to compositional tools to expressions of societal fears and anxieties, the inventiveness of gardens has always been unlimited. "The garden is the place where the great inventions of our time are made." (Lassus, 1996) How can spatial-experiential compositional principles, such as those that were invented in garden design, be of value for different design contexts and the environmental and societal challenges that contemporary planners and designers are facing?

Methods

To allow a discussion of design beyond its appearance, style, or aesthetics, I will compare three spatial designs, dating from the 18th, 19th, and 20th century. Each have different scales and different functions and uses, but comparable compositional principles. The first is the technical, agricultural, pedagogic social reform landscape of the Gartenreich Dessau-Wörlitz (Prince Leopold III of Anhalt-Dessau, 1760-1830), followed by the theatrical urban design for London connecting the government centre with the landscape panorama (John Nash, 1810-1826) and finally the residential urban landscape of Borneo-Sporenburg in Amsterdam (West8, 1993-2000).

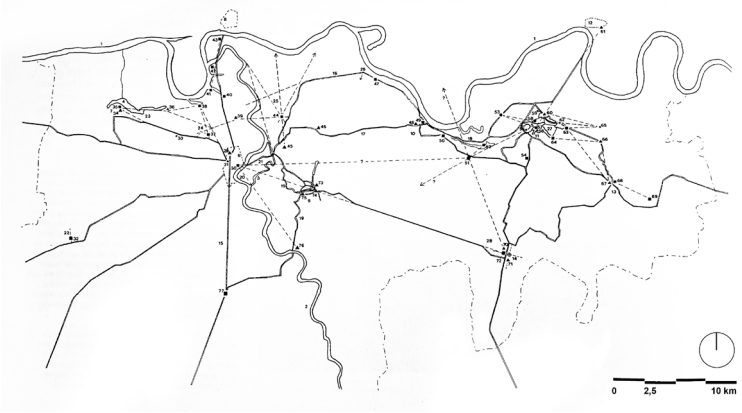

Figure 1

The architectural landscape of the Gartenreich Anhalt-Dessau (drawing: Petroushka Thumann, 1995)

Results

Gartenreich Dessau-Wörlitz

In 1758 Leopold III Friedrich Franz von Anhalt-Dessau followed his father as monarch of the principality of Anhalt-Dessau. Pursuing an economical, scientific, cultural, technical, and social prospering for him and for his subjects, the reforms that he made were revolutionary: education and reform programmes for all children, reclamation of the Elbe river landscape, agricultural reforms, all held together by an architectural landscape of gardens, avenues, and view lines. With the river Elbe as the natural spine of the *Gartenreich*, the design of Prince Friedrich Franz connected all components to this natural framework and to each other. Transforming the basic form of the natural river landscape by architectural means created the framework for reforming the agricultural and the urban physical structure and as a result its use and economic, cultural, and social structure. The landscape design consisted of several layers: the *Auenlandschaft* [flood plains] was made accessible for agriculture, the villages were brought into a landscape architectural framework, a network of *Gartenlandstrassen* [avenues]

was constructed, parks were built, and all of these were connected by a composition of view lines marked by buildings (Figure 1). (Reh, 1995)

The paved *Gartenlandstrassen* connected the royal court in Dessau and the garden residences of the several members of the royal family, with every five kilometres an inn or tavern. The straight parts were focused on monumental buildings or the spires of redesigned neo-gothic churches in the villages. Next to the avenues were walkways for pedestrians, where they were protected from the dust produced by the carriages. Trees were planted to provide shadow and, at regular distances, seats with panoramas to the surrounding landscape. Sightlines connected the existing residencies to the tower of the palace in Dessau. Views are limited by the visual reach of the human eye, but by connecting points and lines and adding new ones, a visual network was created that covered the full 400 square kilometres of the kingdom: a kingdom as a garden. The spatial design, that embraced and interconnected cities, villages and countryside transformed the landscape into the technical, agricultural, pedagogic social reform landscape of the Gartenreich Dessau-Wörlitz.

The Wörlitzer park was the residency of Prinz Friedrich Franz himself, but also from the beginning a public park, and in that sense very avant-garde, intended as an example and inspiration for the visitor, to become a more educated and better person. The garden is a hybrid ensemble of garden components and agricultural fields, connected by sightlines and buildings, with the river and its dike as a structuring element (Figure 2).

Figure 2
The Vulkan in the Wörlitzer Park, one of the follies visually connecting garden and agricultural landscape

The river dike was built already during the reign of Friedrich Franz's father Leopold. Walking paths were laid out on top of the dike, and along the river dike towers-*Wachhauser*-were built as set pieces. They functioned as lookouts for dike guarding, resting places for traveling and as ornament, and, because Franz was very pragmatic, if another function was needed, they were used for that. Such as Wachhaus Limesturm: an eclectic building that looks like a vernacular farmhouse on top of a classical temple, expressing its different meanings and uses. It was a storehouse, part of a historical narrative, reflection on local architecture, reflection on the shape of the dike, and a beacon marking the course of the dike and because of that the shape of the river (Figure 3).

Thus, the formal principles of garden design were deconstructed and brought in a new relationship, scaled up to a full country, without losing their compositional power. The composition-as a translation of

the natural river landscape-was leading, evoking and new cultural and agricultural uses and relations.

Grand Design

This translation of garden design principles to the scale of a full country may be quite unique, but we see a similar translation in, for example, the Grand Design for Regent Street and Regent Park by John Nash in London, a century later (between 1810-1826). From the 17th century onward London had been developing fast and erratic. Expansion was in the hands of landowners and developers. The fast urbanisation destroyed the connection between the government centre in Westminster and the surrounding landscape, traditionally the basis for the aristocracy, and the random new housing projects disrupted the continuity of the originally agricultural road pattern. A new approach to the composition of the urban structure was needed to create space for the development of public urban life. Nash's plan tackled these issues, providing a new housing area for the aristocracy with a view to the rural landscape, designed as an urban landscape garden with a continuous, ceremonial routing, connecting the government centre with the park, with Mayfair and the landscape panorama. (Steenbergen and Reh, 2011)

Designed in stages, starting with Regent's Park, followed by redesigning New Street (which is now Regent Street), then Buckingham Palace and the surrounding ceremonial government buildings and finally reorganising the area around St. Paul's Cathedral, allowed Nash to develop the idea of a complete scenography between the River Thames and Primrose Hill, in a continuous relationship between city and countryside (Figure 4). This scenography that allowed the urbanite to walk from the centre at the river Thames uphill out of town towards an arcadian landscape in the

Figure 3
Wachhaus Limesturm

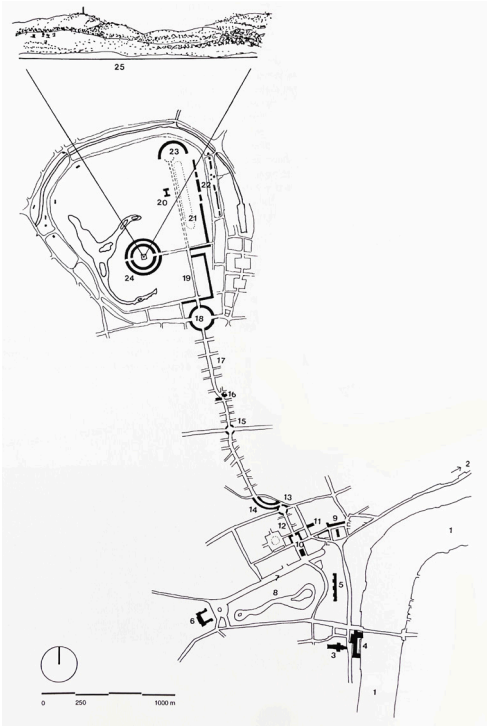

Figure 4
Scenography of the Grand Design in London, that positions the government centre in its landscape context, connecting the river Thames to Primrose Hill (drawing: Ellen Bestebreurtje, 1995)

hills, gave the illusion of spatial continuity. From the endpoint at Primrose Hill, one could look back to the city in the Thames valley. Nash did not use trees to frame the space, but used the buildings as his material, architecturally elaborating the street walls, using theatrical set pieces to articulate bayonet-like, staggered transitions, and creating frames, view lines and focal points (Figure 5). In this sequence Regent's Park was designed as the central connecting element, in what Nash called the 'Theatrical Panorama.' He surrounded the park with terraces and villas with an open view to the park and at the same time creating the visual horizon when seen from the park, both stage and décor. The park was conceived as the landscape framework for an urban residential programme, uniting the qualities of city and landscape.

The recovery of the visual contact with the surrounding landscape and the theatrical staging of public space was based on the concept of the landscape garden. Despite all the architectonic simplifications, wear and tear and increased traffic, Regent Street and Regent's Park still are among the most important public spaces of metropolitan London. The design enhanced the visual contrast between city and countryside but at the same time erased the programmatic opposition, creating the urban space as landscape-urban continuum. The design tools of the landscape garden were used to give space for a new and better functioning of the urban programme, embracing all urban functions in one gesture.

Borneo-Sporenburg

A more contemporary example shows a similar sensitivity for landscape architectural design means to create the conditions for urban use. The residential urban landscape of Borneo-Sporenburg in Amsterdam (West8, 1993-2000) is a former harbour area developed into a residential area with the density of the inner city (100 dwellings per hectare). To achieve this urban concentration, but in a suburban programme, West 8 introduced a fresh typology: a sea of low-rise buildings, given rhythm by a variation of blocks and open spaces. This rhythm recurs on a larger scale in the tapestry of land and water characterizing the whole area. The sea of low-rise buildings is interrupted by three immense, sculptural blocks that seemed to have landed as 'meteorites', functioning as focal points in the urban scenography, determining sightlines over and between the sea of houses (Figure 6 and 7).

Figure 5
The famous bend in Regent Street, using the architectural elaboration of the street walls as landscape architectural design tool (photo: Wouter Reh)

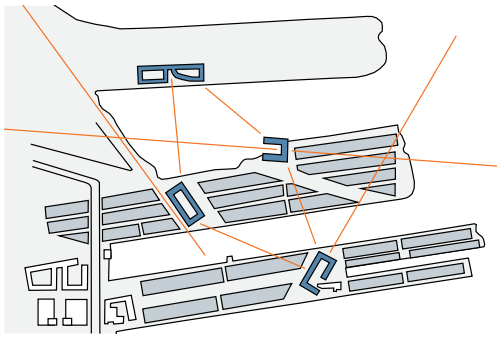

Figure 6
Sculptural blocks define visual connections through and over a sea of houses, connecting to each other and to the surrounding urban landscape (drawing Anastasiia Ignatova, Lene Westeng, Pietro Grignani, edited by author)

Like in Nash's Grand Design, the buildings are used as the material to create the landscape architectural form of the urban space, defining a contrast between narrow streets and the large open spaces of the water landscape, and using theatrical set pieces to articulate long sightlines. The sculptural building blocks are focal points from afar, creating visual connections. Their internal spaces act as connecting links between inside and outside, making the internal, residential space part of the urban landscape. This is the case for example in the courtyard of the Whale, one of the meteorites (ArchitektenCie, 2001). By elevating two sides of the building, the inner area transforms the traditionally private domain into an almost public city garden (Figure 8). The garden is not to be entered; therefore, the design is based on the view from the street and the view from above. The latter has resulted in a strong graphic two-dimensional pattern. A transparent fence filters the view from the street. Through the fence a space is seen with an open centre, flanked by two rows of columnar objects, like two galleries flanking the courtyard. Thus, the landscape architectural design principles that define the urban landscape, also inform the design on the smallest scale of the garden.

Figure 7
The Whale as one of the 'meteorites' in the sea of houses (photo ArchitektenCie)

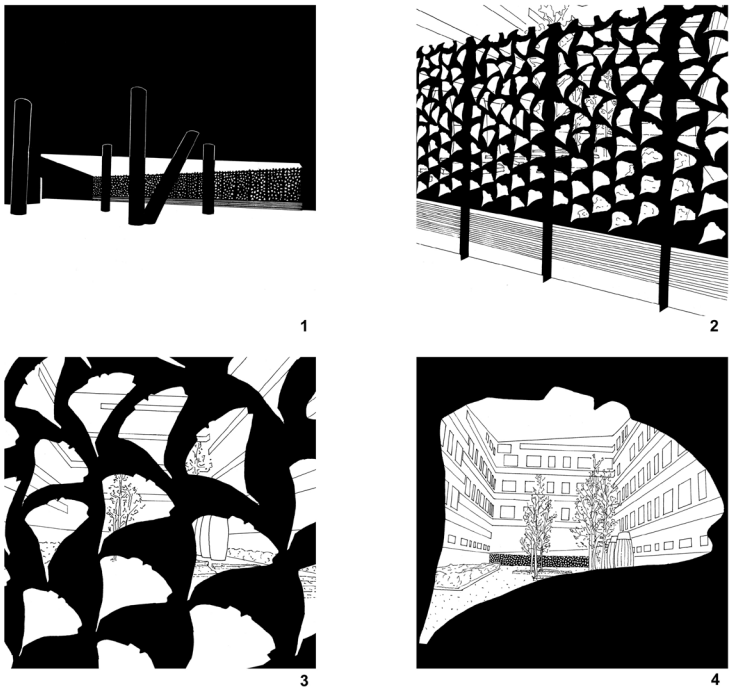

Figure 8
The internal garden becomes part of the urban scenography (drawing Lisanne Braak)

Discussion

In each of these examples we can recognize the formal principles of the picturesque garden. "Invented" in the late 18th century, the composition of the picturesque garden was based on the principle of the circuit walk, staged as a sequence of pictorial scenes: landscape fragments are connected by a route as a scenographic succession of composed scenes or tableaux. The construction of these garden scenes was inspired by the landscape paintings that the landlords brought back from their Grand Tour through Europe. Underlying these paintings was a perspective construction that placed the components of the scene in a monumental architectural context. In the gardens, the route was the carrier of the composition, linking the various scenes together, allowing the

viewer to participate in the "performance". Conceived to accommodate a garden programme, this compositional principle, a relation between form and space as the initiator and carrier of structure, turned out to be versatile enough to accommodate and generate varying uses and processes, and could be transformed to function at the scale of a residential neighbourhood, a city, a country even.

These examples are no exceptions. A similar sequence of designs could be discussed that are based on the design principles of for example the formal garden, such as Georges-Eugène Haussmann's 19th-century renovation of Paris. Clearly the lessons learned within the safe playing ground of the garden were taken well into account when the need arose to control the grim reality of traffic, hygienic problems and violent civic uprisings, following the advice of Abbé Laugier, who wrote in 1775: 'Let the design of our parks serve as the plan for our towns.'

Conclusion

Landscape form is the organisation of perceivable qualities of our living environment: the shape, dimensions and proportions of space, the plasticity of surfaces and volumes, colours, textures, light, and structural relationships. However, as these examples illustrate, this does not mean that it is restricted to the small scale of experiencing the environment through the near senses (touch, scent, sound, balance, etc.). The same principles of organizing perceivable qualities are relevant at the large scale of vision and movement that can be measured by the time it takes to move through a landscape. Parallelly, specific design principles are not tied to a specific land use, but can be extracted, decomposed and translated to sites with a different scale, use and complexity, not giving shape to predefined land uses, but using the existing topography as a catalyst for new land uses. While in the case of planning the site is looked at in light of the programme, and may even develop from it, we see the opposite happen in landscape design: here it is rather the programme which is envisioned through the site and may even be inspired or engendered by it. These examples illustrate a landscape architectural position that is in its essence not about problem solving but about creating form as condition for different uses, practices and experiences, intended and unintended, expected and unexpected.

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The Sparrow and the Elephant (The Garden and the Territory)

Marc Treib

In 1977, Charles and Ray Eames produced a film called *The Powers of Ten*, a cinematic interpretation of the book of the same name by Phyllis and Philip Morrison published some years before.[1] The film attempted to explain in a simple way the relative scales of objects in the universe by linking images that traversed ten times the distance, traveling at ten times the speed, every ten seconds in time. Rather than the universe, however, my reference to the film concerns ideas of the relationship of scales on our own planet. That is to ask: Is there—should there be, or even can there be—a continuity of approach through all types and scales of environmental design? Or do more appropriate forms and approaches to landscape design exist at each scale? I will suggest the second as a more plausible and desirable attitude.

Time, Planning, Landscape Design

The design and transformation of landscape—whether at the larger scale of environmental planning, or the more focused scale of landscape architecture—involves varying degrees of initial transformation as well as continued maintenance thereafter. As a practice, planning governs management and regulation more than any active reshaping and planting the land. As a generalization, we could say that of less concern to the planner are the aesthetic aspirations that characterize, and in some instances propel, design in landscape architecture. Environmental planning governs and directs operations in large areas of territory, with changes that usually span extended periods of time. While landscape architecture may also shape the form of the land for many decades—or even centuries—to come, the changes brought by landscape design are usually more immediate and implemented over a more compressed period of time. In addition, landscape design usually operates on smaller sites, with its modification to form and vegetation recognizable after a shorter interval of time has elapsed. Thus, the differences between landscape design and landscape planning include not only differences of scale—the measure of the surface area being modified—but also in the degrees of identifiable form that results, the demands for maintenance placed upon it, and the shorter time interval required to realize each project. *Change* always involves *time* as well as *form*.

Each scale of design intervention is—or should be—governed by methods, materials, and design vocabularies that appropriately guide the transformation of the site, however minor that transformation

may be. The dimensions of the site usually play a major role in the shape and manner of its design of course, together with budget and the time assigned for design and construction. In nature, unlike landscape architecture and other human efforts, the time needed for adaptation and change extends over numerous eras. Although the conference theme—"scales of change"—included no reference to time, the temporal dimension always conditions what and how modifications are made to landscapes at all scales.

Scales of Structure

Bionic analogies demonstrate that appropriate organs and skeletal structures adapted over time exist for each species and suggest that an appropriate degree of intervention is required for each scale of landscape. For an analogy, let's look at the world of birds. The skeletal frame of the sparrow, or any bird that flies, has resulted from eons of evolution as bird structure has continually moved towards one of reduced weight. Not only are the diameters of avian bones minimal in terms of size, but many of the bones are hollow—thus benefiting from the structural efficiency of the tube and truss, in contrast to the rod or beam.

The elephant, a beast of a far greater magnitude than even the largest bird, has a body that must bear the weight of these huge terrestrial mammals as they stand and move. As far as I know, *Dumbo*© has been the only elephant able to leave the ground and fly; most elephants, in contrast, remain earthbound. Being land based, the elephant's body is primarily set in compression, and therefore requires a skeleton that is heavy, dense, and to a large degree solid.

The bone structures of the bird and the elephant, as well as their shapes and internal organs, have evolved to address the specific structural and performance demands placed upon them. As you cannot simply enlarge the lightness of an avian skeleton to support the mass of an elephant, you cannot simply scale up garden practices and use them to manage a territory. The issues governing the two landscape types differ considerably in their needs and fitting design response, guided as they are by their respective constraints of economics, societal issues, climate, topography, and a host of other factors. As a result, a territory can be regarded as a garden only metaphorically. In turn, the analytical processes common to environmental planning may constrain and direct the design of a garden, but they will neither shape its specific spaces and forms, nor select and compose its plants.[2] Once it has been determined, for example, that a certain number of trees are needed, or that the land must be graded to drain against flooding, it is the landscape architect who must produce the specific earth form, select the species, and compose those trees to best perform the needed operations and satisfy any aesthetic intention. I would hope that the landscape architect contributes more than only an engineering solution, and perhaps even adds a touch of poetry to the pragmatic address of function.

Three Strategies

In the past, a number of strategies have been used to link the small and large scales, to relate the sphere of landscape architecture to that of the planned and

unplanned region or the wilderness. One strategy—which we could term *Degrees of Intervention*—establishes related zones of design intervention whose identity diminishes with distance from the house as it progresses toward the greater landscape (Figure 1). Although this technique was widely adopted in eighteenth-century England, certain landscape designers like Capability Brown sought to erase the distinctions between the garden and the greater park by sweeping the lawn right up to the very windows and doors of the manor (Figure 2). Brown's landscape at Chatsworth demonstrates both the advantages and disadvantages of this approach, among them a reduction in the apparent monumentality of the building caused by depriving it of a visually suitable base.

On the level of quotidian experience, the use of variegated zones of care is quite sensible. The immediate zone of the garden is used more often by the residents and guests of the manor than the extended terrain of the park. The method was also practical in terms of labor, with smaller, highly managed gardens adjacent or proximate to the house leading to less maintained land such as the pasture, whose growth was controlled primarily by grazing animals. This conjoining of grounds of pleasure with those of production, in turn created the need to prevent the animals' entering the occupied zone of the manor. In response, the ha-ha was born. Even less care was given to the forest, as well as the zone that in literature was termed the "wilderness"—which in actuality it was not (Figure 3).[3] In summation: a gradient of linked juxtaposed zones represented one method by which to relate the highly designed and tended zone of the garden with the greater scale of the agricultural, hunting, or untamed land beyond it.

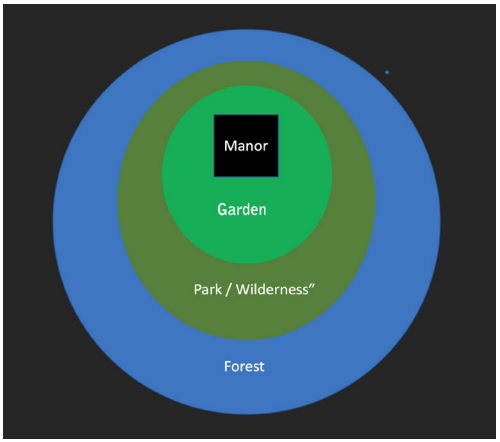

Figure 1 (above)
Concentric zones of design and maintenance intervention, from *Manor to Forest*

Figure 2 (middle)
Lancelot "Capability" Brown, Chatsworth, England, 1765

Figure 3 (below)
Zones of design and maintenance intervention, from Manor to "Wilderness" or Park

The American landscape architect Peter Walker once noted that there really was no term in landscape architecture—at least in English—that described the scale of what for architecture and cities is known as urban design or urbanism (Figure 4).[4] Here Walker was referring to a landscape design larger than, say, the small estate, whether private or corporate. It is true that historically, even a landscape of the magnitude of Versailles could still be referred to as a park or a garden. However, its design differed considerably from what we today may encounter on the perimeters of major cities. At these expanded scales the question becomes to what degree the landscape can be truly designed. Or more realistically, can it only be regulated and managed?

A second model offers another approach: *Urban design using landscape elements*. The Dutch village of Nagele provides a model of a truly designed landscape of a transitional scale. The village was constructed in the 1950s on reclaimed polder land, designed by a stellar group of architects and landscape architects called De Acht [The Eight] (Figure 5).[5] Larger than a garden, yet by no means a city, with a collective form in terms of housing, municipal, and religious structures, the design of Nagele fused landscape architecture with urban design. As such, it represents one of the few realized projects to date that can truly claim to be an example of landscape urbanism. In its design large stands of trees were used to define the zones of the village, while more intimate landscapes and gardens guided design on the individual lots (Figure 6). One can read the strategy employed at Nagele as an enlarged application of ideas found at the Miller garden in Columbus, Indiana, designed at almost the same time by Daniel Urban Kiley (Figure 7). In this private garden Kiley used lines and masses of white oaks, apple trees, and red buds to interweave bounded yet fluid spaces with limited and longer views. In Nagele, bands of dense forest plantings serve similar purposes.

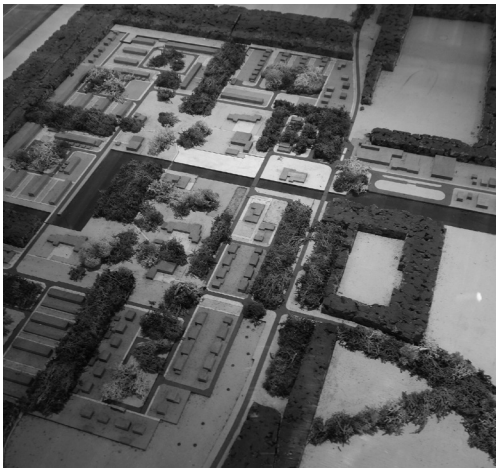

Figure 4 (above) Peter Walker, IBM Offices, Solana, Texas, 1989

Figure 5 (below) De Acht, Plan for Nagele, Netherlands, 1954+. Town model [detail] at the Museum Nagele

More recently, French landscape architect Alexandre Chemetoff has been engaged in an exceptional project on le Plateau de Haye, in the city of Nancy in eastern

France.[6] To reduce the bulk of the existing 1960s social housing blocks, create an personable scale for the neighborhood, and strengthen the connections with the center of Nancy below, Chemetoff proposed the complete demolition of three of the 1960s buildings, and the partial demolition of two 800-meter long social housing slabs dating from the same era (Figure 8).[7] Replanning and upgrading the quarter was a challenge, as the site contained a functioning prison and a former quarry, among other heterogenous and potentially troublesome features. The prison, still in use, was encircled by a moat to enhance security and collect rainwater, with rows of trees used to screen the buildings of the facility and buffer the prison from the surrounding community (Figure 9). Scale was a major issue, given the need to reconcile the enormous masses of the apartment buildings with the landscapes at their feet.

Chemetoff used the rubble from the building demolition to create a massive hill within the quarter's large central park. Tree plantings in the park followed an extensive regrading of the prior topography. By necessity, the gestures behind Chemetoff's design were large-scale, with the details purposely strong and robust (Figure 10).[8] Chemetoff's design for the Plateau first addressed large-scale planning issues, and subsequently realized them primarily by using significant landscape features of sufficient size.

A third model—*Territorial design using landscape elements*—inserts "islands" of highly designed landscapes to define sectors within the large territory. Projects by Michel Desvigne provide excellent examples of this approach, with designs that have grown continually larger over the years (Figure 11). These are works that in some ways scale up the design strategy used to plan Nagele, and then apply it to the design of the city, the suburb, and the greater territory.[9] Desvigne's larger projects will require decades to implement and reach maturity, but a strategy he used in the northern French city of Lens suggests how these ideas would operate in the greater territory.

As urban enrichment and to support orientation and circulation in the city center, lin-

Figure 6 (above) De Acht, Nagele, Netherlands, 1950s. Forest strip, gardens, and housing

Figure 7 (below) Dan Kiley, Miller garden, Indianapolis, Indiana, 1957. Alignments and groves of trees define the spaces of the garden

ear masses of trees and shrubs were planted to support circulation from the railroad station to a new branch of the Louvre (Figure 12).[10] Some might call these plantings "green infrastructure" because they operate at an urban scale and define spaces within the city. Desvigne's is a hybrid approach that considers the scale of the territory by sustainably planning it for development, while nonetheless considering the human presence within the landscape and the type of interventions required to create a sense of comfort for those who live and work in the city, and for visitors with the art museum as their primary destination. This is an innovative model for territorial design that mixes elements designed and planted with those constructed—interventions that serve as space-defining units within the broad expanses of the periuban landscape.[11] Landscape design and environmental planning benefit from a strong partnership—but only if the relationship is truly symbiotic.

In Closing

Although by no means a complete list of possibilities, the three approaches discussed above have each attempted to reconcile the inherent differences that distinguish landscape design from landscape planning. Over an extended period of time, planning establishes the matrix that determines subsequent management, potential development, and even the landscape architecture that follows. It guides what we will eventually encounter and experience—but only rarely does it produce specific perceivable form. That role is left to landscape architecture. In the historical English model, the two modes are juxtaposed, although carefully associated. Nagele provides a transitional representative of the expansion of a modernist idea of garden space to the planning and design of a village. In turn, projects by Alexandre Chemetoff exemplify an enlightened tactic for improving existing environments that mixes demolition with terrestrial and vegetal intervention. Designs by Michel Desvigne have expanded the values and perceived results of landscape architecture to the scale beyond the city: to that of the the territory. Each, when properly applied, offers a method for addressing the differences in scale characteristic of landscape design.

Figure 8 (above) Alexandre Chemetoff / Bureau de Paysage, Plateau de Haye, Nancy, France, 2004+. Remaining apartment blocks with new park promenade

Figure 9 (below) Moat and new tree planting to collect water, provide a visual buffer, and augment security

Notes

[1] Phyllis and Philip Morrison, *Powers of Ten*, New York: Freeman, 1982.

[2] I feel that this was the limit to the usefulness of the work of Ian McHarg. Scientifically and ethically, his analytic methods may rightfully constrain a design, but they will not produce it.

[3] In his book the *Formal Garden in England*, published in 1892, Reginald Blomfield provided a rational for juxtaposing the ordered and less ordered zones of the landscape as more appropriate for estates of any distinction: "The formal treatment of gardens ought, perhaps, to be called the architectural treatment of gardens, for it consists in the extension of the principles which govern the house to the grounds which surround it." P. 2.

[4] Peter Walker, in conversation with Marc Treib, c. 2009.

[5] Under the name of de Acht, the architects included such luminaries as Aldo van Eyck, Gerritt Rietveld, and Mart Stam; and landscape architects Wim Boer and Mien Ruys.

[6] See Alexandre Chemetoff, *Visits, Town and Territory: Architecture in Dialogue*, Basel: Birkhäuser, 2009.

[7] Having studied landscape architecture and horticulture, Chemetoff joked that he knew how to prune.

[8] There was little attempt to propose sophisticated and delicate details that would not endure.

[9] See Michel Desvigne, *Intermediate Landscapes: The Landscapes of Michel Desvigne*, Basel: Birkhäuser, 2009; and Michel Desvigne Paysagistes, Transforming Landscapes, Basel: Birkhäuser, 2020

[10] The building for Lens Louvre was designed by SANAA; its landscape designed by Mosbach Paysagistes.

[11] With this approach designed terrain is used to articulate larger territories, a manner having parallels with the historical Japanese practice of *shin-gyo-so*, embedding within one another "degrees of formality" to produce formal and spatial richness. See Marc Treib, "Modes of Formality: The Distilled Complexity of Japanese Design," *Landscape Journal*, Spring 1993.

Figure 10 (above) New bioswales and tree planting

Figure 11 (below) Michel Desvigne, Garden for the Walker Art Center, Minneapolis, Minnesota, 2005. Blocks of trees used to define garden spaces (Michel Desvigne Paysagiste)

Figure 12 (middle) Michel Desvigne, Urban landscape corridor, Lens, France, 2012

Multiscale approach to biodiversity conservation: Chicago as a case study

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Abstract
Biodiversity loss is a major global concern, strictly connected to heterogeneous phenomena occurring at various spatial and temporal levels. A multiscale approach to biodiversity conservation is therefore crucial to better understand and manage ecological dynamics and processes.

Among the many cities that are worldwide adopting biodiversity-aimed policies, Chicago stands for its forward-looking approach to environmental conservation, whose antecedents can be found at the turn of the 20th century, when the Forest Preserves of Cook County were established.

The institution of this system of protected sites became the framework for the foundation of the regional alliance Chicago Wilderness in 1996, aimed at implementing the quality of delicate ecosystems and conservation areas. In 1999 the alliance produced an innovative document for that time: the Biodiversity Recovery Plan (BRP) for the greater Chicago region. It was followed in 2004 by its spatial representation, the Green Infrastructure Vision, that identified priority areas to be protected, restored, and connected.

In order to translate the BRP regional goals at the urban level, in 2006 the City of Chicago developed its first Nature and Wildlife plan (updated in 2011) to preserve and restore habitats within the city.

Proposing the experience of Chicago as a best practice, the paper addresses the complex system of tools adopted to tackle the loss of biological diversity from regional to municipal level. Through the analysis of three contemporary landscape architecture projects implemented in Chicago, the paper intends to highlight the productive and mutual influence of landscape planning and design in biodiversity conservation.

Keywords
Urban biodiversity, ecosystem restoration, environmental planning, ecological design, Chicago Wilderness

Introduction
Since the Rio Convention on Biological Diversity (CBD) in 1992, biodiversity – understood as genetic, species and ecosystem variety – has increasingly entered the global consciousness as a value to be preserved, since its alteration can produce closely interconnected impacts that inter-

act with the ecological balance of the planet (Rockström et al., 2009). In this sense, scholars agree that urban environments are the decisive arena to address this global challenge (Prominski, 2019; Tan, 2019; Kowarik, 2011; Müller and Werner, 2010). Indeed, cities host the majority of the world's population and are the setting for manifold anthropogenic activities that are major causes of habitat and species depletion.

Considering that biodiversity loss is strictly connected to heterogeneous phenomena occurring at various spatial and temporal levels, a multiscale approach to biodiversity conservation is crucial to better understand and manage ecological dynamics and processes. Therefore, a joint effort of decision-makers, planners, and designers is pivotal to successfully integrate the conservation of biological diversity into sustainable development strategies from the national to the local scale.

Environmental awareness and planning tradition in Chicago

Over the last three decades, several international strategies have followed to promote the integration of biodiversity conservation into local policies. Among the many cities that are worldwide producing biodiversity-aimed policies and planning documents, Chicago deserves to be highlighted as a virtuous example due to its forward-looking approach. Although USA did not ratify the CBD, the city had already long developed a strong environmental awareness. Sensitivity towards the natural environment rose between the 19th and early 20th century, when population growth in Chicago made it evident to scientists, architects, and planners that vast portions of the land should have been preserved from urban development (Gobster, 2012; Tate, 2015).

Following a visionary proposal (1905) for the creation of an extensive park system for the Chicago metropolitan area by architect Dwight H. Perkins and landscape architect Jens Jensen, in 1910, the city adopted the Plan of Chicago. The plan, developed by architects and urban planners Daniel H. Burnham and Edward H. Bennett, aimed at configuring a continuous system of tree-lined boulevards, parks, and protected forests: 'a park area entirely surrounding the city' (Burnham and Bennett, 1909, 55). This intention was initially prompted by public health reasons, in line with a widespread attitude observed in many European and US cities, such as Paris, London, and New York.

Forest Preserve District of Cook County

Gradually, this attitude turned into the recognition of the value of nature *per se* and thus the desire to preserve a public asset. In 1913 the approval of the Illinois Forest Preserve District Act led, two years later, to the establishment of the Forest Preserve District of Cook County. The early activity of the Forest Preserve District was marked by the purchase of thousand hectares of forest in the Chicago Metropolitan Region and its environs and the application of a pioneering active-conservation regime, able to reconcile environmental conservation with the provision of recreational spaces for people.

The system of preserves was soon provided with plans for the spread of vegetation and fauna as well as strict regulations for the use of space and the protection of

trees and wildlife, as the importance of educating and inspiring the local community was soon understood as crucial.

Chicago Wilderness
The Forest Preserve District was progressively developed for decades, becoming the framework for the foundation, in 1996, of the regional alliance Chicago Wilderness. The alliance manages over three million hectares of public and private woodlands, wetlands, marshes, and prairies, between Illinois, Indiana, Wisconsin, and Michigan.

Coordinating different stakeholders, Chicago Wilderness is constantly concerned with the dissemination of scientific knowledge, as shown by the rich production of documents, maps, and educational events. Among the publications, *An Atlas of Biodiversity* was defined in 1997 to promote public awareness of the regional habitats that are main drivers of biodiversity, with an emphasis on rare and threatened communities.

In 1999 Chicago Wilderness published a ground-breaking, practical guide for environmental management and restoration. The *Biodiversity Recovery Plan* (BRP) is an evolving tool providing an assessment of the environmental heritage and a set of measures to restore species and habitats. In 2004, the BRP has been translated into a spatial representation on a regional scale, the *Green Infrastructure Vision*. The vision contains various maps that identify priority sites to be preserved, restored, and connected, and a list of specific recommendations for each location.

Chicago Nature and Wildlife Plan
As a local response to the regional BRP, in 2006, the City of Chicago produced the *Chicago Nature and Wildlife Plan* (CNWP). Due to the emergence of new topics related to climate change, ecological connections, and evolving scientific knowledge, a second version was released in 2011 defining four updated goals:

- 'Protect and Expand Natural Areas' broadens the essential aim related to conservation, promoting the enhancement of the green infrastructure and the mitigation of climate change effects;
- 'Manage Existing Natural Areas' refers to management actions aimed at reinforcing natural systems, including environmental restoration, shelter supply for wildlife, and development of specific plans for natural areas;
- 'Foster Stewardship' aims at involving local communities in the management of natural areas, to foster people's sense of belonging and interest in maintaining the environmental quality of the open spaces;
- 'Monitor Sites and Conduct Research' is crucial to evaluate the efforts put in natural resource management and environmental restoration, also supporting citizen science activities.

Neither edition of the CNWP introduces detailed indications for the design of new urban spaces, although promoting the expansion of protected areas and nature parks. Nevertheless, the plan has contributed to the enhancement of the ecological quality of riparian sites, the establishment of new natural areas along the lakeside, and the extension of nature reserves and wildlife sites.

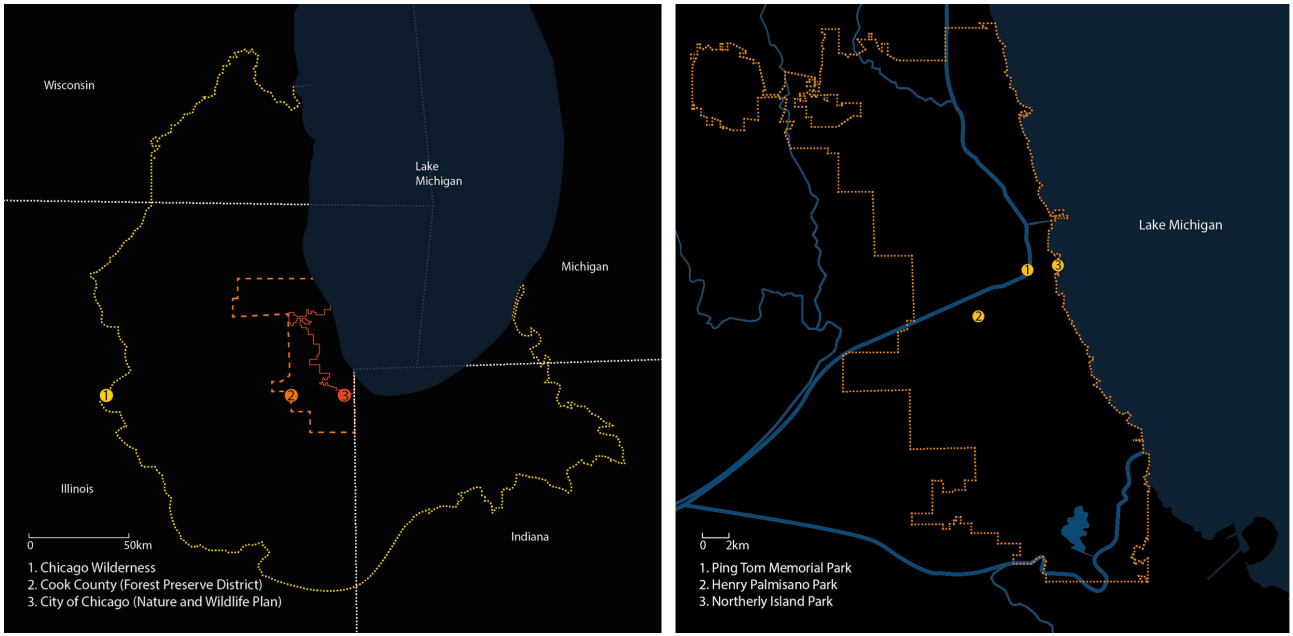

Figure 1
From left to right: spatialisation of the scales of action covered by the management and planning documents analysed; location of the three landscape architecture projects within the City of Chicago (author's elaboration)

Biodiversity-aimed landscape design in Chicago

Ranging from the vast scale to the municipal scale (Figure 1), the experiences examined demonstrate a recurring approach, permeated with the constant effort to balance environmental protection and recreational use of the space.

Following, design scale will be addressed through the analysis of three contemporary landscape architecture projects implemented in Chicago (Figure 1) and selected for their focus on the reconstruction of biotopes and preservation of biodiversity. The design of the parks will be related to the strategic and planning tools described so far, with the intention of highlighting the productive and mutual influence of landscape planning and design in biodiversity conservation.

Ping Tom Memorial Park

Ping Tom Memorial Park runs along the east bank of the Chicago River, in the southern Chinatown district. In the late 1960s, the construction of the Dan Ryan Expressway deprived the neighbourhood of its only green spaces. This event triggered a long campaign of protests, guided by civic leader Ping Tom, which supported the idea of developing a new park on a former railroad site. In the '90s the brownfield was finally acquired by the Chicago Park District and the project was entrusted to Site design group (Site design group, 2015; Chicago Park District, 2002).

The realisation of the park took place in two phases: the first phase (2.8 hectares) consists of a linear park, mainly designed with the intention of paying homage to Chinese aesthetics, represented in several ornamental gardens, a pagoda pavilion,

and a playground. After the completion of the project in 1999, the community enthusiastically requested further expansion to the north and northeast.

The second phase (4.9 hectares), implemented between 2009 and 2013, focussed instead on the re-naturalisation of the riverfront through several shoreline treatments and reconstruction of aquatic habitats, while including also recreational spaces and facilities. A mixture of domestic aquatic grasses was selected to restore the river habitats, with the dual objective of housing wildlife and purifying the river water. A zigzagging walkway allows the public to observe and cross the renewed river landscape (Figure 2), while limiting disturbance to the reconstructed biotopes.

Next to the wetland habitat, a system of gentle hills, densely covered with native grassland species, increases the spatial and ecological complexity of the park. Further east, an oak savannah environment has been configured at the edge of the railway, serving as both a noise buffer and a refuge for wildlife.

Ping Tom Park reconciles active and passive recreation with ecological conservation, following an attitude systematically found in Chicago's history, from the foundation of the Forest Preserve District to the establishment of Chicago Wilderness. While the project was conceived prior to the publication of the 2006 CNWP, the realisation of the second phase is in line with the interest in urban habitats promoted in both editions of the plan. The park is mentioned in the 2011 update among the accomplishments achieved within the priority action 'Promote riparian areas along the Chicago River through shoreline enhancements'. Ping Tom Park embodies many objectives expressed in the plan, especially with regards to strengthening ecological connections and environmental restoration.

Figure 2
Ping Tom Park (photo: Site design group)

Henry Palmisano (Stearns Quarry) Park
Henry Palmisano Park covers an area of 10.8 hectares in the southwestern Bridgeport neighbourhood. The site, an ancient coral reef, was converted into a limestone quarry in the late 1830s and then used as a landfill for construction debris since 1970. In the late 1990s, the area was acquired by the Chicago Park District to transform it into a public open space. Also this project (inaugurated in 2009) was entrusted to Site design group, in collaboration with DIRT Studio, and the overall design intention focused on eco-sustainability.

The capping of the landfill created the opportunity to define a 10-metre-high landform, covered with native prairie species and serving as a central viewpoint.

In the northern portion of the park, the cavities and walls of the quarry proved inspiring for the design of a catch-and-release fishing pond, equipped with a fishing pier, which also serves as a birdwatching post. The reservoir is overlooked by a terraced sequence of wetland plots (Figure 3), which form part of a recirculating water system and provide the park with the opportunity to host habitats with variable moisture conditions, contributing to the overall ecosystem diversity.

As far as the choice of vegetation is concerned, wetlands and prairies were designed using eight plant associations typical of the Mid-Western Region, which provide food and resources for a rich local fauna, mainly resident and migratory birds, but also insects and mammals.

Also in this project, the search for a calibrated coexistence of recreational activities and nature conservation is evident, although 'a lot of the park is fenced off, putting humans in their place' (Marshall, 2020, 64). Recreational possibilities are countless although the space has not been over-designed with features for outdoor activities, suggesting activities based on nature experience, which also helps facing human-wildlife conflicts (an issues considered in CNWP update).

Thanks to the heterogeneous habitats hosted, Henry Palmisano Park fits in with the goals shared by the founders of the Forest Preserve of Cook County, the Chicago Wilderness alliance, and the City of Chicago in relation to increasing space for wildlife conservation. Furthermore, its water management system is also in line with the concern towards the effects of climate change expressed in the 2011 CNWP. With respect to the goals of education and public involvement, the park proves to be a successful setting for multiple activities to bring urbanites closer to nature.

Figure 3
Henry Palmisano Park (photo: Site design group)

Northerly Island Park

The third project involves the transformation of Northerly Island, the only artificial peninsula built off Chicago's coast as part of the archipelago proposed in the 1910 Plan of Chicago. The peninsula was used as a public open space until 1947, when the small Meigs Field airport opened. The airport was dismantled in 2003 by order of then-Mayor Daley, laying the foundation for its transformation into park land (Kamin, 2015).

The framework plan for Northerly Island – a collaboration between Studio Gang and SmithGroup – divided the area into two portions. The naturalistic atmosphere of the southern section (completed in 2015) is a counterpoint to the urban character of the north, given by the underway inclusion of facilities and services. An eastern reef is also envisaged as part of a long-term vision.

The realised portion (16 hectares) hosts an articulate landscape composed of softly sculpted topography and a collection of habitats, with the dual intent of providing resources for wildlife and an immersive nature experience for users (Figure 4). The hills act as a windbreak and embrace a two-hectare wetland environment fed by Lake Michigan, providing a valuable habitat for insects, fish, amphibians, and migratory birds.

The reserve is dotted with more than 20,000 trees and shrubs belonging to over 150 native species, grouped to form a collection of woodland, savannah, wetland, and prairie habitats winding through the southern portion of the island, which provides an immersive experience of the biological communities that would potentially develop spontaneously on the site. A system of thin trails branch off from the main, looped cycle and pedestrian path surrounding the wetland, allowing the different biotopes to be observed. Throughout the year, Northerly Island hosts events, guided tours, and programmes to boost public knowledge and appreciation of the local environment.

The project evokes the intentions expressed in Chicago's planning tradition, not only realising a part of Burnham's vision towards a lush lakefront park, but also embodying the intentions of the CNWP. Indeed, the park contributes to increasing the urban green infrastructure for both wildlife development and the well-being of citizens, who are brought closer to local ecosystems.

Figure 4
Northerly Island Park (photo: Steve Hall, Hedrich Blessing)

Furthermore, Northerly Island participates in the series of transformations that provide disused infrastructures with a new, sustainable vocation. The inclusion of decommissioned sites and vacant lots in the broadened scopes of the 2011 CNWP update demonstrates how the plan has been influenced by the progressive application of ecologically oriented design in neglected, ordinary urban landscapes capable of becoming nature parks.

Conclusion

Despite the massive urban development occurred over time, the planning and design history of Chicago reveals a peculiar concern about environmental conservation since the 19th century. Progressively striving for ecosystem conservation, the city has produced its own holistic, systemic approach, also applied at the scale of landscape design (Table 1).

This attitude led designers to focus on recurring themes, such as ecological restoration and enhancement of plant diversity, as drivers for the development of rich living communities. While initially planning had

to focus on the imposition of protection regimes on areas of recognised natural value, it is now clear that even disturbed urban ecosystems offer possibilities for habitat development. The re-functionalisation of spaces stemming from the city's industrial and infrastructural heritage provides robust occasions to preserve biodiversity and strengthen ecological connections.

The case of Chicago shows how a systemic, multi-scale effort can foster the development of biological diversity in a vibrant urban context. Public open spaces are often the main opportunity for urbanites to experience ecological dynamics and heterogeneity. This role is not played only by areas protected for their natural value, but also by newly designed spaces in which the calibrated distribution of different

Planning/Management Documents		Ping Tom Memorial Park	Henry Palmisano Park	Northerly Island Park
Forest Preserve District of Cook County	Plans for vegetation and fauna	Environmental restoration	Increased space for wildlife conservation	Strengthened urban green infrastructure
	Regulations for using and protecting the space		Activities based on nature experience	Events, guided tours, and programmes
Chicago Wilderness	An Atlas of Biodiversity (knowledge)		Improved public knowledge	Improved public knowledge
	Biodiversity Recovery Plan (restoration measures)	Environmental restoration	Increased space for wildlife conservation	Increased space for wildlife conservation
	Green Infrastructure Vision (preservation, restoration, and connection measures)	Reinforcement of ecological connections		Strenghtened urban green infrastructure
Chicago Nature and Wildlife Plan 2011	'Protect and Expand Natural Areas'	Promotion of riparian areas along the Chicago River	Increased space for wildlife conservation	Strenghtened urban green infrastructure
	'Manage Existing Natural Areas'	Reinforcement of ecological connections; environmental restoration	Water management system as a tool to address climate change	Sustainable refunctionalisation of a decommissioned infrastructure
	'Foster Stewardship'	Enhancement of the sense of belonging felt by the Chinatown community	Activities based on nature experience	Events, guided tours, and programmes to boost public awareness
	'Monitor Sites and Conduct Research'		Improved public knowledge; Reduced human-wildlife conflicts	Improved public knowledge; Reduced human-wildlife conflicts

Table 1
Overview of the main relationships between the contents of the planning/management documents and the design outcomes (author's elaboration)

space typologies and intensities of use allows for new possibilities of coexistence between humans and other-than-humans.

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Representing the complexity of nature from micro to macro scale

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Abstract
Today, the relationships woven between man and Nature have taken on new forms: they have become decidedly complex and seem destined for continuous evolution. Thus, taking into account new needs felt on a planetary and interdisciplinary level, we feel called to reflect on the role of representation in conceiving new relationships with natural phenomena. In general, it is possible to say that in the era of the Anthropocene, in order to cope with social, geopolitical, climatic and environmental changes, landscape design must tend towards a vision that considers phenomena as a whole, rather than focusing on specific aspects. This approach, which we can call holistic, has quite a few implications for the project. One, for example, is the need to understand and manage very complex phenomena, from small to large scales, such as ecological ones. In this contribution, therefore, we will attempt to investigate how representation can meet these new demands on landscape design to make us able to understand and manage the phenomena of the planet.

Keywords
Landscape Architecture, Representation, Scales, Project

Since Leonardo da Vinci's time, representation has been a way to investigate and understand the phenomena of nature in a scientific and systematic way (Geddes, 2020). Today, however, the relationships woven between man and nature have taken on new forms: They have become decidedly complex and seem destined for continuous evolution. Thus, considering the unique needs felt on a planetary and interdisciplinary level, we are called to reflect on the role of representation in conceiving new relationships with natural phenomena.

In various disciplines, new ways of investigating and understanding our way of relating to space and the environment have emerged. Physics, for example, is looking for a theory to unify general relativity and quantum mechanics, coming to conceive the existence of strings and other dimensions curved or rolled upon themselves (Randall, 2006).

Philosophy and science have discussed their interest in scale in many forms. From past centuries, we remember the visionary intuitions of Giordano Bruno that led some researchers to a multiscalar approach to the study of the Earth (La Porta, 1994).

More recently, fascinating studies like Albert Einstein's research on Brownian motion show the macroscopic effect produced on pollen grains by the microscopic movement of water molecules (Odifreddi, 2013). A few years ago, Aazami and Petters discovered a universal principle that unites the curious interplay of light and shadow on the surface of our morning coffee with how gravity magnifies and distorts light from distant galaxies (Aazami & Petters, 2009).

The concept of multiscalarity has grown excitingly over the years, and as landscape architects, we feel engaged in such a field of creation and experimentation. In architecture, the concept of the scale was investigated recently by Michelangelo Russo, who argues that a dynamic interpretation of multiscalarity as an interpretative lens is fundamental to rethinking the urban planning project of contemporaneity. For him, multiscalarity is the hallmark of the ecological dimension of environmental phenomena. Moreover, it is the interpretive category for dealing with the complexity of urban and territorial phenomena increasingly intersecting with ecological and environmental issues as an inescapable value system for contemporary spatial design (Russo, 2015).

As Simon Bell demonstrates in *Landscape: Pattern, Perception and Process*, patterns are a clear example of how different scales can be used simoultaneusly: "Landscape develop and evolve through an interacting series of processes – climatic, geological, ecological and cultural – over varying periods. These processes shape the structure and character of the Landscape which we experience. Over time, distinctive patterns emerge, ranging in scale from the distribution of small plants to the sculptured sides of a huge canyon. Our perception of these patterns goes beyond just their visual appreciation into a richer understanding of how we experience our environment" (Bell, 1999).

Should a multiscalar approach also emphasise many teaching methodologies applied to landscape architecture? Since the discipline is still frequently taught as a unidirectional process in which the designer goes from the biggest to the smallest scale, depending on the scale of the area, it is now probably essential to undertake a trans-scale view to understand the environmental issues and their results on the tiny scale of the project.

We know that in the era of the Anthropocene, landscape design must tend towards a vision that considers phenomena as a whole rather than focusing on specific aspects to cope with climatic and environmental changes. This approach has a few implications for the design process, like the need to understand and manage very complex small and large phenomena. Consequently, our attitude should go beyond just visual appreciation into a richer understanding of our environment regarding methodology, including representation techniques.

But if we look at the images of many design competitions, it is evident that today, hyperrealism is still the predominant mode of representation (Kullmann, 2014). So instead of indulging in what Richard Weller effectively calls the "digital sublime", we probably need to focus precisely on the processes of the Earth system to under-

stand and manage the planet's changes (Weller, 2020).

It is becoming increasingly necessary, on the one hand, to rethink how to overcome the anaesthetising superficiality of "hyper-representations". Christophe Girot, for example, uses special scanners integrated with drones to create complex point clouds, making it possible for him to map and analyse topography and landscape. The information gathered in his renders includes geography, topography, infrastructure, and the quality of the land, to name just a few. Based on this information, the user acquires multiple levels of reading (Girot, 2013). However, the equipment is not affordable to all worldwide.

On the other hand, we as researchers should probably be more dynamic and flexible, not limiting the creative practice to one approach but alternating fluidly between the micro and the macro scale. For example, the beautiful drawings by Christine Enrègle of a *Ficus macrophylla* in the Lisbon Botanical Garden – and reproduced here in the picture – show that fluxes and floods can reflect both the little and the big scales, confirming that representation is the necessary dynamic to understanding this complexity through the design process (Fig. 1, Enrègle, 2020). Representing should, then, mean understanding relationships and connections and revealing the hidden dimensions of our complex world.

Advances in technology are numerous, and may can help also landscape designers. Detailed three-dimensional reconstructions of neuronal maps are even beginning to be made, so that it is possible to map these structures in the brain of a *Drosophila melanogaster*, the fruit fly, with a precision of 20 µm (Janelia Research Campus); at the same time, three-dimensional reconstructions of our galaxy are being made, so that it is possible to 'jump' from a nearby star, such as Fomalhaut, to a much more distant

Figure 1
Charcoal drawing on cotton canvas, 150 x 80 cm, from the series Jardim da Estrela, Lisboa, Junho-Julho 2019
© Christine Enrègle

one, such as Wezen, 1612 y.l. away, and to know the most relevant information (Simulation Curriculum). At the heart of this need to represent the complexity of natural phenomena seems to be the need to portray life in its various forms, with wonder and curiosity.

The current historical moment presents the designer with new problems and solutions, prompting him to search for forms of expression and question the role of representation. The environmental challenges, the countless new theories emerging from the various scientific and humanistic fields, and the social demands allow us to shed surprising new light on representation while permitting us to pause to understand its role, which is irreplaceable, particularly when applied to our understanding of natural phenomena and the transformation of nature.

Multiscalarity is one approach we can start to think of in teaching methodology in recognition of how students can begin to think at different scales in a multi-directional manner. This enhances the creative process in surprising ways, making the design activity more complex and aware, for example, as well as questioning the designer about the interconnections between ecological issues and human needs. That brings to mind the words of Giordano Bruno from *De imaginum compositione*: "*Colui che vede in se stesso tutte le cose è al tempo stesso tutte le cose*. - Who sees in himself all things is at the same time all things."

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Using negotiation to reduce the gap between planning and implementation

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Abstract
This study demonstrates the complexity of the "negotiation issue" in planning and how it can be addressed in digital planning negotiations toward comprehensive, efficient, and responsible planning process. The study presents and compares two Geodesign workshops that explored the challenges and opportunities of deep public involvement in the digital planning process in Neve Sha'anan, Tel Aviv. This neighbourhood test case illustrates an urban fabric where institutional, planning and socio-economic factors have caused a gap between the initial vision for the neighbourhood and its development over time. In analyzing the current planning process, the study shows how the digital process promotes transparency and deep involvement of stakeholders in a regulated planning process. Using such a collaborative interface allows representatives from the community to engage in a deep and comprehensive dialogue, to reach a consensus that can then be advanced towards implementation.

Keywords
Planning, digital negotiation, "the negotiation issue", participatory process, planning implementation, consensus

Introduction
The negotiation of space and resources was traditionally considered an administrative by-product of planning (Innes, 2018). Planning has been considered a procedural field and the best way to implement it is based on political considerations (Flint Ashery, 2015). However, during the last decade, planning has evolved from being a technical and rational process to a negotiation and compromise activity, which takes into account the "rules of the game", the resources each party brings, as well as the dynamics of negotiations and the results (Geertman, 2017). Issue-related complexity occurs when an issue consists of many sub-issues. There are generally three general types of negotiation complexity identified by Winham (1977) in studies on this topic: (1) negotiators use simplified structures to facilitate decision-making, (2) complexity reduces the significance of concessions, and (3) complexity increases the likelihood of reaching an agreement. Laubert and Geiger (2018) then stated that complexity could be beneficial or detrimental to an outcome. Following previous studies asserting that "the negotiation issue" is an important variable in negotiation but complexity in negotiations has not been conceptualized, this study illuminates

the complexity of the "negotiation issue" in planning and how it can be dealt with in a digital planning negotiation process.

The planning policy has been a key instrument for governments in addressing spatial, economic, social, and environmental issues (Rydin, 2011). Thus, the implementation stage of urban planning is seen as a process that follows the prioritized processes of agenda-setting and policy formulation (Hupe and Hill, 2016). A common attitude when resources are limited and political and social conflict is intense is that "the best solutions are those for which there is the greatest agreement" (Smith,2018). In this view, bartering and negotiation are the most effective and optimal methods of implementation (Goodchild, 2010). By resolving conflicts and reaching a consensus, negotiations facilitate a satisfactory outcome (Eckley, 2002; Flint Ashery, 2017). A resilient solution is one in which all parties agree and compromise (Flint Ashery, forthcoming). When information is complex, decision-makers are at odds, and there are multiple turns in the system, generating consensus guarantees at least some degree of delivery (Davies, 2001). Despite certain aspects of rational thinking that divert attention from the underlying processes that underlie the creation of space, few perspectives are offered on how planners are handling the increased prominence of negotiations (Geiger, 2017). Generally, planners and developers are viewed as intermediaries between public, private, and political actors. Considering that implementation is the result of complex interactions (Raiffa, 2007), of which planning policy is only one, reveals the importance of negotiation methods.

Human negotiation supported by geodesign software can connect theorists and practitioners (Ervin, 2016). The research for optimal negotiation shows both the promise of the critical approach and the need for scenario analysis tools (SA) to bridge the gap between urban planning theory and practice. The concept of negotiation is expanded by Verhage and Needham (1997) to include multiple parties seeking multiple goals at the same time. According to Fisher (2016), we discuss how geodesign can be used to disentangle issue-based complexity and use it to implement planning policies by using digital processes of bartering and negotiation. Issue-related complexity refers to issues that are composed of a number of sub-issues (Ogrin, 1999; Pogačar., et al., 2018). Therefore, negotiations revolve around ten systems, with a wide range of policies and projects proposed for each (Prominski, 2016; Ennis, 2017). By defining the issues in this manner, it is possible to conceptualize the complex nature of the urban field and characterize it using diverse spatial categories according to their relationships and contexts (Grêt-Regamey, et al., 2021). Additionally, scale, scope, macro- and micro-level strategies, morphology, and cost/benefits are examined to test the sensitivity and validity of the negotiation models.

Methods: Re-thinking Growth in the Tel-Aviv Region

The Research Area of the Neve-Sha'anan neighbourhood

The dense, marginalized, and neglected Neve-Sha'anan neighbourhood, polluted by two problematic central bus stations, serves as a "limit case". Around 15,000 people of various ethnicities and economic

means live in Neve-Sha'anan, which has a surface area of 760,000 square meters. There are many foreign workers, refugees, and asylum seekers among them: According to the Central Bureau of Statistics (CBS) and Tel Aviv Socio-Economic Research Centre (SERC), Neve-Sha'anan has approximately 4,900 documented residents, along with 9,000-10,000 undocumented foreign residents (including family members). There is a high level of crime, prostitution, and drug abuse in the neighbourhood. With gentrification, however, the foreign population has gradually been replaced by Israeli students and young professionals in recent years. As gentrification intensifies, undocumented residents are displaced and the neighbourhood's profile is changing. In addition, local homeowners and large landlords from afar become real estate investors, purchasing small apartments and renting them out to these new residents.

The original plan for Neve-Sha'anan was to divide it into parcels of around 400 square meters. Each parcel allows for a building to be built in the front and a courtyard to be built in the back. With only 4-5 meters between buildings, the parcels were built up according to the plan to create a dense neighbourhood. There is almost no open space or public buildings in the neighbourhood. Today, most of the area is covered by two plans, 'town planning scheme 44' (1941) and 'detailed scheme F' (1946), which designates the area as a mixed-use area. According to the city's TA/5000 (2016) master plan, the municipality promotes high-rise development throughout the neighbourhood by indicating the maximum floor area divided by the plot size (e.g., building rights) and maximum building height. There are several areas where high-rise construction is permitted, including the Ayalon Road highway and the nearby MEA. The neighbourhood's heart will be dominated by an eight-story residential area. Additionally, the municipality's planning department is developing two new neighbourhood planning policies. There is a policy related to the new central station zone in the southeast part of the neighbourhood. Second, there are highrise buildings on the periphery. These plans can add up to 1,500,000 sqm of built-up area and around 7,000 residential units when combined with private initiatives.

Pre Workshops Stage

Neve-Sha'anan workshops at Bar Ilan University were organized and run by Dr Shlomit Flint Ashery and Rinat Steinlauf Millo in collaboration with Tel Aviv-Yafo municipality. In June 2020, two-day workshops were organized to understand how geodesign can improve spatiality in widely dispersed and diverse settings. Four main tasks were involved in pre-workshops organization: designing the workshop's content, workflow, and timing, which took about six weeks. We drew the initial polygons of policies and projects for each of the ten systems based on the ten systems and the growth assumptions of the Tel Aviv-Yafo municipality. The diagrams were edited and added to during the workshop. 24 participants from different fields relevant to the planning area attended the workshops and chose to increase the inventory of public open and built areas for existing and future communities. As well as pocket gardens and linear parks, they added extensive open spaces. Also, bicycle lanes and public transportation routes

Figure 1
The 1st stage designs from the two workshops

were added to enhance mobility and accessibility for all residents in the neighbourhood (Steinlauf-Millo, Flint Ashery, & Tchetchik, 2021).

Results: Negotiations during the NS Workshop

Through the use of digital processes of bartering and negotiation, we further implement planning policies using geodesign to disentangle issue-based complexity in negotiation. A complex issue has a positive impact on negotiations: Using digital evaluation models, we were able to conceptualize the scope of the negotiation-related complexity and then arrive at an agreed solution in a few design cycles of negotiating.

On the first day of each workshop, participants have introduced to the theory of Geodesign and Geodesignhub software, and were organized into four interest groups: AGOV (Authorities and Government), BEOD (Business and Developments), COM (Community), and ENV (Environment). For the Version 1 2050 proposal, the teams selected, edited, or added diagrams. Impacts and costs were assessed and re-evaluated at least once (Figure 1).

During the second day of the workshops, the interest groups began informal negotiations, since one of the aims was to come up with a negotiated solution for the region, and the alternatives were reassessed. Using a sociogram (Flint Ashery & Steinitz, 2022), the workshops determined which groups were capable of working together and their mutual propensities for formal negotiation. Based on the similarity/potential symbioses between the proposed scenarios for 2050, a negotiation has been organized between the most compatible interest groups (Figure 2). With the help of GIS data layers related to topography, tenure, social makeup, and the ten systems, the participants classified the subproblems in the planning of the place into projects and policies related to each of the ten systems and proposed interventions. Based on the preferences of the interest groups, the interventions were altered to reflect the area as a "topic of negotiation" based on the TA5000 master plan. In order to approach the overall complexity of the negotiations, ten basic systems were used to classify the area and diagrams were created to represent specific projects or policies.

Participants then adapted their professional experience with similar problems elsewhere to the test case of Neve-Sha'anan and added additional interventions. In each of the ten relevant systems, these are expressed as polygons. Different colored polygons represented different projects in these systems (e.g., blue polygons represented drainage basin projects at specific locations), while dashed blue polygons represented policies (e.g., surface runoff policies) across a broader area. Lines represented connectivity (e.g., black lines represented roads in the transport system, and green lines represented bicycle paths in the green system). The title and description of each polygon describe the rationale behind the intervention. As a system of coloured polygons, the interventions abstract and translate the complexity associated with negotiations into shapes that are easily editable. As part of the workshop, participants were encouraged to learn about the opponent's strategy. Participants had access to all the material and were encouraged to adopt the polygons proposed by other groups. The teams adopted various good ideas while omitting a few less good ones. Transparency in the digital system and sharing polygons (representing such values and principles) among groups provided a useful framework for future negotiations. In general, the polygons that were most preferred by most groups were the best ones,

Figure 2
The 2nd stage designs from the two workshops

so discussions initially revolved around them. The negotiations described here shed light on how negotiation over spatial planning can deliver complex issues due to its place-based approach. In line with previous studies exploring how complex issues affect negotiation, this study uses graphic and geographic elements to conceptualize processes of negotiation, where topology plays a crucial role.

As a result of the final negotiation process (Figure 3), it became clear that workshop participants preferred policies and projects that would increase density rather than reduce density for Neve-Sha'anan. In order to further protect the neighbourhood's historical assets, the buildings already declared were approved for conservation.

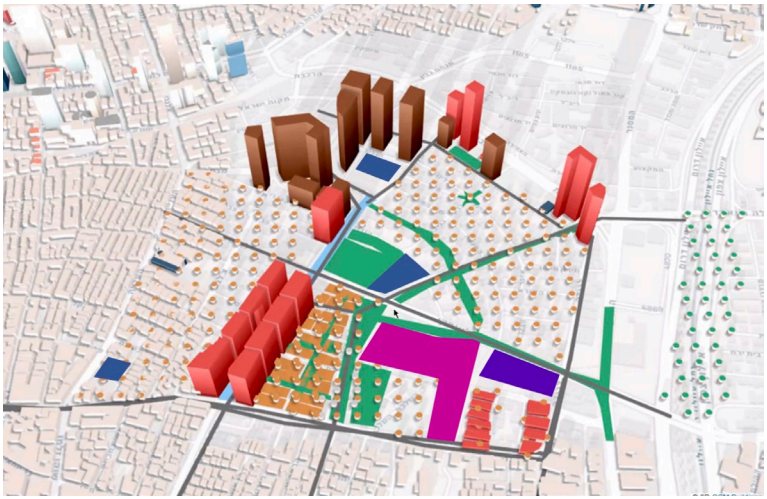

Figure 3
The final and similar design from the two workshops

Despite the various and most defined starting points, and in line with previous research that argues that negotiations with complex issues affect the ability to determine the counterpart's bargaining range, this study shed light on the characteristics of "the negotiation issue" in planning, and how technology can be used to facilitate meaningful negotiation. The geodesign negotiations toward agreements with complex planning issues are conducted digitally in an open and participatory manner, enabling both parties to learn from the "opponent's strategy" and sometimes adopt it.

Discussion and Conclusion

This study presents and compares two Geodesign workshops that explored the challenges and opportunities of deep public involvement in the digital planning process in Neve Sha'anan, Tel Aviv. This neighbourhood test case illustrates an urban fabric where institutional, planning and socio-economic factors have caused a gap between the initial vision for the neighbourhood and its development over time. In analyzing the current planning process, the study shows how the digital process promotes transparency and deep involvement of stakeholders in a regulated planning process and aims to reach a consensus that can then be advanced o implementation.

The similarities between the workshops include the participant characteristics, including the number of participants from the world of professional planning, academia and the general public, as well as their ages and genders. Similarly, the Workshops lasted two days and followed a constant flow process moving from one alternative scenario for each group to an agreed alternative. Also, despite different approaches and scenarios in planning, the final alternative agreed on in both workshops was similar. The workshops, however, differ in several ways. In the first workshop, the four original interest

groups were later divided themselves into two mixed groups: (1) BEOD+ENV (Business entrepreneurs + Environmentalists) and (2) AGOV+COM (Authorities, Government, Municipality + Community). In the second workshop, the four original interest groups were later divided themselves into two mixed groups: (1) BEOD+COM (Business entrepreneurs + Community) and (2) AGOV+ENV (Authorities, Government, Municipality + Environmentalists). At the first workshop, the main and polluting central bus station was the subject of discussion. Alternatives to demolition were explored, as well as a change of use for the building. During the workshop, it was proposed to roof the Ayalon highways in such a way as to create a public space linking the eastern and western sides of Tel Aviv. The second workshop, however, focused on the residential layout of the entire neighbourhood, with issues of preserving the original outline with densification requirements due to anticipated demographic pressures. During this workshop, the neighbourhood's main business centre was proposed (Flint Ashery & Steinlauf-Millo, 2021, 2022).

Geodesignhub enables us to facilitate planning in conflict zones while facilitating negotiation between parties. Thus, and in contrast to Winham's assertions, we can claim that negotiation complexity has three influences on digital planning negotiations: (1) Participants themselves use and offer diagrams to facilitate agreement on decisions. The structured representation of the intervention (a polygon) facilitates communication between participants who come from diverse backgrounds, but it also presents the intervention itself (e.g., a cluster of apartment houses in a specified location); (2) Complexity reduces the significance of concessions when sharing polygons, meaning agreeing on the nature and location of the proposed intervention. Digital records of activity are used to enable analytics of the complexity of decisions made in a collaborative way; and (3) A lack of sharing leads to concessions on less good interventions, thus opening the door to the implementation of "shared" interventions on which there is consensus. Using such a collaborative interface allows representatives from the community to engage in a deep and comprehensive dialogue towards implementation.

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Mapping heritage: Georeferenced Heritage Assets Applied to the Cultural Characterization of Madrid (Spain)

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Abstract
This paper describes the cultural characterization of the landscapes of the Community of Madrid using a database of geolocalized heritage assets. In this sense, the concept of cultural characterization refers to the spatial study of different attributes resulting from the interaction between the population and its environment.

The methodology used is based on a virtual model of the Community of Madrid, in which more than 9,000 heritage sites registered by the Historical Heritage Information System of the Community of Madrid since 1990 are indexed. Our work consists of analyzing these elements in their spatial concentration, both as a whole and by type and period, and then comparing them with other territorial structures. The process allows us to deduce the links that maintain certain cultural expressions with a place and their permanence over time. As conclusions, some of the results obtained are presented, such as the identification of landscapes associated with historical factory complexes in the river basins, or the vestiges of Islam in the water meetings. Likewise, a relationship between the historical configuration of the territory of the Community of Madrid and the spatial systems formed by the BIC cultural assets is advanced.

Keywords
Cultural Landscape, GIS, Madrid, Heritage Assets

Introduction

The work described here consists in the elaboration of a database of cultural assets that will allow a future characterization of the cultural landscapes of Madrid. Cultural landscapes are a type of heritage of enormous dynamism and complexity. On the one hand, they imply a quantitative expansion of the spatial scale of cultural assets, since they are generally deployed over important territorial extensions. On the other hand, they imply a qualitative change in the traditional criteria for evaluating cultural heritage, which for the first time are shifting towards phenomenological aspects related to perception and cultural meaning. These issues represent an enormous challenge for public administrations, which have to identify, value, study and manage this new category of heritage from a very different perspective than the traditional one.

This paper focuses on the adaptation work carried out on the official georeferenced inventory of the historical heritage of the Community of Madrid. The work is part of a larger collaboration with the Community of Madrid: the CULTURESCAPES-CM project, which addresses the knowledge of cultural landscapes from an integrative approach. The program lasted three years, and the work has been continued with a second program, also funded by the Community of Madrid: "LABPA-CM: Contemporary Criteria, Methods and Techniques for Landscape Knowledge and Conservation".

The region amended its Historical Heritage Law in 2013 to introduce the typology of cultural landscapes, in line with the European Landscape Convention. The CULTURESCAPES-CM program was therefore developed to innovate in techniques and methods to approach cultural landscapes, while proposing intervention criteria and strategies for their creative management. The six objectives of the program are:

1. Landscape documentation in high-definition digital models.
2. Integrative methods for the appreciation of sensitive factors.
3. Identification and characterization of Madrid's cultural landscapes.
4. Relationship between cultural landscape, society and tourism.
5. Instruments of creative intervention oriented to territorial and economic development.
6. Internationalization, training and dissemination of knowledge.

The research presented here falls under Objective 3. The identification of the cultural landscapes of Madrid was carried out through interviews with experts, bibliographic research and GIS territorial characterization. The latter process allowed a reading of the geographical continuum of the region based on the presence of remnants of heritage value. The work was based on an existing database and most of the effort was invested in the reclassification of the elements contained in it. As a preliminary step to the description of the process developed, the following section deals with the origin and characteristics of this inventory.

The evolution of the Archaeological Charter of Madrid

In 1985, as a measure against the great urban expansion and infrastructure development, a new law for the protection of the historical heritage was passed in Spain. In the same year, the Community of Madrid implemented an Archaeological Charter Plan, which systematized the prospection of its entire territory in order to locate the archaeological sites to be protected (Velasco, 1991). The procedure developed was based on preventive archaeology. The assumption that a territory might contain sites of interest was enough to declare it a cultural property. This is a method with a certain peculiarity, as evidenced by the fact that some authors have called it the Madrid Model (Vázquez, 1996). For the purposes of this article, it is of particular interest because it led to the declaration of almost 5% of Madrid's territory as a protected area.

The Archaeological Map of Madrid is the germ of what is today the database of all the immovable properties that make up the community's historical heritage (Bermúdez, 2016). At the beginning of the 1990s, this map was transferred into a

GIS-based model that has not stopped expanding since then. Beginning in 2010, a series of administrative changes were initiated that culminated in Law 3/2013 of Historical Heritage of the Community. The Archaeological Protection Area became the Historical Heritage Protection Area and, therefore, the Catalogue "became the responsibility of the entire General Directorate and was no longer to contain only information of an archaeological nature, but of all types of immobile historical heritage (industrial, ethnographic, paleontological, architectural, artistic or landscape heritage)" (Bermúdez, 2016: 419).

The resulting geographic information model is a collection of areas of very different sizes, with those of archaeological interest, as explained above, being larger than the rest. The latter, those added later, result from the delineation of a specific object or its environment, which, similar to the setting, would be "the area that surrounds [the property] and allows its proper perception and cultural understanding" (Region of Madrid, 2013, p. 11). Although each geometry has its own *raison d'être*, its attributes are subjected to a homogenization process in order to be included in the database. The disparate nature of the catalogued elements is mitigated to some extent by the classification of their characteristics into a set of common fields.

The following section analyzes the ways in which the information in the database has been treated with the aim of culturally analyzing the territory of Madrid. Although this is a critical study, it is recognized that the work developed by the current inventory of the Community of Madrid has included the "generation of criteria and working methods to be able to integrate all types of immovable assets of historical heritage" (Bermúdez, 2016: 421).

Methods

Information processing

First, a study of the density of culturally significant elements will be carried out, based on the digital inventory of the heritage of the Community of Madrid. The format of this inventory is that of a geographic information model. On the one hand, a set of geometries (areas) is represented geographically, and on the other hand, each of these shapes has associated attributes. The determination of the density of these elements is based not only on the study of concentrations, but also on the first differentiation between the type of geometry and the type of attribute. Depending on the solution adopted, the reading can vary considerably.

Geometries

Figure 1 shows a map of the 9,018 areas of cultural interest demarcated at the time of the study. At first glance, large protected areas can be seen in the basins of the Manzanares, Henares, Jarama and Tajo rivers. This is due to the aforementioned Madrid model, which was extensively covered in anticipation of what might be available. Due to its size, there is also a large patch in the west of the community, which contains the Real Sitio del Escorial. It can also be seen that we are faced with different types of surface development. Although they are all areas, some are marked with dots, because they indicate an object of reduced size; others with lines, because they include roads or canals, and others with extensive areas that extend in all directions.

Given the formal diversity, the first step is to geometrically equalize all entities. To do this, we reduce each entity to a point located in the geometric center of its area. In this way, we avoid a misunderstanding that the map produces. For example, looking at the large protected areas in river basins might lead us to think that these are the areas where the greatest concentration of elements are found. The larger areas do not delimit cultural landscapes, they define potential archaeological areas to ensure the protection of what may appear in the future, but the actual existence of the assets is not guaranteed. In addition, the same areas contain within them other smaller areas that are not visible when viewed as a whole. Figure 2 shows the conversion to points and a very different distribution from the previous one. The development of the work is based on this second map, although the negative consequences of working with point geometries are also explained in the conclusions.

At first glance, this new map shows us how the rest of the basins have as much or more importance than those that are completely delimited. We can see that the Tajo, to the east, and the Tajuña, a little further north, now stand out as having a notable concentration of elements, something that could not be seen in the previous map. Likewise, with the disappearance of the spot of El Escorial, this end of the community no longer has so much weight in the whole. From this map we can obtain a map of point densities (Fig. 3).

In this third map, we can see that there is a greater density of inventoried elements in the south, southeast and northwest. Like the river basins, the city of Madrid is

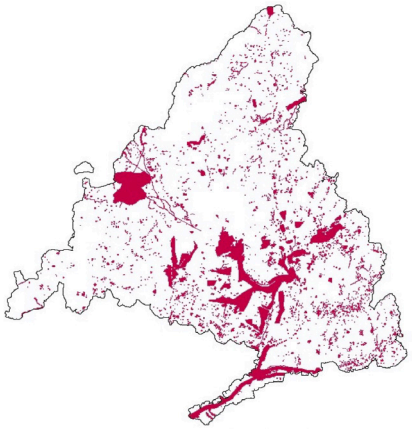

Figure 1
Map of the immovable historical heritage of the Community of Madrid (areas)

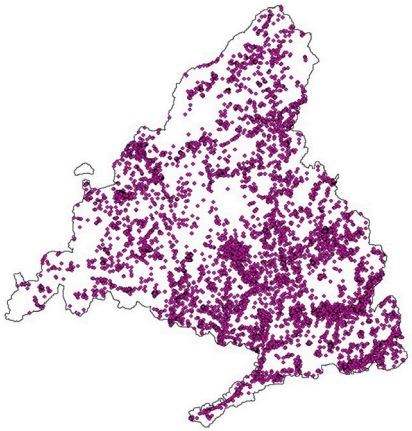

Figure 2
Map of the immovable historical heritage of the Community of Madrid (points)

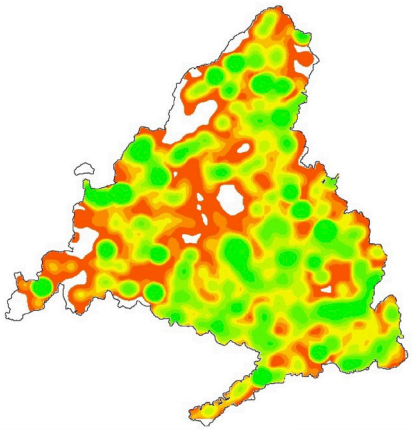

Figure 3
Density map of the immovable historical heritage of the Community of Madrid based on points

a great concentration of heritage elements, which contrasts with the great void left by Monte de El Pardo to the north. Finally, the Sierra de Madrid is also characterized by large concentrations of elements. In general, the operation carried out here is useful to see where the historical heritage is concentrated in the Community, but it does not offer a cultural reading of the territory. Having obtained a valid way of developing density maps, the next phase of the work consists in filtering the associated attributes.

Attributes

In the language of geographic information systems, an attribute is a parameter associated with a given geometry. As mentioned above, the classification of attributes developed by the Community of Madrid is the instrument for homogenizing the inventoried heritage. Thus, although an archaeological site differs from, for example, a mill both in its conception and in its demarcation, the attributes of both are ordered according to the same classes. There are a total of 11 classes defined by the Community of Madrid.

Thus, according to the above comparison, an archaeological site such as the Necropolis of Los Remedios (catalogued with code CM/0000/020) has the following attributes, based on the original classes (Table 1).

On the other hand, the attributes of a mill of industrial interest such as the Navallar Mill (code CM/0045/011) are (Table 2).

The problem that arises from such a classification is that it does not allow for easy cross-readings. Although the previous examples coincide in their archaeological interest and in their link to Renaissance culture, in the first case the culture is mixed with Visigothic, and in the second case the interest is mixed with industrial. Therefore, it is not easy to select all the geometries on the basis of a single attribute, unless it is done one by one. This is very laborious for 9,018 elements.

Interest	Period	Culture	Activity	Typology
Archaeological	Bronze, Altomedieval	Visigoth, Renaissance	Funeral Home	Residential complex, Cemetery

Interest	Period	Culture	Activity	Typology
Archaeological, Industrial	Plenomedieval, 16th, 17th, 18th centuries	Renaissance		Industrial, Services

Table 1 (above) Attributes of Necropolis of Los Remedios

Table 2 (below) Attributes of Navallar Mill

Therefore, the second phase of information processing is to rearrange the classes. In order to make the attributes easier to handle, each original class is broken down into the descriptions provided by the Community of Madrid. For example, it can be seen that the original class "Culture" has 6 attributes among the 9,018 elements: "Rock Art", "Megalithic", "Islamic" (including Mudejar), "Christian" (including repopulation), "Industrial Revolution" and "Civil War". Six new columns are then added to the table, one for each of these. This changes the attribute from descriptive to binary: for example, if an element fulfills the conditions for "Christian" and "Industrial Revolution", a YES is entered in that column, and a NO in the others that do not. The original classes are rearranged (Table 3).

This reorganization of the attributes optimizes the filtering by cultural characteristics. Thus, by selecting and studying the density of points based on a given property, the actual characterization work begins. As this is still in progress at the time of writing, only a few cases already studied can be shown. Figure 4 shows the spatial distribution of different heritage elements. From left to right, in the first case we can see how the Civil War heritage follows the spatial development of the battle front. In the second, we can see the relationship between the Islamic heritage and the rivers of the municipality, and in the third, the relationship of the industrial heritage with the rivers and the urban settlements.

Discussion

The designation of historical heritage as cultural property is more than a mere designation. The different nature of the elements included in the original catalogue of the Community of Madrid leads to very marked formal differences. In addition, the way in which their characteristics are classified is typical of a traditional inventory, more descriptive than operational. It is the treatment of geometry and attributes that leads us to optimize filtering and read the information homogeneously. The mapping of cultural assets is essentially different, since its purpose is not to describe an element, but to organize it in relation to others. That is, it is not so much the element itself that is of interest, but the spatial distribution of the whole. It is in the relational aspect that cultural property finds its *raison d'être*.

These relationships between elements are the basis for establishing cultural readings of a given space. By transforming the original inventory into a relational model, studies can be initiated that lead to distinguishing spaces based on how they reflect historical activities or cultures, that is, "searching around the world to identify landscapes that have emerged from, are associated with, or represent the great cultures. " (Fowler, 2003, p. 56).

Table 3
Reorganization of original classes

ORIGINAL CLASS	NEW CLASSES
Activity	Farming Assistance Commercial Shows Industrial Funeral Home Military Religious Residential Services and infrastructure Transportation Others
Culture	Rock art Megalithism Islamic (including Mudejar) Christian (including repopulation) Industrial Revolution Civil War
Period	Prehistoric Romano Medieval s. XVI s. XVII s. XVIII s. XIX s. XX s. XXI
Interest	Archaeological Architectural Artistic Ethnographic Industrial Historical Paleontological Landscape
Typology	92 new classes.

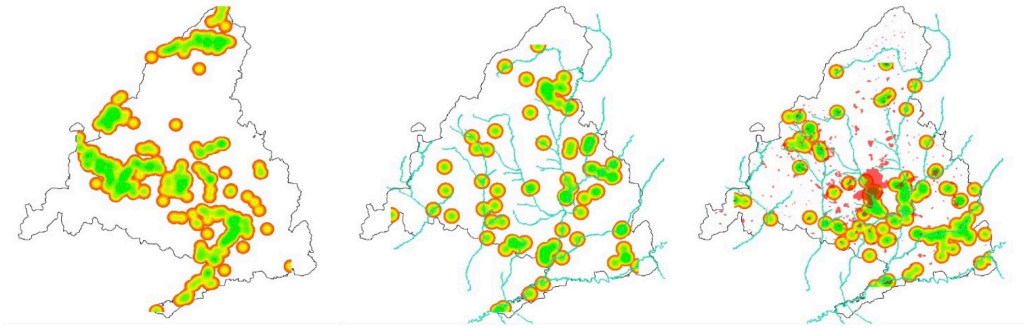

Figure 4
Historical heritage density surveys, from left to right: Civil War-related elements, Islamic-related elements, and industry-related elements

The proposed model, although it works correctly in terms of selection by attributes, offers certain problems in the geometric treatment. The point, in its state of zero spatial dimension, paradoxically helps and hurts the study. On the one hand, it represents a quick and effective way to geometrically standardize a series of areas, which makes it possible to ignore the problems derived from the peculiarities and motifs of each one. On the other hand, it eliminates the essential characteristics of these forms by reducing them spatially. An example of this dysfunction can be seen in the historical roads: the forms of linear development have a cultural influence that, although not very extensive, is fundamental to the structure of the territory. The correction of these deficiencies is more complex, since it involves recognizing the real spatial condition of each of the inventoried elements.

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0003
TEACHING ACROSS SCALES

Teaching across scales: learning to design in the context of the dynamics of landscape form and design

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Abstract
Teaching in landscape architecture takes place in real time and real place, with the studio as core of the program. In this paper I will focus on teaching at the Master's level in European universities and design schools. The main research question is: how does the concept of scale play a role in teaching landscape architecture in the Master's? The research methods are mixed and are based on the principles of case study research. The research material is first of all textbooks in landscape architecture, complemented with my own experience in different schools and programs, publications from others and experiences from colleagues. The paper is organised in two main parts. The first part elaborates on the concept of scale in landscape architecture, the second part on the use of scale in teaching in design studios. In the conclusions I will emphasise the conceptual approach of design teaching based on fieldwork, visual thinking, drawing and presenting; in all teaching modes, scale plays a key role but is mostly implicit. In teaching design, size, scale and level are related with specific design means at each level.

Keywords
Landscape architecture, master's education, levels, design means, design teaching

Introduction

The concept of scale in landscape architecture

Core of learning and teaching about scale in landscape architecture is that at different scales there are different elements, structures and processes. Let's take the example of forestry as a type of land use. On the regional scale the forest is a big green mass of trees, the choice of the location is mostly defined by the growing conditions of soil, water, climate, in most cases the context of the project. At the local scale parcelling and forest management play a role while at the intermediate scale the boundaries, the internal structure and the water system are at stake. The three scales are related because of the site, the species of trees and land use but at each scale the human use and perception is different; at the regional scale it is the property of the owner, at the local scale the people who work in the forest and those who use the forest for leisure are determining human use of the forest. At the intermediate

scale, opening up, internal road structure and water system define the forest. As an object of planning and design, the forest requires different interventions at different scales that are not always related. Use for leisure and day-to-day work in the forest should in some cases even be separated because they cannot be combined.

So, sometimes the land use at a certain scale can be related to a different scale but often not. In the design process the organisation of different types of land use is part of the program/assignment, the integration of levels is a key issue. The teaching across scales in landscape architecture is one of the characteristics of landscape architectural design. From the very beginning on in any program in landscape architecture, the perception, thinking and working on different scales is part of regular teaching practice not only for fieldwork and the studio but also for lecture courses and seminars on history, theory, construction and visualisation.

In my own education, we have always been taught with the idea of scale in the background, not only in the sequence of studio's (from garden to landscape) but also in any of the studio's the different scales were always important but mostly implicit. When in 2000, I started to teach at an architecture school, I noticed that architecture students and architects often lack the competence and insight of working at different scales and thinking in processes, in one project.

Scale as part of the curriculum

At an academic level teaching in the BSc is focussing on learning 'how & why', while in the MSc on 'why & how' focussing on the relation between research and design. A common didactic approach in most programs is to start in the BSc with a small garden and house, park or plaza, then move to a larger park or landscape and finally move to the regional scale; working from small scale to the regional scale (Birli, 2016; Toorn, 2022). In the MSc, the program comprises three semesters and in most cases the main studio's focus on rural, urban or regional landscapes. The teaching approach from small to regional scale seems to be a tradition. As far as I know there is no systematic evaluation on the basis of student work, evaluations and teacher's experiences, what works best or is most effective.

Methods

Goal, research materials, research methods

There are few – if any – publications on teaching 'scale' in landscape architecture. In this paper, I will use my own teaching experience in different schools and programs to describe and explain how I use 'scale' in teaching. Goal of the research is to gain some insight into the backgrounds of teaching scale in different modes of teaching landscape architecture. The research materials are, next to the textbooks used in landscape architecture, my own materials from studio's, fieldwork, seminars supplemented with publications on these subjects. The research methods are mixed and are based on the case study approach using theory, practice and publications from others (Zeisel, 2006).

Scope and outline

'Scale' in landscape architecture has many aspects and applications in the design process (Blumenfeld, 1953; Burt, 2003). In this paper I focus on the dynamics of the form of the landscape and the design process;

the landscape as time/space continuum. The paper is organised in two main parts. First part elaborates on the concept of scale in landscape architecture, the second part on the use of scale in teaching in design studios.

Terms and definitions
Even though teaching across scales is basic and fundamental to teaching in landscape architecture in general, it is taught in various ways, the terms and definitions are diverse and the didactics can vary considerably. Below, a short overview of terms used in this paper.

Landscape architecture: The ECLAS definition
The space/time continuum: In landscape architecture there is no space without time and no time without space. We view that as a continuum. In this article the space/time continuum is defined by levels; the level of element, structure, process. Together they characterise the dynamics of landscape form and design. Rhythm is an example of the space/time continuum and is a frequently used design principle.

Teaching modes: Teaching modes in landscape architecture are studio, lecture course, seminar, excursions & fieldtrips, periods of practice.

Scale: Scale is relative size or time period and is based on hierarchical principles. In landscape architecture this relative size can refer to maps, to human size and dimensions, to objects and to time range such as short, middle and long term. Scale is a mental construct, it cannot be seen and can also be considered as an abstraction (Swyngedouw, 2004).

Level: All projects in landscape architecture are always based on the landscape as space/time continuum. It means that scale is not only related to space but also to time; I use the term 'level' for space/time, both in my teaching and my research, I distinguish three different levels; element, structure, process. While 'scale' is referring to the landscape/site, 'level' in landscape architecture is related to spatial & temporal scale and the boundary of a project.

Design means: Comprise design principles, types used and materialisation. At each level design means can be distinguished but they have a different content at each level.

Results
What is 'scale' in landscape architecture?
'Scale' is one of the terms that is used in landscape architectural education from the very first day on, both in Bachelor's and in the Master's. The Oxford dictionary gives three descriptions for 'scale' as noun; for landscape architecture only one is relevant: (…) *The relative size or extent of something*. The relative size can be compared to people; the human scale, or to other objects (Haak, 2005). Not all phenomena and entities in the landscape are related to scale; there are also scaleless features such as colour, unity, water. These are always qualitative phenomena and form a significant factor in design. There are also specific terms that refer to scalelessness such as 'transition' but also 'entrance'. On the beach overlooking the sea without seeing any ship or other human intervention, is typically an example of a scaleless space because there is no reference to elements or human features.

The term 'scale' in different textbooks on landscape architecture; what is the use of the term 'scale' in some American/English language textbooks, regularly used in schools. The choice in chronological order; Simonds, 1961; Lynch, 1974; Laurie, 1976; Simonds, 1997; Bell, 1999; Motloch, 2001; Bell, 2012; Holden & Liversedge, 2014 (fig. 1).

Some conclusions on the term 'scale' in the analysed textbooks: None of the textbooks lists 'scale' as subject in its table of contents; Most textbooks do include the term 'scale' in the index, although some refer only to an illustration; Most of the textbooks do not have a glossary; of the three that do have, two do not include 'scale'. Only Motloch (2001) defines 'scale' in the glossary.

If an outsider would read these conclusions, the most likely remark would be that apparently 'scale' is not so important in landscape architecture. However in my view there is another reason for so few attention to 'scale'; there is no doubt that all of the authors would rate the concept

Figure 1
A comparative analysis between eight textbooks on the issue of 'scale'

Comparison of the term 'scale' in textbooks on landscape architecture, in table of contents, in index, in glossary

Simonds, 1961 *Landscape architecture — The shaping of man's natural environment*	**Lynch, 1974** *Site planning*	**Laurie, 1976** *An introduction to landscape architecture*	**Simonds, 1997** *Landscape Architecture — A manual of site planning and design*	**Bell, 1999** *Landscape — Pattern, perception and process*	**Motloch, 2001** *Introduction to Landscape Design*	**Bell, 2012** *Landscape — Pattern, perception and process*	**Holden & Liversedge, 2014** *Landscape architecture — An introduction*
· table of contents							
- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents	- 'scale' not in table of contents
· index							
- in index: 'scale induction' in: illustration on p. 113	- in index: scale, proportion and, 192-194	- in index: scale, 133-134; affected by paving materials, 143; for children, 134	- in index: 'scale' p. 145	- in index: scale not in index	- in index: scale, 115-116, 143-144, 237-238, 354 of concern, 25, 33 of economy, 25 exaggeration, 144 hierarchies and fractal geometry, 156 independence, 156 and pedestrian traffic, 163 size in relation to person, 143 and viewing distance, 116	- in index: scale 15, 29, 56, 105	- in index: scale not in index
· glossary							
- no glossary	- no glossary	- no glossary	- no glossary	- glossary: no 'scale'	- glossary: Size in relation to the human or some other unit of measure. The scale of a space includes its size in relation to the size of its context, and its size in relation to the observer.	- no glossary	- glossary: no 'scale'

of scale in landscape architecture as a key concept but it is implicit in most texts, projects and illustrations in the textbooks.

Size, scale and level

The distinction between size, scale and level is fundamental in landscape architecture (Lynch, 1974; Selman, 2006; Batty, 2008). Size can be measured, either in the field or from the map, or GoogleEarth. Scale in landscape architecture is used in different ways: the cartographic scale (Lenzhölzer, 2010), changing scale means also changing legends; the human scale (Haak, 2005), size in relation the people (Hall, 1966); scale of elements or structures in the landscape in relation to other elements, for instance parking places related to size of cars; scale in time/space, speed of movement defines also the use and experience of the landscape (Jellicoe, 1960; Parkes & Thrift, 1980).

Levels; the time/space continuum. In the landscape as object of planning and design, we consider the landscape as a space/time continuum. It means that we cannot see and experience space and time separately (Craig, 2001; Lynch, 1974). The term 'level' is used to refer to this space/time continuum and refers not only to the spatial scale but also to the temporal scale (fig. 2). Generic spatial scales are: local, regional, national scales. Generic temporal scales are short term, middle-long term, long term. The three levels refer also to a generic distinction in the project; the level of context of the plan, the plan and its internal structure and the elements within the plan that are either part of the structure or not. The relation between time & space is one of the characteristics of landscape architecture and determines the dynamics of landscape form, use and design (Zevenbergen et al., 2008). Rhythm is a well-known example of space/time continuum and frequently used as design principle in landscape architecture (Spirn, 1988). Rhythm is a typical example of space/time experience in the daily living environment. Knowles (1981) in his study on the sun shows the influences of the solar rhythm on the daily environment. Rhythm is the repetition of visual elements to establish a pattern. Similar to music, rhythm invites in developing a tempo in design, enticing users with a variety of intriguing variations (Craig, 2001). Christory (1994) gives an interesting example of how technical road management is influenced by diurnal and seasonal rhythms. By incorporating rhythm into design, you can maximise the impact of the visual experience and create a sense of unity and harmony. The most common rhythm in landscape architecture is linear plantations of trees at a regular distance along roads or other places. However there are also other examples; Knowles (1992) analysed the rhythm over time of the landscape development in a case study in Ohio (US) by a comparative analysis of a series of maps.

levels; spatial and temporal	*short term*	*middle-long term*	*long term*
local scale	***level of element***	-	-
regional scale	-	***level of structure***	-
global scale	-	-	***level of process***

Figure 2

The landscape as a space/time continuum represented as levels. In the core activities in the design process – perception, analysis, synthesis – levels play a key role because at every level the content is different. At the level of element, material form and design materials play a role, at the structural level the water system and the road system, at the level of process the landscape as a system is the heart of the matter

level of element	*level of structure*	*level of process*
elements:	existing landscape structure (rural,	processes related to the existing
entrances	urban, infralandscapes):	landscape:
bridges	geomorphological patterns	as a natural system
intersections	topographic patterns	as a socio-economic system
buildings	natural water patterns	as a cultural system
settlements	form & function of road and water	systems and forces:
farmsteads	systems:	natural forces
image, form, construction	ring roads	socio-economic forces
relations between elements	axial systems	cultural forces
image <-> form	grid systems	strategy for the landscape
form & viewpoint	drainage and irrigation	development in the long run:
design materials:	systems	direction of development
ground	relating designed structure to	organisation of main types of
water	structure of the existing landscape:	land use
plantation	insert	densities of use
pavement, hardening	adapt	
transitions	change	

Figure 3
Content and some examples of the different levels used in landscape architecture

Scale in teaching design in landscape architecture; the studio

Teaching design in landscape architecture is always related to scale but that is mostly implicit and rarely taught explicitly. In any new project or assignment, a first step is to distinguish between project area and context, defined by the boundary. Inside the boundary we find elements, structures and processes, of which some extend into the context, the study area. Levels comprise both space & time and have a different content for each type of project; for an urban park or a landscape plan for a region (fig. 3). It means that scale is always related to the landscape, while levels are related to the project and the design process. Scale is not necessarily related to the project but levels are.

Learning to distinguish levels. Distinguishing levels is the start of any project of assignment. One of the elementary activities in teaching design in a Master's studio is the distinction of levels. Levels are related to the specific project and comprise space & time. In defining the boundary of the project, the project area and the context become clear. The area within the boundary has an internal structure and elements. The context is the domain of processes that influence the project area and the internal structure, such as the geological material, the water system and climate.

Scale plays a role in all teaching modes in landscape architecture. In fieldwork the focus is on learning to see and systematically analyse the form & use the landscape (Fekete & Toorn, 2021). In seminars the main issue is learning to research in the context of design. For this paper I will focus on teaching in the studio.

Scale in the studio; learning to design

The studio – in French 'atelier' – is the core of any program in landscape architecture; in most cases lectures and seminars are taught in the morning, the studio in the afternoon. The studio mimics the work in practice; in general a studio will follow the same steps in the design process of perception, analysis, synthesis. Note that these steps are sequential but do also include feedback. So, during a design process from assignment to plan and realisation, this sequence is repeated many times resulting in cyclical design process. The didactic principle of learning and teaching in the studio is learning in real life and

real time by means of learning by doing (Schön, 1985; Latz, 2008). Usually the Master's is built up in the three semesters and comprises for instance; semester one (urban park as part of the urban landscape), semester two (new urban extension, with historical elements), semester three (landscape plan for the regional scale) (Holden, 2009; Vroom, 2014). In the BSc, the assignment – or the 'brief' – is described in the form of a problem statement ready to start immediately with the design problem. In the MSc, the assignment is more generally formulated for instance as a question on what landscape development. The students themselves have to define the assignment into a design problem and design approach.

The assignment / program; problem analysis and defining levels; what is the design problem?

Problem analysis; what is the design problem and at what level is the core of the problem located (Rowe, 1987)? Taking the example of an assignment for the improvement of an urban park because the park is poorly used according to the municipality, the problem analysis could result in the creation of a new element – say a children's playground – but it could also lead to a conclusion that the organisation of different activities is poorly done or that the park is not easily accessible from the neighbourhoods around the park. All three problem definitions play a role on different levels and will result in a core level where the problem is located (fig. 4). In case of a new playground, it is the level of element, for the organisation of different activities in the park the level of structure is needed and for the access, the level of process in the context of the park is essential. After defining the problem, the content of the levels can be defined. First the main level which then becomes the central issue, then there is a level of context and the level of materialisation.

levels & problem definition	*children's playground*	*organisation of activities in the park*	*access to the park from neighbourhoods*
level of element		-	-
level of structure	-		-
level of process	-	-	

Figure 4
Problem analysis and defining levels for an assignment of improving an urban park

The scale of the landscape / site

Since in landscape architecture, the existing landscape before intervention is always a point of departure, the scale of the site is a first issue. Let's take two different examples; an assignment for an urban plaza of ±150x150 metres or one for a part of a river valley of say 10 kilometres. The scale of working on the urban plaza is somewhere around 1:500/1:1000. For the context of the urban plaza, 1:5000/10.000 will do, while for details the 1:50/1:100 scales will do. For the river valley project, the scales are about ten times larger. Note that the smallest scale remains always the same because it represents the human scale.

The scale of the project, related to the design process; levels of intervention & basic activities/operations

The basic activities/operations during the

design process are perception, analysis, and synthesis. They are applied at each level. During the whole design process feedback plays a key role, making the whole process recursive. So, through the distinction of levels, scale is part of the design process at large (fig. 5).

scale as part of the design process	*perception*	*analysis*	*synthesis*
level of element			
level of structure			
level of process			

Figure 5
At each level, the basic activities/operations are applied. Repeating these basic activities at each level represent steps in the design process while feedback makes the process recursive

Perception is a general term for the distinction between looking, seeing and observation (Bijhouwer, 1954; Deffontaines et al., 2006; Ferguson, 1999; Vroom, 2014). In perception the landscape is seen as an object of planning and design in which the relations between landscape form, functioning and use are analysed. In one of the first steps during the problem analysis, the perception of the problem is a key issue (fig. 6). What is the viewpoint as basis for a design approach? Here questions of the relation between people & environment, between nature & culture and between conservation & development have to be dealt with at different levels of perception. Working out will result in first strategic concept for the landscape development in the long run. This first strategic concept is the basis for a first field visit in which form, function and use of the existing landscape are analysis on site. Working out this first fieldwork, forms the basis for the second

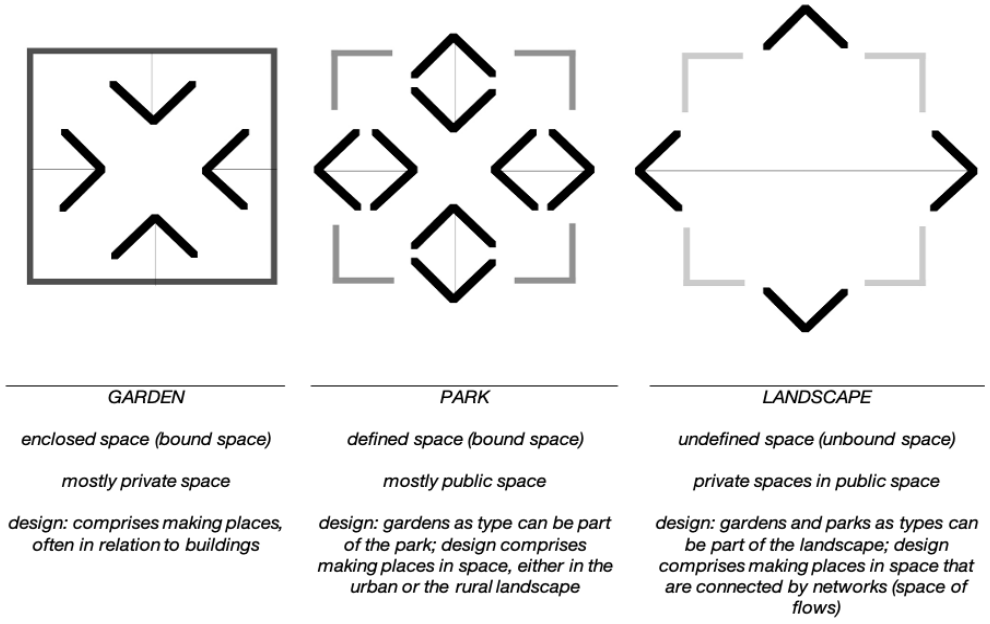

Figure 6
Garden, park, landscape as basic problem types in landscape architecture in relation to the scale of the landscape as problem space

concept on the level of structure. In this concept the relation between the structure of the existing landscape and the re-structuring on the basis of the program are conceptualised; how does the designed structure relate to the existing structure? The structural concept is the basis for a second field visit in which the material form of the landscape forms the focus. Design materials ground, water, plantation and different forms of hardening, pavement are the main focus. Working out of the fieldwork should result in a first concept for the materialisation of form of the landscape (Toorn & Have, 2012: Toorn, 2022). All together, the step of perception results in three first concepts, a first investigation into the site in relation to the program and a number of research questions (fig. 7).

Analysis; what are the forces behind the form? In the analysis, the functioning and use of the landscape as a system is investigated. What are the forces behind the form of the landscape; forces imposed on the existing landscape and how they relate to the interventions proposed by the plan? The landscape as a system comprises different forces; natural, socio-economic forces and cultural forces. At each level they work out differently that can be represented in a matrix. Knowledge and insight into the functioning of the landscape as a system is needed in all plan making because in landscape architecture there is always an existing landscape as point of departure.

Synthesis; design interventions at each level. In synthesis the are distinguished as levels of intervention (fig. 7). How can program, site and design concept be integrated into a new meaningful order? All

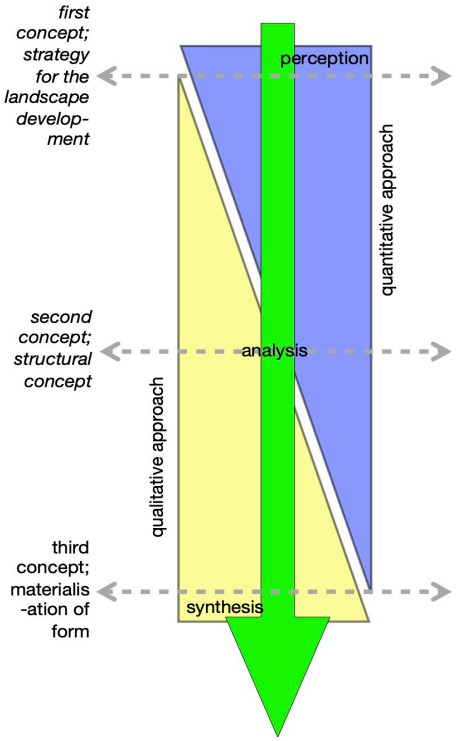

Figure 7
In synthesis, program, site are brought together in a new organisation of the landscape; the integration of site, program and design interventions by integrating the different levels of intervention into a meaningful order. This bringing together is based on a concept and conceptual thinking and is done in small steps; first a strategic concept is developed that defines the landscape development in the long run, then a structural concept is developed that defines how the new structure relates to the existing landscape structure and finally the material concept that comprises the materialisation of form is developed. Feedback makes the process cyclical; note that in the diagram, the feedback is left out to make it more readable

work in landscape architecture is done in projects, both in practice, research and in teaching. The project is defined on the basis of an assignment, a commission or a question of a client. The project defines the boundary and the time schedule. The boundary of the project can be a physical boundary for instance a fence around a park but it can also be an administrative boundary (property, municipality, province or other) which is invisible in the field. The boundary defines the size and implies a basic problem type. In the synthesis, the integration between site & program, between the different levels, between conception & analysis, takes place (Toorn, 2008). While analysis is based on explicit analytical methods and techniques, for synthesis there are no explicit and defined

methods but is based on a conceptual approach (Rowe, 1987). In the design process at large, site & program, research & design, the different levels of intervention are integrated and transformed into a new meaningful order based on conceptual thinking.

Discussion

Scale

In science, four different types of scales are distinguished; nominal (just numbering), ordinal (numbering in a ranking order), interval scale (ordering and ranking based on the same intervals) and ratio scales (absolute scales having a zero point as starting). In physics the term 'order of magnitude' is used to describe scales in nature that range from nano to stellar systems in astronomy and is based on mathematics (Havel, 1995). It is an exponential change of plus or minus 1 in the value of a quantity or unit. The term is generally used in conjunction with power-of-10 scientific notation. In architecture, scale is mostly referring to human scale. In landscape architecture the term 'scale' is usually referring to maps and cartographic scale, to human scale or to other elements in the landscape and time.

Planning and design

The distinction between planning and design is not a matter of scale but is related to the ongoing development of the profession/discipline and the demands of society. The work of landscape architecture diversifies, is deepening and widening also due to new demands of society. The distinction is not so much related to scale – planning, design and management play a role at all scales – but to assignment, type of design problem and problem analysis. In landscape architecture there is no planning without design and no design without planning; the same goes for management. So, I see planning, design and management not as 'sub-disciplines' of landscape architecture but as part of any project, although with a different focus. Any project has planning, design and management aspects that come together in the design process.

The time/space continuum

In geography, one of the problems in the definition of scale and making it operational, is that even though the relations between time & space are always there, they are not always causal relations (Herod, 2003; Marston et al., 2005). In the network approach of human environments, scale is not a major issue but the processes, structures and relations are emphasised; the digital networks are also scaleless. Use of the human scale is specific for use in design disciplines. Note that in geography the time/space continuum raises questions in its causal relations. Harvey (1968) draws attention for the scientific weakness of the time-space concept in geographical research: *The connection between the temporal and spatial (…) usually remains undefined, although there is no doubt that several traditional methods of handling time-space transformations are intuitively appealing. It would be helpful, however, if temporal and spatial elements in any geographical problem could be connected in some more formal manner.* It means that the time-space continuum often implies a causal relationship but that is not always the case. This is also relevant for landscape architecture both in the analysis of the landscape as a system and in plan making.

Conclusion

Scale in landscape architecture is multi-facetted phenomenon that plays a key role in teaching, practice and research. It is largely implicit and there are almost no publications on 'scale' as such.

In the eight textbooks, in my own education and now in my research and teaching, scale was a key issue but not dealt with and not taught as such. Teaching in landscape architecture takes place in real life and real time, where scale is always at stake but is mostly implicit. Next to the studio, teaching of scale takes predominantly place in fieldwork where learning to see the landscape at different levels in time and space and how scale influences form, functioning and use.

Scale in landscape architecture comprises both time and space, that results in the dynamics of landscape form, use and design. We use the term 'level' for the time/space continuum. Core of learning about scale in landscape architecture is that at different scales there are different levels; elements, structures and processes. Sometimes they are related but often not. In the design process, the integration of levels is a key issue in the synthesis. The distinction between different levels is a helpful means to analyse the form of the landscape in a systematic way.

As in cartography and mapping, any map on a specific scale has a special legend. In fieldwork, students learn to see how the same site/landscape can be related to different scales that result in different forms, functioning, use and meaning. Scale is a mental construct that helps students to come to grips with the (dynamics of) form and use of the landscape.

In daily practice but also in teaching, scale is always related to size and level. This triplet of size, scale, level is used in all phases of the design process. In teaching it should be built up in a sequence that begins with the physical scale (map & legend). The second step should focus on the human scale (space and daily use) and finally time/space (speed of movement and experience of the landscape). Scale is also related to the speed of movement; at different speeds of movement, the experience is different. In our culture of mobility, the design of spaces of flow is part of most projects. Core of design of spaces of flow is 'design speed' that creates different experiences. Part of the design problem is to integrate these different aspects.

The distinction between different levels applies to the main types of thinking and working in the process of plan making; perception, analysis, synthesis. They are part of a cyclical design process in which feedback defines its iterative character.
In landscape architecture education, three aspects of scale can be distinguished. First of all in building up the program, from garden to landscape or from small scale to the regional scale. Secondly, scale is fundamental in any project in the studio, in fieldwork and research, we use the distinction between levels. Finally, scale is also part of the personal development of the student, a cognitive process learning to see the different scales in one site/landscape and the embodied experience of the landscape in distance, elevation, materials and spaces.

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Scaling up, scaling deep: Negotiating scales for productive urban landscapes

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Abstract
This paper disseminates pedagogy and detailed methodology for a scale-based approach to landscape design towards productive and resilient solutions. The site chosen is around the Sabarmati, a seasonal and severely engineered river that passes through Ahmedabad – Gandhinagar area in Western India. A stretch of the river edge was identified as a site that can be developed as a public space, sorely needed in the growing cities. The site consists of remnants of the degraded ravine, acres of farmlands, pockets of urban villages, and a river bed contested with illegal sand mining - all of which are in the face of change from urban pressure.

To reflect on ecological processes and environmental concerns related to the site, a framework was necessary to foster a comprehensive understanding of landscape scales and operations connected outside the area. As a result, a methodology for module-based teaching was created to help students grasp the connections between the larger environment, the site, and other interactions on a human scale.

The teaching modules progressed from large to small - XL, L, M, and S - and each contained a unique set of questions pertaining to that scale. Each module equipped students to engage with the complexities of the site through larger and smaller lenses. The authors argue that based on the results of the exercises, this approach has enabled weaving sensitive connections across scales, and interventions have largely reflected on both- ecological and social dimensions. Students' survey results and design outcomes will be highlighted in the paper, revealing the approach and module where students need more time.

Keywords
Productive landscape, public space, pedagogy, scales, landscape futures

Introduction - Unit Context
The studio's chosen site (Figure 1) lies in the peri-urban area around the Ahmedabad - Gandhinagar metropolitan area along the edge of the seasonal river Sabarmati in Western India. The Sabarmati River basin falls in the hot arid region in the mid-southern part of Rajasthan and Gujarat, with a total catchment area of

21,674 sq.km., out of which 18,550 sq.km. lies in Gujarat state. It is primarily a rainfed river, and the soil type allows moderate to severe erosion on the edges to create ravine-landscapes with deep gorges.

Over time, the catchment area has reduced due to rapid urbanisation, and the river stays dry most of the year. With the vision to create a permanent riverfront around Ahmedabad city, the landscape was engineered to borrow water from the Narmada irrigation canal. Today, the central part of Sabarmati, around Ahmedabad, 11.5 km in length, in the heart of the city, has been developed as Sabarmati Riverfront development (Figure 2: right). Further along, the stretch of Sabarmati towards the north, an extension is planned as a part of phase 2 development. Similarly, Gandhinagar has also developed stereotypical public projects along the river, like Sarita park (Figure 2: left) and plans to implement an Ahmedabad-like riverfront project in the near future.

Large swaths of vacant public parcels along the northern part of the Sabarmati river lie in waiting for the opportunity to be developed. Figure 3 shows images of the terrain and the site's patches along the river's unbuilt edges. Several anthropogenic activities and disturbances along the floodplain include mining, sewage dumping, and significant *Prosopis juliflora* spread. Without intervention, it poses a long-term threat to the land and the remaining native species.

Observing the urban design projects constructed along the river reveals a methodological gap in reading the landscape scales. The conventional design process often begins and ends at the site, disentangling several networks, flows, and operations vital to a resilient approach. And since the site development plans are in the works to create public space proposals, the studio units placed students on demonstrating a project that balances aesthetics, functionality, and ecological value.

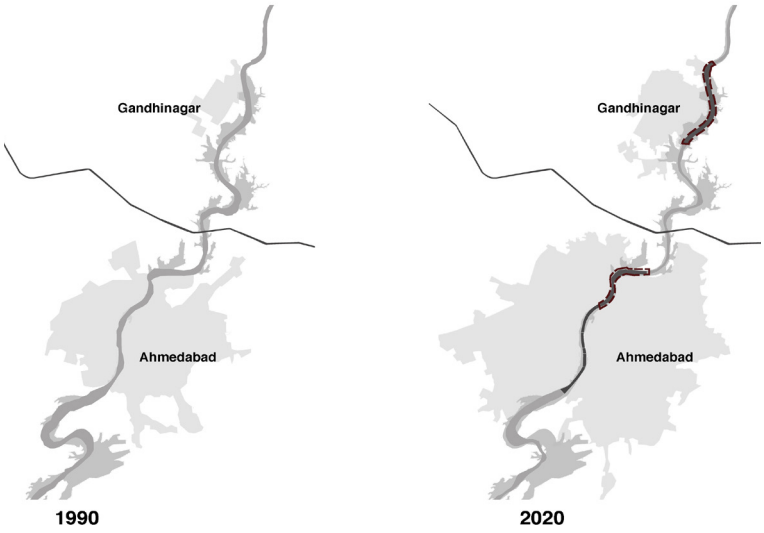

Figure 1
Growth of cities and context of sites chosen for studio units

The question then was, as human and environmental phenomena occur at very different scales, how to develop appropriate solutions in the scale of perceptible landscape design, being mindful of larger ecosystem health. It necessitated a methodology that accomplishes two key goals:

1. Move beyond stereotypical urban park development with intensive lawns and pockets of ornamental species that have become a common approach to development and bring a paradigm shift in design thinking of urban landscapes that acknowledges systems and native ecology.

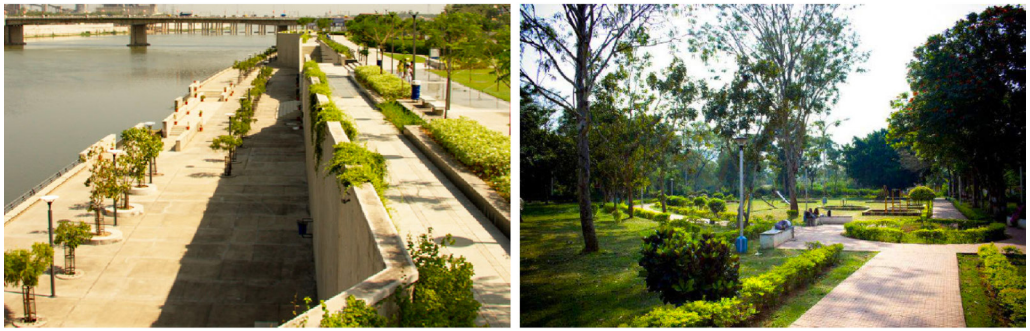

Figure 2
Left: Sarita Park in Gandhinagar, on the edge of Sabarmati, shows flattened terrain and stereotypical urban park development with common urban trees. Right: Sabarmati riverfront development in Ahmedabad

2. Develop contemporary spatial solutions that can consider the systems at various scales, from minor details of plantings to the larger context of the surrounding neighbourhood or city—and build from a holistic understanding of the relationships between different elements and systems at play.

For this, we developed a pedagogy demonstrated through two studio units- Eco-Warrior and Water Plus at CEPT University. The unit Eco-Warrior was conducted with Bachelor of Urban design students in 2020, 2021, and 2022. The Water Plus unit was conducted in 2021 and 2022 with students of the Master of Landscape Architecture. The sixteen-week-long semester for both units was programmed into three modules through a scale-based approach. The pedagogy developed in 2020 has continued to evolve while maintaining its fundamental premise of designing across scales.

Methodology- Scaling up, scaling deep

The methodology follows linking design thinking from macro to micro in three modules and then back to the macro scale within 16 weeks (Figure 4). Working around the same site, Eco-warrior focuses on a productive and performative landscape, and Water Plus focuses on interventions around water-holding areas.

In the first module, students look at the river as a system and understand its relationship to the built fabric. At the XL scale, water flows, networks (ecological or infrastructural), city systems, or patterns (of usages or vegetation) become crucial. Students often look at multiple parameters

Figure 3
Images from one of the sites along the Sabarmati. Left: Degraded embankments, scattered Prosopis and mining dominating the floodplain. Right: Historic ravines run through the site. Also seen is the dominance of Prosopis and the characteristic grain of vegetation. Site images documented during July- August 2022 at Gandhinagar riverside

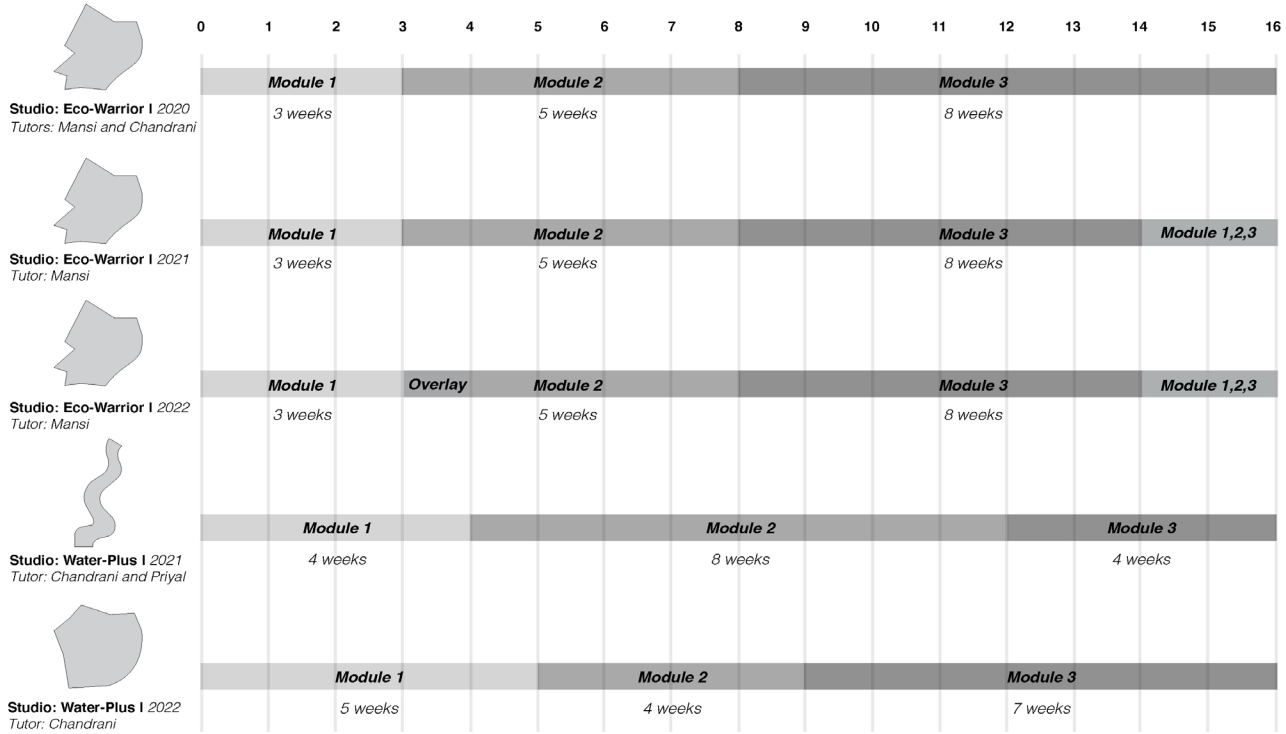

Figure 4

Modules vs timeline of Eco-Warrior and Water Plus studios taught in 2020, 2021, and 2022 showing different adjustments over the years

to build a vision plan at the XL scale in relation to the challenges observed at the site.

The second module, or the L/M scale, involves developing a detailed design aligned with the vision plan. Seeing and reflecting on the scale at the city level enables a better understanding of challenges, vegetation patterns, and knowledge of comparable circumstances throughout the riverbank. The design decisions made at this scale should support and validate the concept chosen by the student. And it is at the S scale that site-specific design solutions are further resolved and tested for their performance across scenarios (Figure 5).

In urban design, since students observe landscapes for the first time, the XL module output varies widely. They could range from conceptual strategies, such as connecting disparate ecological ensembles, to water conservation approaches at various scales. Projects also include more typological approaches to bring ecosystem services from the site into the urban fabric. For example (Figure 6) shows a project (Forms of Bio-architecture) that developed a series of visual and spatial cues through specific architectural forms that provide a range of ecosystem services - in the site and beyond. The student's first evaluation of terrain, ravines, and missing urban linkages catalysed further into the idea of bridging and making visible dispersed places through architecture for ecological regeneration in module 1.

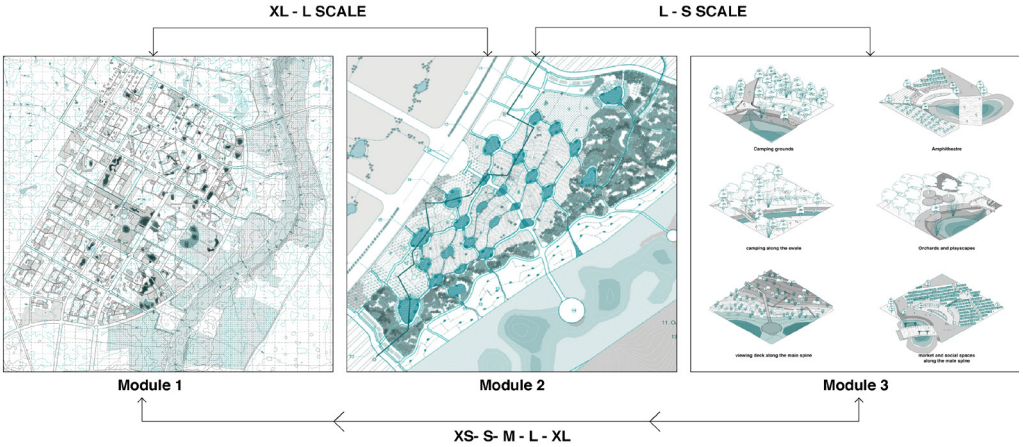

Figure 5
Modules showing scales of interventions from vision plan at XL, site-specific design at L scale and details, vegetation, at S scale, all of which cohesively stitch together towards a concept of Water-full: Slow, Spread & Seep- strategies at varied scales for water re-charge (credit: Hariyali Gajera, 2021, Unit Eco Warrior 2021)

The project concept is further detailed in the second module. The site's zoning contains areas for conservation, water storage, and forest patches, interspersed with suitable infrastructures for ecological and social purposes for the community and upkeep of the land, following the XL strategy. Through a more comprehensive understanding of how the site relates to its surroundings, the student was able to create a design that was inventive and sensitive.

In the third module, or at the S scale, small and specific design solutions with details of architectural form are developed along with specificities on planting strategies, activities, and possible usages of the infrastructures (Figure 6). At every stage, students are encouraged to be mindful of the multiscalar consequences of the decisions and how XL, L, and S scales are related when stitched together.

Along the same line, in the Water Plus unit, a student followed a systematic understanding of the context to revive the post-sand mining sites along the river bed. To develop the XL strategy in module 1, detailed mapping of sand mining sites was recorded along with their degree of deterioration, disturbance in landform and vegetation, and the emergence of avifaunal species after the mining stops.

In the second module, the post- sand mining sites were chosen for the L scale design, which already have signs of revival with a strong presence of many avifaunal species. The master plan developed at this scale had specific sets of landscape habitats to further enhance the nesting, feeding, and roosting habits of avifaunal species spotted on site.

Since the ecotones are the most biodiverse among the avifaunal species, three different edge conditions - aquatic, terrestrial, and riparian buffer, were designed in detail at the S scale (Figure 7). The scale-based reading helped in a clear understanding of the relationship between flora and avifauna in different transition zones that could be applied to restore and revive similar sites beyond the chosen site boundary.

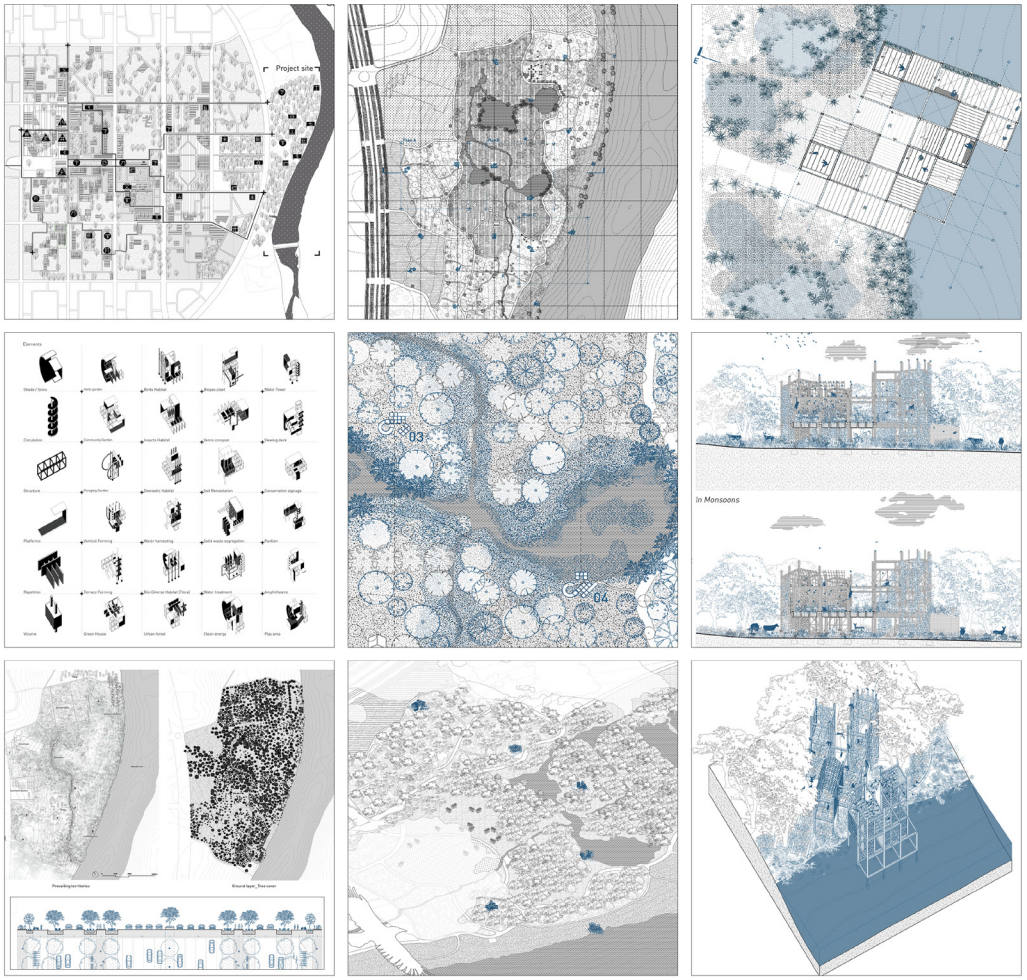

Figure 6
Shows a few drawings from the Project 'Forms of Bio-architecture' by Parth Patel. The Gandhinagar city vision and site-specific studies are presented in the XL module. Design is demonstrated in the L-M module. And the third module includes planting techniques, architectural interventions, and detailed plans (Credit: Parth Patel, Eco-warrior unit 2020)

Observations and Changes

In module 1

It was observed that the XL scale required a thorough understanding of the past and present physical layers of the site, like topography, geology, limnology, hydrology, and vegetation grains. These investigative studies were conducted through toposheets, GIS spatial analysis, and site observations. Since the physical context at this scale remains relatively similar across a larger terrain, the students worked in groups to record and collate the information from the site. In the case of Eco-warrior, since the understanding of the system at the XL scale was mainly done through field observation by the urban design students, a three-week duration was satisfactory to define a vision and move on to the following scale. Whereas in the Water Plus unit, detailed calculation of surface water catchments and stream corridor analysis

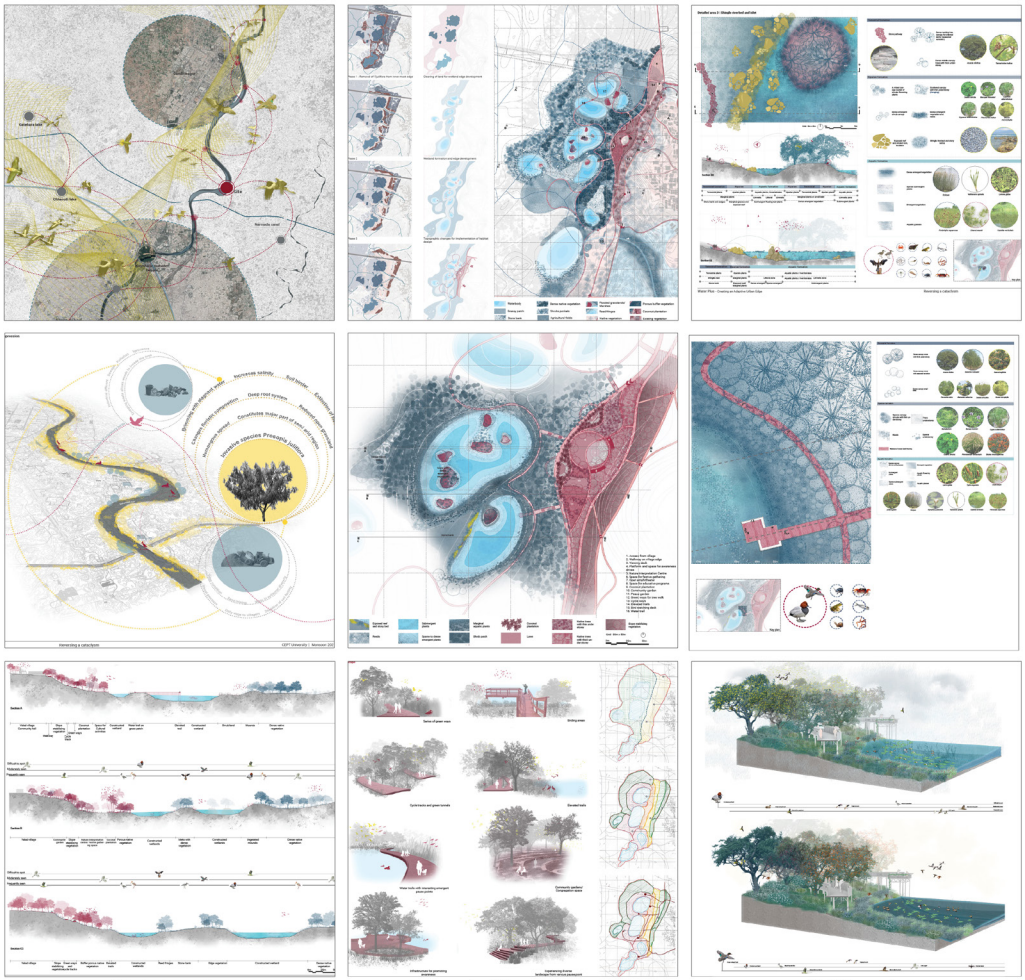

Figure 7
Shows a few drawings from the Project 'Reversing a cataclysm' by Janhavi Modh. It focuses on the revival of post-sand mining sites - restoring the missing links between ecology, people, and the river demonstrated through different scales (Credit: Janhavi Modh, Unit Water Plus 2022)

at XL scale required the duration to be 5 weeks (Figure 4).

In module 2
At the L-M scale, as each student developed their area of interest, the master plan projects became individual exploration. It was the most crucial stage of the design process, as it formed the bridge between XL and the S scale. The L scale module in the Eco Warrior Unit is programmed for five weeks to develop resolved designs. However, in Module 3, as students work on finer resolutions, the L scale is reviewed and modified as more accurate information becomes available. In Waterplus, although the timeline of the L-M scale was reduced to 4 weeks, the transition to the S scale took an additional 2 weeks.

In module 3
For the S scale, students were asked to

demonstrate a detailed design solution for a particular area most representative of the master plan. For the Eco Warrior unit, this module is given a full eight weeks to work on finer details, such as architectural resolutions, planting details, and seasonality of the landscape. This module in the following years was reduced to 7 weeks allowing time of one week to bring all different scales together at the end. For the Water Plus unit, four weeks of timeline in 2021 only allowed making a virtual model and testing seasonality with changes in flora and fauna. Moving along the line of resilient landscapes for the future, it was essential to test the design performance through extreme conditions of flood and drought. Hence, in 2022, the unit extended the time by one more week, which allowed the exploration of extreme scenarios and testing of an experience-based planting strategy in response to ground moisture.

Discussion and Conclusion

The Eco-Warriors and Water Plus unit has run five times and generated a varied range of future public spaces. From these outcomes across the two urban design and landscape architecture programs, the authors raise the discussions around two questions -

1. Did this scale-based structure of the unit help to best demonstrate a design solution?
2. Are all three XL, L, and S scales equally important across all projects?

To address the first question, the authors argue that, in general, the methodology helped students to be more cognizant of the multi-scalar consequences of their decisions. Through this methodology, students were able to derive holistic solutions, often recognising that the challenges may not have their originations in the defined area of intervention.

For example, within more urban sites, the proposed interventions were able to connect the site better in relation to the spatial context, existing users, and future urban demands of open spaces. This further laid the ground to show that the defined design approach will yield beneficial results for many similar urban sites. Thus, this scale-based approach can demonstrate a site-specific detailed design and, at the same time, can take the project beyond the site boundary by replicating it in other similar parts of the city.

The multi-scalar approach particularly allowed the typology-based design strategies to go beyond the site and hence widening the scale of the impact area. Therefore, the authors argue that the typology-based solutions worked best in achieving resolution at all scales, as their versatility allowed easy adaptation in different contexts. In contrast, the site-specific or non-typology approaches often grapple with smooth transitions across the scales. Moreover, To capture how the module-based pedagogy fared with the students, a short survey was conducted to understand whether the continuity of learning was consistent as the design transitioned from large to small scale. It was overwhelmingly seen that everyone could reflect on the learning from one scale to the next, irrespective of the type of project. For the second question, the authors conclude that not all projects need equal time in all three scales. This was further supported by the students' survey, where subjects from the same unit voted for more

time, sufficient time, and less time in some modules, depending on the nature of interventions. One way forward would be to keep the duration of modules in a dynamic equilibrium within a defined timeline, depending on the nature of the project. Another critical observation is that most design decisions are taken at the L/M scale as it bridges XL and S scales. Hence, for all project types, the relative duration of the L/M scale module should be more than the XL and the S scale.

Overall, the studio outcomes offered a certain level of resolution and strategies for scaling the project, linking better with existing systems, and extending beyond the site. Because of this methodology, students felt capable and excited about resolving spatial challenges apt to the scale, which may have worked poorly had the starting scale been the site itself. Further, the studio framework is based on approaches towards active, productive, and performative landscapes for the future rather than ornamental and resource-intensive designs. Hence, it is also in that light that scales matter as valuing and acknowledging microsystems within the site not as a component but as a part of a larger network.

However, this process is constantly shifting, changing as it evolves. The most crucial part of the scale-based process has been the ability to foster systemic thinking, give a befitting solution when sometimes the problems may have their origin outside the site and break the atomistic design constructions.

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4x1: 4 km² over 1 century

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Abstract
"4x1" is a semester-long exercise developed by students at the University of Ferrara. They were asked to select and frame an area of 4 square kilometres from anywhere in Italy. Three plans were required, representing the landscape context today, its ongoing transformative forces and its appearance in a century from now. The main request was to consider documented forecasts on climate change effects, as well as concurrent social trends (tourism, depopulation, etc.) or actual plans for urban and infrastructure development. In contrast, they have been free to speculate about future configurations according to different attitudes (policies) towards the forces at play: ranging from strong anthropic responses to "do nothing" answers. One purpose of the assignment was to challenge students' tendency at "overmining" design or analysis tasks: that is to take into account too general or generic topics, overestimating them, in the belief they can be transferred linearly from one scale to another. Throughout the research, they had to, and learnt to, continuously change the scale of their investigation, even in order to decide how to frame the chosen context. The resulting illustrations are a distilled outcome of a wider survey - on data and processes - which for the most part almost disappears during the journey. In the long run, like an "hyperobject", the landscape we try to depict is always something that "withdraws" from our knowledge, perception or any attempt at fully describing it. But this is its fascination and why we keep probing it.

Keywords
Object Oriented Ontology, hyperobjects, climate change, uncertainty, landscape representation

Introduction
Even in the face of the challenges imposed by climate change and its effects, landscape design in recent decades has been radically transformed from a practice oriented toward the perception and visual composition of outdoor space to a more ecologically oriented discipline for which an understanding of the environment, in its biotic and abiotic components, is a key element. This trend, which has its roots in the work of Ian McHrag (1969), has naturally influenced the methods of land representation and investigation that have themselves become an integral part of a design approach largely inspired by the notion of landscape design as a hermeneutic practice theorized by James Corner (1990a; 1990b) in his two essays published in Landscape Journal. Thirty years later, the then-emerging dialectic between the

conception of landscape architecture as scenography or infrastructure, although from a purely theoretical point of view, now seems to have been overcome in favour of the latter (i.e., infrastructure), in practice, it remains a perfectly valid opposition when analysing the forms of representation still used today. In this regard, as noticed by Richard Weller (2020), a main distinction can be done in the current types of representation assuming as reference both the concept of "hyperreal" and the notion of "hyperobject" as defined by the philosopher Timoty Morton (2013).

Hyperreal representations are structured as "picturesque" images (in terms of perspective and points of view) and with a certain erotic tone. They contrast vividly with the context to enhance the 'greenish' sharpness of the proposed intervention. One of the characteristics of frequently used representations is that of freezing the image in the future, showing a mature intervention (think of plants usually depicted as mature, tall and lush, i.e. in a condition that takes decades to reach) without focusing on what are instead the long, lived phases of an environmental-landscape-type intervention. What the images associated with the hyperreal concept present is a suggestion of "confidence and comfort" linked to an idea of an "ecological paradise". The focal point is that such images mask the landscape and its processes, do not show the deeper, structural ecological and social problems of contemporary cities by playing on a totally "passive" observation. The deep-seated and widespread problem with the hyperreal is that «it is suspended between truth and fiction without exercising and enjoying the full potential of both» (Weller, 2020, p. 32).

On the other hand, representing the landscape «not as scenic but as complex environmental processes» (Weller, 2020, p. 30) is instead the theme related to "hyperobject" representation that proactively includes the temporal dimension and identify the human as «one actor in larger ecological and political networks wherein all species and all forms of matter have both rights and agency» (Weller, 2020, p. 34). According to Morton's thought and the philosophic assumptions of the Object Oriented Ontology (Harman, 2011) that grounds it, such "flat ontology" implies that the access to reality is based on the interactions between objects with no preconceived hierarchy between human beings and things. As Graham Harman (2018) argues, if we assume this flatness, we also should accept the fact that interactions between things are just as deep, and just as limited, as the interaction between them and human thought.

Climate change is an example of this: it does not exist as a function of our knowledge or perception, it just exists. Like other objects, it retracts, it is irreducible to a univocal scale as well as it is inexhaustible by our admittedly vast knowledge in the same way it is by the, perhaps more limited but certainly different, knowledge of a cetacean. Humankind can statistically study some of its manifestations, sensitive or relational, at the local level, but no one will ever be able to completely describe its contours or report it everywhere at the same time scale. What Morton calls "hyperobjects", are something deeper than processes since they occupy the multidimensional space of phases, which means they cannot be located at a single point in time or space. So, the climate change,

as other hyperobjects, exhibits its effects only into an "interobjective" manner; that is, it can only be detected in a space that consists of the reciprocal relationships between the aesthetic (sensible) properties of objects, whether human, artifact, animal or social constructs.

In this sense, the representation of landscape as a device for aesthetic mediation with reality can be extremely effective in alluding to entities so complex and large in space and time, even beyond the purpose and intentions of those who produce them. While it is true that this excess of reality nonetheless surpasses our perception, it is also true that today we are increasingly able, thanks to digital tools, to expand our awareness of the landscape beyond horizons and substances that were until recently obscure. Analysing the ecological component in its most technical and scientific part by distancing oneself from purely picturesque positions reveals the landscape as a system in which the balance of forces is the only true impartial judge. Flows, forces, behaviours, relationships. These are the factors that, in their becoming, continuously and irrepressibly shape the landscapes around us. Beginning to perceive and represent invisible but extremely present factors is a fundamental prerequisite for a critical landscape exploration.

Describing both the dynamic nature of the landscape and the image we perceive of it – i.e., its representation – the time-scale representation process can provide fertile ground for the creation of new imaginary with the aim of shaping new landscapes. Reasoning on J. B. Harley (2009) position regarding the fact that time-space relation is a fundamental element for spatial planning and that a dynamic multiplicity of urban processes cannot be contained within a singular, fixed spatial frame, James Corner states that «projecting new urban and regional futures must derive less from a utopia of form and more from a utopia of process - how things work, interact and interrelate in space and time. Thus, the emphasis shifts from static object-space to the space-time of relational systems. And, it is here, in this complex and shifty milieu, that maps, not plans, achieve a new instrumental significance» (Corner, 1999, p. 228). As Weller noticed, since the subject at the centre of the hyperobject are the processes of change, it is necessary to incorporate the dimension of time within landscape imagery. Engaging with the aesthetics of time in itself is difficult enough, but the more "important challenge is not only to illustrate change, but to show how certain forms of human intervention (design) can affect, redirect, accelerate or slow down change" (Weller, 2020, 35). In other words, the challenge of working with hyperobjects is not to indulge in what we might today call a contemporary sublime dictated by the aesthetics of the Anthropocene, but to insert ourselves with greater precision and critical sense into the environmental processes (and not only) that shape the landscape with the aim of understanding and redirecting them towards coherent and sustainable design practices.

Methods

Focusing on these premises, we worked with fifth-year students from the Department of Architecture in Ferrara as part of the Final Master Thesis Studio on a workshop about the representation of landscape transformations over long-term time

horizons (Emanueli and Lobosco, 2018). The exercise we proposed is designed to develop an effective method of representing the landscape by confronting dimensional and temporal scales such as to stimulate critical reasoning on the transformative processes that may affect a given environmental context. The work was carried out in three phases corresponding to as many plates they had to draw:

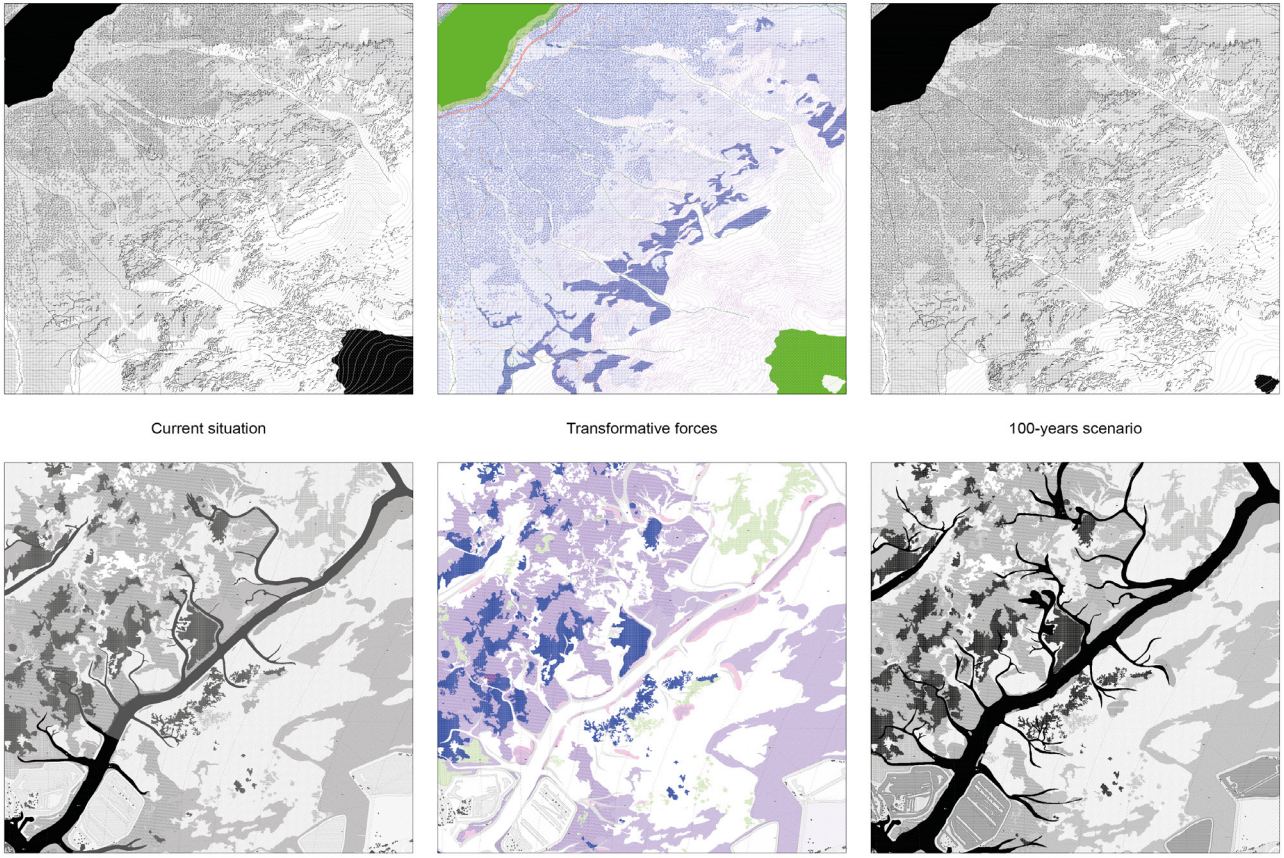
1. Current scenario. Based on the available information, an initial drawing describing the current condition of the chosen landscape had to be done. In particular, notable and recurring landscape elements were depicted, such as topography, vegetation system, hydrogeology, anthropogenic components and so on. The location was left to the free choice of each student.
2. Transformation processes. In relation to the context described in phase 1, the possible effects that phenomena, events or dynamics (water levels, drought, hydrogeological instability, abandonment of agricultural areas, development of infrastructure, deforestation, etc.) could potentially have on the landscape are identified and represented in order to project its possible transformation.
3. 100-year scenario. The third phase consisted in redesigning the landscape analysed, according to the same rules used for the current one but projected over a 100-year time horizon. The permanence or transformation of the anthropic and environmental systems is decided according to the previously hypothesized processes. This new landscape balance was matched by a coherent spatial articulation of the elements described in phase 1.

Besides this assignment, few more contains were given, concerning for example the use of colours and the fact that each phase had to be drawn in plan to a scale of 1:5000, no matter what location they chose to investigate. Such relatively restricted viewport on the landscape should have emphasized, or not, the correlation between some transformative dynamics and their field of influence. In other words, the aim of the work was to explore how the relationship between a given time span and a given dimensional scale interfered with the representation of the landscape and its understanding. Asking the students to limit the map to a certain framing has been a way to encourage them to think outside the box (and the boundaries of representation) for finding larger phenomena that may affect the transition of the physical space, which is, at the end, the very challenge that any landscape project should address in our times.

Results

The results extrapolated from the exercise were very heterogeneous, so that some areas examined seemed not to significantly change while others showed major variations. By way of example, we will briefly compare hereafter two works that highlight, in slightly different geographic contexts, the impacts of time (Figure 1).

The first case study focuses on the landscape between Lake Gioveretto and the glacier of the same name that currently extends to just below Rabbi's Peak in the province of Bolzano (Italy) at an elevation of about 3250 meters. The study of climate trends related to rising average temperatures has made it possible to estimate the actual retreat of the glacier within a



century. This phenomenon is accompanied by a whole series of impacts on the hydrological and vegetation structure that will lead to a drastic change in the landscape. These include the likely rise in the mean lake level downstream of the glacier and the consequent need to relocate part of the road infrastructure bordering it. This will be accompanied by a gradual expansion of coniferous forests at higher elevations and simultaneously the extension of pioneer vegetation into areas that currently lack them.

The effects of sea level rise within the Grado Lagoon in Friuli-Venezia Giulia (Italy) were addressed using the same methodology. This second case study examined an eastern quadrant of this ecosystem currently characterized by the coexistence of different biotopes (salt marshes, mudflats, etc.) whose variety is closely related to the position of soils with respect to tidal levels. In the elaboration of the 100-year projection, a heavy anthropogenic intervention - consistent with the current directions of lagoon landscape conservation - was assumed to compensate for the rise of the mid-sea through backfilling operations of

Figure 1
Two examples of the maps produced by the students. Above, the hypothetical 100-years evolution of the Gioveretto Glacier (elaborated by Gianluca Sartin); below, the analogous span of time investigated for an area in the Grado Lagoon (elaborated by Yasmine Nouira)

the excavated material from the navigable canals, guaranteeing as much as possible the permanence of the wet, semi-wet areas and their related habitats. In this case, the future scenario is nothing more than a sweetened, and equally artificial, version of the current one: visible only through a representation that shows what is happening below the surface of the water, but which otherwise would not be clearly perceptible by a hypothetical observer on the field.

Discussion and conclusions

Looking at these examples, it is quite clear that is only by the means of representations that baulk at man's intrinsic perception that we can grasp the already mentioned hyperobjects or, at least, realize what changes they might produce on a certain landscape. Only by taking a critical-descriptive approach we can channel this information and project it towards concrete and coherent scenarios that go beyond a postcard image of reality. Far from being a purely speculative exercise, approaching the landscape through the representation of its ongoing and future dynamics is essential for grounding design and planning practices much more aware of the forces that, blending, shape the environment in which we live. As Deleuze and Guattari (1987, p. 12) said, «What distinguishes the map from the tracing is that it is entirely oriented toward an experimentation in contact with the real. […] The map has to do with performance, whereas the tracing always involves an "alleged competence"». To represent an object is therefore to approach its understanding. In such perspective an especially in the case of landscape architecture, wishing to be far removed from mere picturesque rhetoric, the temporal scale must be given as much importance as the spatial one with the objective of clearly and specifically identifying all the factors that could potentially affect the object and or be the subject of a project.

In this sense, perhaps one of the greatest contributions of landscape architecture to the way contemporary design challenges are conceived and addressed lies precisely in the acceptance of uncertainty (Lobosco, 2021). In relation to representation, this translates into the concept of accuracy which recalls a strategic attitude to selective precision: conscious or unconscious omissions and the coexistence of potential alternative paths become essential characteristics of a resilient design process. This does not imply a renunciation of the description and analysis of physical space but pushes the research deeper into those features of the landscape that simultaneously take up a plurality of meanings. The presented work carried out with students is an attempt to test this idea by constructing potential paths of change to be addressed by the project.

In contemporary design culture, the production and reproduction of the landscape need to be increasingly configured as an imaginative act aimed at establishing a field of comparison, a horizon of meaning from which to develop multiple narratives for the future. The landscape project should be thus identified as a field of possibilities related to interdependent – and in any case variable – environmental (vegetal, geological and morphological) patterns, rather than as a univocal response to specific needs. In this perspective, the analogical function of representation must replace the purely descriptive and analyti-

cal one in order to aesthetically penetrate the reality of objects (like climate change) that ontologically withdraw from us. Fortunately, although, some idealistic forms of representation (as the "hyperreal" ones) still permeate the media, new approaches are rising to question the "very large finitude" of the hyperobjects featuring the Anthropocene; and the experience reported in this article follows precisely this direction.

Acknowledgements

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Working across scales and contexts in the Aarhus River Valley

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Abstract
This paper uses two project-based semester assignments from Studio 1A: Urban Design|Landscape Architecture (UD|LA) and the Aarhus School of Architecture to argue for a cross-scalar approach that enables landscape architecture students to grasp the complexity and urgency in dealing with current challenges of urbanization in the Anthropocene.

Through three different situations, one urban and two suburbans, the three-semester assignments use the Aarhus River Valley as a common ground. In this context, the paper investigates how landscape contextual understandings can inform urbanization across scales in the river valley.

The explorations span from 1:1 hands-on experiments to spatial volume studies and well-known, often-used tools and formats like mappings, plans, sections, models, etc.

While the hands-on experiments include implementing several small-scale, 1:1 transformations of, i.e., forest landscapes based on the students' (1) physical engagement, (2) careful site readings, and (3) considerations about future spatial conditions. Central for this is how a cross-scalar approach, introduced at a didactic level through the teaching design, can facilitate the ability to translate contextual findings from one scale into design proposals in another, and vice versa.

This is important, as it teaches students to reveal the rich complexity of sites and situations across scales and the context in which these are situated. Here the context is also to be understood through its active Latin root 'contexere' denoting an act of weaving rather than its more static ordinary meaning.

Keywords
Context, scale, didactics, landscape, urban design

Methods for scale experiments: Teaching design and matters of scale

Teaching across scales and making the students capable of working across multiple scales is an area with a particular focus at Studio 1A Urban Design & Landscape Architecture at the Aarhus School of Architecture (DK).

The studio works with open semester assignments in which the students can program significant parts themselves and an

educational design that encourages them to investigate various topics through their focus. Working with relations between scales are introduced through the teaching designs, applying tools and knowledge, each student can utilize in their individual project. In the two described semester assignments, the focus was not on specific scales, but the relations between them, and how they can potentially inform each other.

In the professions of landscape architecture and urban design, it lies implicitly to work across scales, professional fields, and boundaries. Insisting on working with both landscape architecture and urban design simultaneously, the studio approach requires a significant degree of openness and methodological adaptiveness and, thereby, a teaching design that reflects those ambitions. It is our experience that it requires a particular didactic focus to work and teach within the two fields for the students to learn from and process the complexities that characterize them in order to develop qualified proposals. With special attention to scalar jumps, we seek to establish a strong emphasis on scales as dynamic relations rather than static, fixed, and ordered.

Throughout various approaches to scale in recent teaching semesters, we have been working with teaching design and assignments that encourage the students to weave different findings together in their projects, with a didactic agenda to train them in informing and qualifying their projects through contextual understandings from multiple scales.

The didactic aim of introducing the jumps between scales is to make the students acknowledge that conditions in one scale level can be related, inform and qualify design choices made in other scales. The approach has been tested in several assignment layouts, spanning from regional scale in 1:250.000 to 1:1 material investigations. The analysis required, spans from overall mappings of physical and structural condition to investigations of urban life narratives and inventories of flora and fauna.

On several occasions, the scalar jumps have been consecutively from one scale to another, often starting on the large scale and moving downwards scalar-wise, with a sequence of trans-scalar iterations in the student's process (see fig. 1, left). But looking at the students' results; they are a product of a process with several prioritizations of found material and conclusions from different scales, brought forward in the process to inform the work in the consecutively following scale. The informing and qualifying between scales are not necessarily based upon working through scales consecutively but rather interrelations between various scales, depending on the project and context. However, this teaching design spawns a productive and often fruitful process and result. However, the "from top-to-bottom" scalar approach often leaves less attention from the student to the scalar jump itself. In that regard, it seems fruitful to combine the conventional approaches with assignments where the teaching designs promote focus on the scalar jumps in themselves.

We have tested several teaching designs in the studio to bring focus and awareness

to the scalar jumps, trans-scalar relations, and their qualifying potentials throughout several semesters. On that behalf, we state two hypotheses to be discussed through three different didactic setups, resembling different approaches to the teaching design:

- *By introducing forced jumps between scales, also in a non-linear and non-hierarchical order, in the teaching design, the students will learn to work with the relations between scales rather than just scales as static, fixed, and ordered.*
- *By being aware of the contents of the various scales, the students will heighten their attention to which contextual tools they use and how they are applied in their design process.*

In the following, we will present three different cases of studio projects based on three different teaching designs. The first two projects depart from what is usually conceived as the small scale with 1:1 landscape adaptation to what is usually conceived as the larger scales, and the third works with various combinations of scales and their interrelations. The diagrams below illustrate the different approaches to working across scales from the different semester's teaching designs.

Case 1: Aarhus Surrounded by Forest

The two autumn assignments in 2018 and 2021, *"THE FOREST CITY – habitation and rewilding*," with similar teaching design regarding scalar jumps (see fig. 1, middle), explored if, and if so, how, sustainable habitation could be linked with afforestation and the viridic transformation of an urban landscape in the Aarhus River Valley. The students were encouraged to

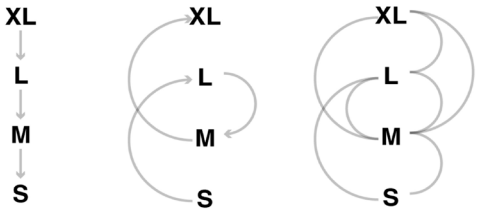

Figure 1
Left: The diagram resembles a conventional and consecutively movement through scales from XL to small. This sequence usually contains iterations between the scales throughout the process;
middle: The spring semester of 2018 related the scale of 1:1 adaptation to the larger scale of urban development, letting the formal language of landscape space inform the design of urban plans. The autumn semester of 2021 was similar to the 2018 semester. It departed with 1:1 landscape adaptation on the small scale, relating it to larger scales throughout the project;
right: The teaching design of spring 2022 pairs different scales (and their contexts) in odd couples to train the student to inform their project and their thinking in relation

explore their project sites, among others, in Årslev, a small village on the Northern slopes of the river valley, as test sites for generating new knowledge on how to live wisely in the urbanizing landscape outside Aarhus; processes of rewilding, landscape ecological principles and spatial landscape elements from the larger scale of the river valley (XL) were incorporated as critical parameters in the development of 1200 housing units in and around the village (L).

Contrary to the larger-scale inquiries focussing on the fringes of Aarhus and the town scale of Årslev, both assignments began with an experimental forest workshop in 1:1 exploring the potentials of afforestation from the position of the moving body of the walker engaged in the breadth and depth of the urbanizing territory. During this initial workshop, the students made visible and enhanced young afforestation projects' recreational, spatial and ecological potentials by creating novel spatial and ambient experiences in 1:1 (S). In the process, they developed and communicated a series of arboreal concepts, drawing on the formal language of trees; 'Grove,' 'Clearing,' and 'Canopy' as they experienced it in the field during the workshops.

In the following phases of the assignments, the formal language of trees and knowledge built up during the initial 1:1

workshop informed the students and their continued work across scales, both in a series of conceptual visions for Aarhus as a city surrounded by forest (XL, 1:50.000), using abstract models exploring landscape ecological principles (M, 1:1.000), as well as in their final visions for the development of Årslev, as a new urban area woven into the lay of the land with a strong focus on afforestation (L, 1:10.000).

Example 1: "Discovering the City through the Forest" by Robert Davies

In the first example from 2018, Robert Davies worked in True Forest on a 150m. long passage through a dense planting of beech trees from where a series of different forest spaces and experiences revealed themselves as one walked along the passage, becoming a gallery of different spatial experiences: Niches, clearings, perpendicular pathways, groves of yew were woven together by the passage. This concept, developed in 1:1, based on discoveries made on the ground and in the field, was expanded and translated by Robert into the scale of Aarhus later in the assignment. His final proposal used the concept of forest passages extensively, resulting in the urban forest not only working as a spatial boundary between city and countryside but also, maybe even more so, as a way to weave different scales of the city and its landscapes together, from the walker in motion, over the home, urban quarter and district, to the city scale of Aarhus surrounded by forest.

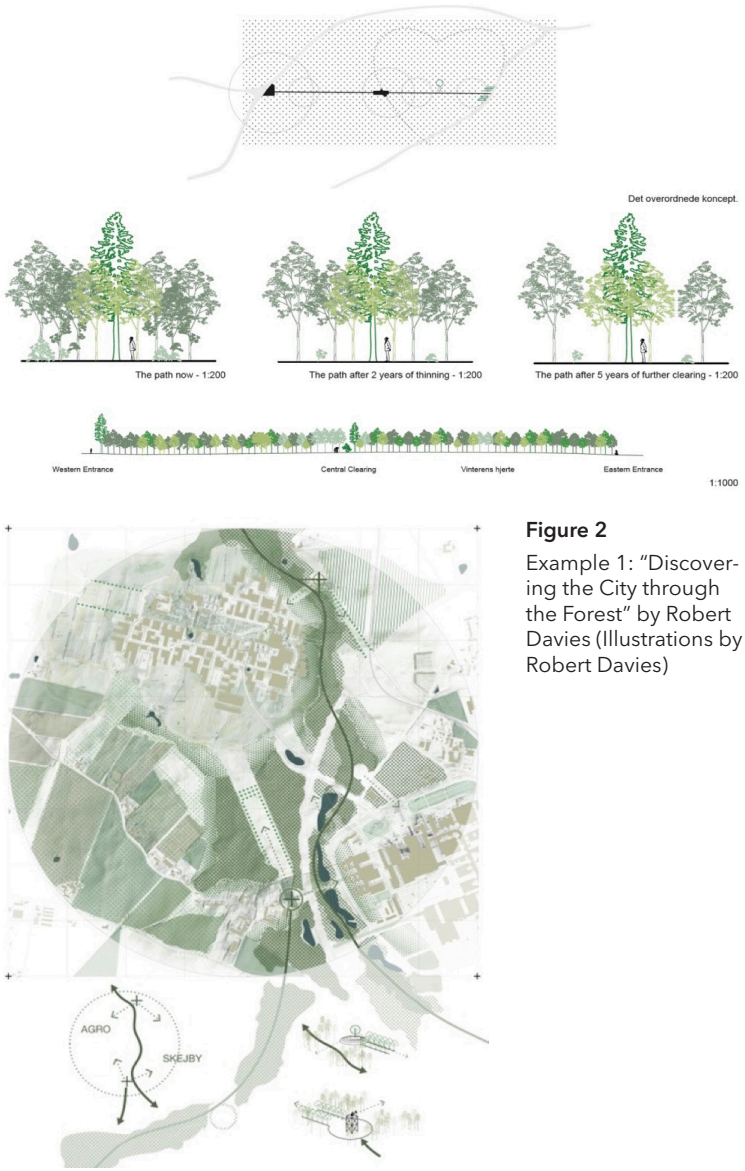

Figure 2

Example 1: "Discovering the City through the Forest" by Robert Davies (Illustrations by Robert Davies)

Example 2: "Årslev Skovby" by Katrine Møllmann

In the second example from 2021, Katrine Møllmann worked in Åbo forest on a series of spatial interventions and a new pathway based on discoveries done during the initial physical explorations of the forest; plantings of cherry trees appeared throughout the area and were brought forward as guiding groves, a large, self-established clearing was enhanced and

cleared for new trees, and smaller clearings were placed along the pathway; all were drawing on the formal language of trees; 'Grove,' 'Clearing' and 'Canopy.' Katrina used this language to drive her proposal for Årslev forward and guide her forest-based vision for the town with extended attention to edges and boundaries, which became another driving principle.

Case 2: THE RAILWAY CITY IN AARHUS

The assignment from spring 2022, *"COMMONS – THE RAILWAY CITY IN AARHUS - new social structures in urban settlements,"* dealt with a transformation of an industrial area in the city center adjacent to the Aarhus River valley. It had an overall focus on 'commons.' It investigated large-scale (almost regional) entities, urban neighborhoods, infrastructures, local meeting places, and primed research (study) questions like: *How can the existing context be reinterpreted, understood, appreciated, and further developed on multiple scales? Furthermore, how can understandings and findings in landscapes, urban life, and urban forms qualify and inform a new neighborhood?*

The semester project aimed to investigate how landscape contextual understandings could inform urbanization across scales in the river valley, the urban setting, and the specific site. Explorations drove the assignment in various scales to explore how this could qualify the design proposals for the given urban situations. The intent was that the designs should be informed by contextual relations and assets from multiple scales, from the extra-urban, almost regional scale with the relation to the river valley, to the small scale with a specific design in a dense urban environment, where the built volumes interacted with its exterior spaces on multiple scales.

The final output should be an overall plan for the area, focusing on the design of a specific urban setting (block, public spaces) within the overall plan.

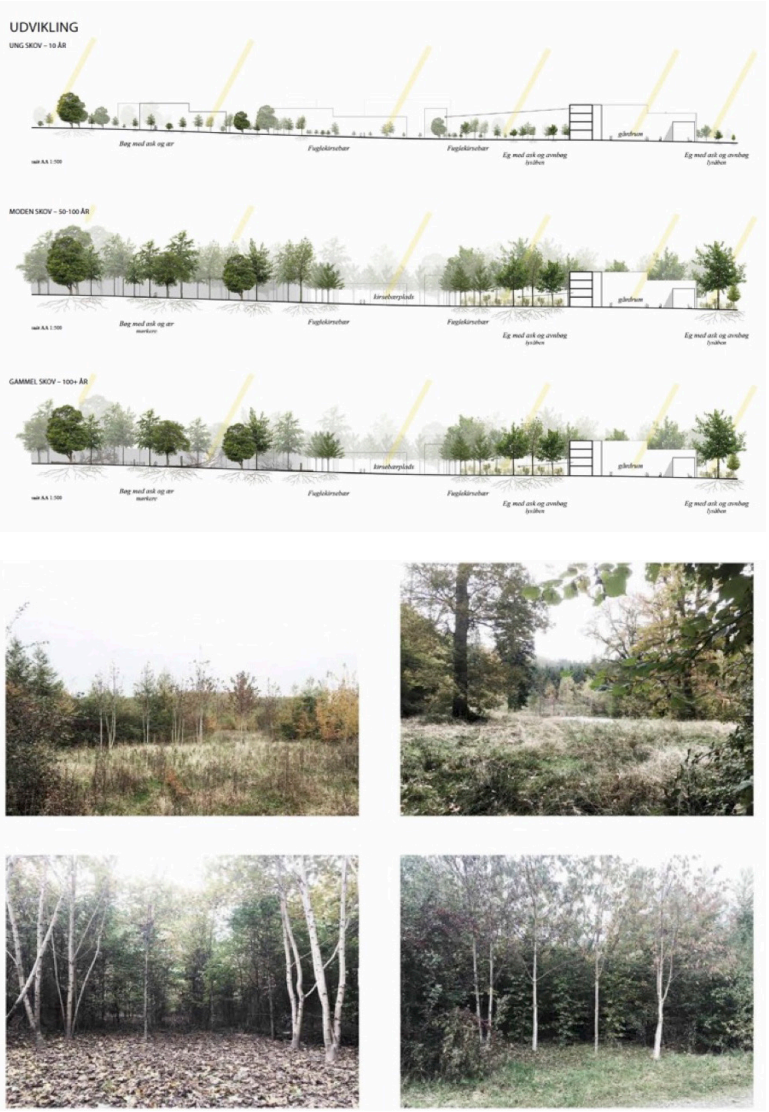

Figure 3
Example 2: "Årslev Skovby" by Katrine Møllmann (Illustrations by Katrine Møllmann)

The educational design for the semester had a sequence of phases where the students changing investigated different topics on different scales. The pairing of scales and the jumps in scales was choreographed through the teaching design and did not follow the more conventional approaches to working with scales, as continuously from top to bottom (see fig. 1, left) or as adjacent pairs (S+M (1:50+1:500), L+XL (1:1.000 + 1:20.000), etc.). The students were asked to relate their findings between more "odd scales" (e.g.) XL to M or S to L (see fig. 1, right). In that way, they were forced to be aware of trans-scalar relations, and they were encouraged to develop new design practices working in multiple scales throughout their studies.

The learning design resulted in projects, where local entities in the projects were informed and related to the city and its landscape as a whole. In the following two examples are described:

Example 1: "Life on Track" by Ziqi Zhang
In the first example, the student (Ziqi Zhang) founded her initial studies around the existing railway site and its infrastructures. Concerning a large-scale study of the site's connectivity and relations to urban areas in a larger context, it became apparent that the site could play an essential part in the large scale connecting the city center, the site, the hinterland and the river valley with a bicycle-based network, using the existing railroad tracks.

This feature informed parts of her urban design project (M) in terms of structural layout, accessibility, design of streetscapes (S), and housing typologies (S/M) in an urban area that was related infrastructurally and identity-wise to the other urban districts in greater Aarhus (XL).

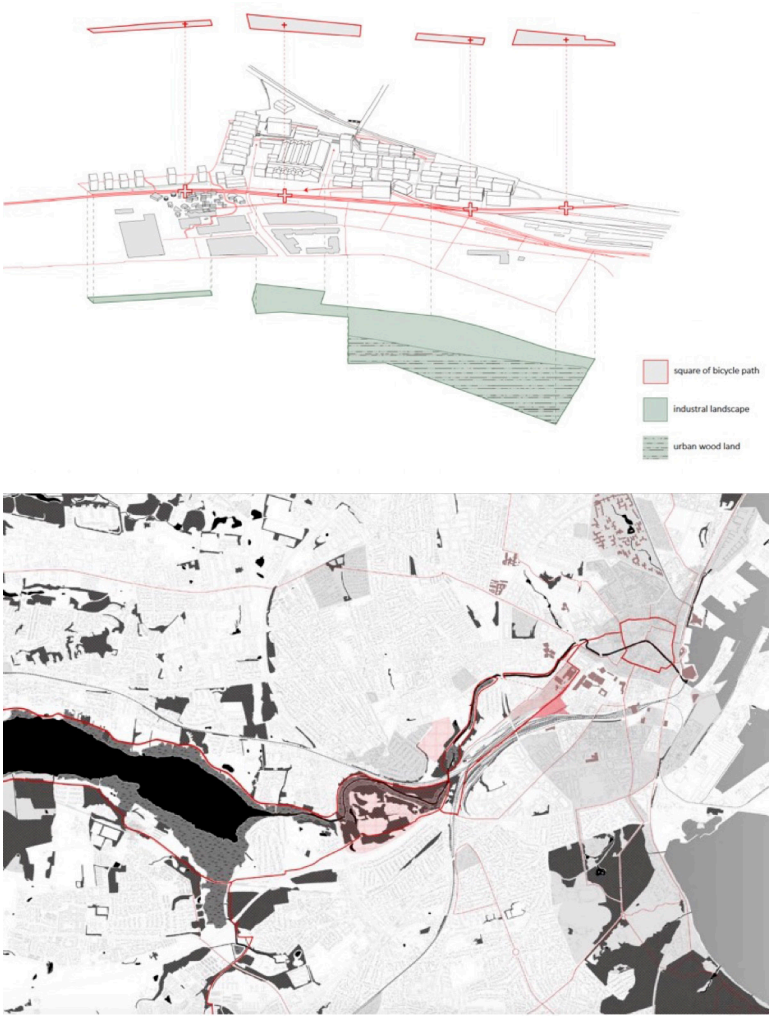

Figure 4
Example 1: "Life on Track" by Ziqi Zhang (Illustrations by Ziqi Zhang)

Example 2: "Confluence of Commons" by Alex Weston
In the second example, the student (Alex Weston) studied the ecological entity of the river valley in relation to the city to create new landscape-based urban spaces on the edge.

He used his large-scale urban analysis (L) to qualify the area's market hall (M) as a new urban anchor connected to the landscape (S, M) and the city's main infrastructures (L).

His site analysis and his reading of neighborhoods in Aarhus (L) inspired and informed the urban life (S) and the streetscapes (S+M).

Discussion

Cross-scalar teaching in a non-linear and non-hierarchical approach to educational designed jumps in scales can contribute to a comprehensive understanding of relationships across scales. The pairing of non-consecutive scales challenges the student to a higher awareness of the inter-scalar relations in themselves and to be open to findings and relations on the different scale levels. However – despite good intentions, the teaching design can also be too determining regarding the findings (on the determined scale levels) and in investigating potentially important content, when the sequence of studies on different scales is choreographed. In that regard, an assignment with a consecutive sequence can provide a more open approach to the findings for the student since the act of changing scales is more latent (and conventional) from the teaching design. It can help to establish a strong emphasis on scales as dynamic relations rather than static, fixed, and ordered (Jensen 2021).

Teaching and working across scales will, in turn, help in establishing a contextual understanding that can inform and qualify a given project's design, design parameters, or strategies. It points towards an expanded understanding of context, where various elements, lifeforms, etc., from several scales, are interwoven. This is profoundly ecological because ecology equals knowing that things are happening on more than one scale at once (Morton 2020). It also focuses on context as dynamic relations instead of static settings (Spirn 1998). The focus on dynamic relations is crucial in understanding, navigating, and reacting in the complex fields of landscape

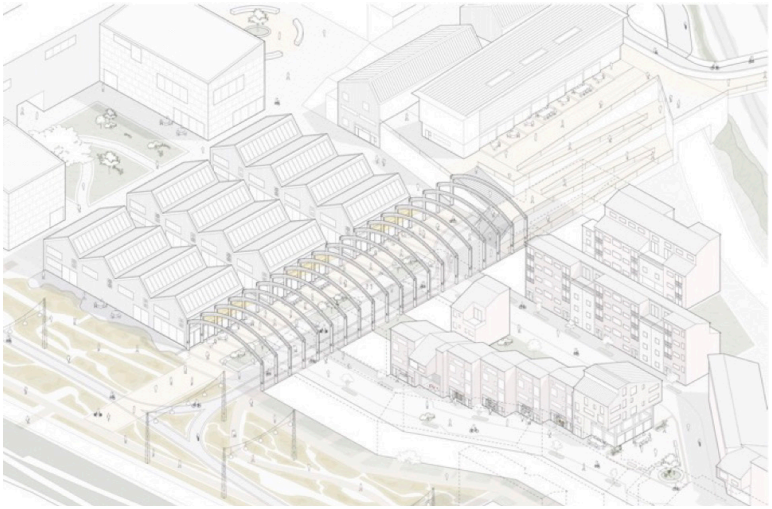

Figure 5
Example 2: "Confluence of Commons" by Alex Weston (Illustrations by Alex Weston)

architecture and urban design in times of climate change (Boris, 2022). Furthermore, it can help inform and strengthen a design study project through contextual tools that enable students to cope with the complex, folded, bounded, and interwoven scales of the Anthropocene (Arènes A., Latour B., Gaillardet J. 2018).

The benefits of focusing on contextual understandings from different scalar levels are not only an academic discipline. It is an approach that is seen used in profitable ways in practice. Some recent projects across landscape architecture and urban design, such as the Aire River re-naturalization project by Georges Descombes and Superpositions, Paris-Saclay, Lisiéres Campus Sud by Michel Desvigne Paysagiste or Superkilen by Topotok1 and BIG, are characterized by a broad and open (albeit controlled) approach to working with scale and context. This approach blurs the lines between the normative professional fields of urban design and landscape architecture. However, it is necessary to address and react to the complexity that characterizes the fields where landscape- and urban processes are handled simultaneously.

Changes in scalar levels must be embedded in the teaching designs when working/studying across the fields of landscape architecture and urban design to establish a broader and dynamic contextual understanding that can add new approaches and tools to process complexities.

The scalar jumps mentioned in the teaching designs of the cases work with both abrupt and unconventional approaches to scalar jumps and an expanded approach to the conception of context. These teaching designs have primarily made the student aware of the scalar jump itself. However, the more abrupt and choreographed change in scales is not to be understood as a permanent alternative to the more conventional and contiguous models (e.g., top (XL)-bottom(S)), but it can be used as a variant. Skilled students usually manage to discover the contextual potentials from the different scale levels themselves. However, the more designed or controlled teaching design models can help a broader spectrum of students discover the potential in scalar jumps and a broader approach to contextual understandings.

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The Vertical Ecology Studio: Accelerating Learning towards Systems Thinking Competencies in Landscape Architecture Design Education

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Abstract
In the Birmingham School of Architecture and Design, the concept of a vertical studio was applied to two core design modules within the undergraduate and postgraduate landscape architecture programmes to embed an accelerated learning process that supports learners to meet systems thinking competencies. The studio draws on pedagogical approaches from a Landscape Systems Perspective, Systems Thinking Theory, and the core competencies of Education for Sustainable Development, to develop a framework of structured sequential tasks. The tasks were carefully scaffolded and began with learners developing an understanding of ecological planning principles and progressively developing design strategies to engage with the landscape as a multi-scalar adaptive system. The approach is underpinned by social constructivist theory, where the individual's learning is shaped by interaction with peers, tutors, and experts. This is achieved through embedding collaboration and social interaction across the learning process.

Keywords
Vertical Studio, Landscape Architecture Education, Systems thinking, Landscape Systems Perspective, Education for Sustainable Development

Introduction

As the Climate and Biodiversity Emergency was declared and institutions such as the Architect's Climate Action Network (ACAN) in the UK emerged, it became clear that an honest reflection on our practises across the design of the built environment was overdue. The change needed must begin with transforming education, as Irina Bokova, former Director-General of UNESCO, outlines: *"…Now, more than ever, education has a responsibility to be in gear with 21st century challenges and aspirations and foster the right types of values and skills that will lead to sustainable and inclusive growth…"*(2016).

Education for Sustainable Development (ESD) arose from the need to meet growing global environmental challenges. Advance HE (2021) defines ESD as *'the*

process of creating curriculum structures and subject-relevant content to support and enact sustainable development'. In contrast, UNESCO (2014) acknowledges that for ESD to be more effective, the educational institution must undergo a holistic transformation, including 'rethinking the curriculum, campus operations, organizational culture, student participation, leadership and management, community relationships, and research' (Reickmann, 2018, p. 46).

Systems thinking has been identified by multiple authors, including UNESCO (Leicht et al., 2022), Advance HE (2021), and the European GreenComp (Bianchi et al., 2022), as a core competency towards ESD and has been widely recognised as an essential aspect of any design discipline. Within the field of landscape architecture (LA), it could be said that environmental awareness has been ahead of its time, as the *McHargian Method* 'Design with Nature' (1969) was delivered over 50 years ago, and our very mandate states LA's purpose is to 'protect, conserve and enhance the natural and built environment' (Landscape Institute, 2012). However, it seems that the influence of LA has not transformed society enough towards low-carbon living and the minimal ecological footprint required to meet the challenges ahead. The UK's national strategic advisor for design, the Design Council (2021), in their publication 'Beyond Net Zero A Systemic Design Approach' highlights the critical importance of design towards creating real change and states that 'system thinker' is one of the core characteristics of the change maker.

Furthermore, engaging with the practise of LA from a landscape systems perspective has been widely advocated since the 1960s and embedded in education by the likes of McHarg (1969) and Steinitz (1990, 2002). Landscape is a dynamic, complex system, and many of the challenges of contemporary LA and the wicked problems of the future are better resolved if supported by systematic approaches and systems thinking, as reinforced by Murphy (2016). According to Richmond (1994), a systems thinker will *'position themselves so they can see both the forest and the trees and keep one eye on each'*, illustrating firstly that systems thinking requires an understanding of how individual components function both independently and as a whole, and secondly how systems function across multiple scales.

This paper focuses on whether a vertical studio experiment can support accelerated learning towards achieving competencies in education for sustainable development while simultaneously engaging learners with the landscape as a complex adaptive system of interactions between humans and nature. **The vertical studio** is collaborative in nature and brings together students on different learning levels to share the same studio environment. It sits within a broader series of cross-disciplinary initiatives within the Birmingham School of Architecture and Design that aim to explore how effective curriculum transformation can support learners to deal with the wicked problems and unpredictable challenges they will face because of climate change and the loss of biodiversity.

Methods and Process

Our pedagogical model for implementing a 4-week long LA vertical studio involved two stages. The first stage began

BALA Module Learning Outcomes	MALA Module Learning Outcomes
1. Analyse precedent and guidance notes, which debate issues in the enhancement and design of natural systems and apply this through the design of a strategic ecology framework	1. Apply design principles used by Landscape Architects within the context of Designed Geographies and their application to a process led narrative to improve the quality of our living landscape.
2. Specify material palettes and produce design which explores ways to integrate human and natural systems	2. Challenge current theory, concepts, principles, and techniques to generate appropriate policies, strategies, plans or practical interventions, at a range of spatial and temporal scales
3. Develop methods of communication, which clearly and engagingly convey strategic and detailed ecological proposals	3. Develop a versatile and sophisticated range of visual skills to communicate all stages of the design process to professional and lay audiences.
No 4th learning Outcome	4. Develop transferable skills, work effectively as an individual, using initiative, self-management, time and task management and personal reflection

Table 1
BA(Hons) Landscape Architecture (BALA) and MA Landscape Architecture (MALA) Learning Outcomes, relating to table 2

Learning Outcome	Learning Objective	Theory supporting Learning Objective
MALA 1, 2 BALA 1	1.0 Build baseline knowledge of ecological principles in order to:	*'It is about understanding whole-system approaches and ecosystems'* (Sue Morgan from Design Council, 2021, P.29)
MALA 1, 2 BALA 1	1.1. Analyse and Interpret ecological principles from the site's spatial and physical context	*'…the genius of the site be discerned as composed of discrete elements, some derived from the natural identity, other from artifacts. These must be evaluated by components of identity, as working processes and value and as containing implications for new formal adaptations'* (McHarg, 1969, P.175-176)
MALA 1, 2 BALA 1	1.2. Understand how human activity impacts on ecological systems and biodiversity	*'Successful landscape change depends on the designers' ability to integrate the environment's physical, social, and ecological systems into a mutually sustaining whole'* (Murphy, 2016; p.246)
MALA 1, 2, 3 BALA 1, 2, 3	1.3. Begin to apply ecological knowledge to enhance site's ecological context	*'to consider time, space and context in order to understand how elements interact within and between systems'* (Bianchi et al., 2022; p.14)
MALA 1, 2, 3 BALA 1, 2, 3	2.0 Gain personal/collective emotional/physical experience of the site	*'to consider time, space and context in order to understand how elements interact within and between systems'* (Bianchi et al., 2022; p.14)
MALA 1 BALA 1	3.0 Understand and experience human influence on the site	*'Systems thinking allows us to understand reality in relation to other contexts (local, nation, global) and fields (environment, social, economic, cultural)'* (Bianchi et al., 2022; p.20)
MALA 1, 2 BALA 1, 2	4.0 Experience the size/scale of the site and its placement in wider context(272hectares)	*'It has been shown that learning progress is stronger when students see problems themselves – either by their own experience or when the problems are presented by 'real people'…'*(Lenzholzer and Brown, 2013; p.90)

Table 2
Theories supporting learning objectives

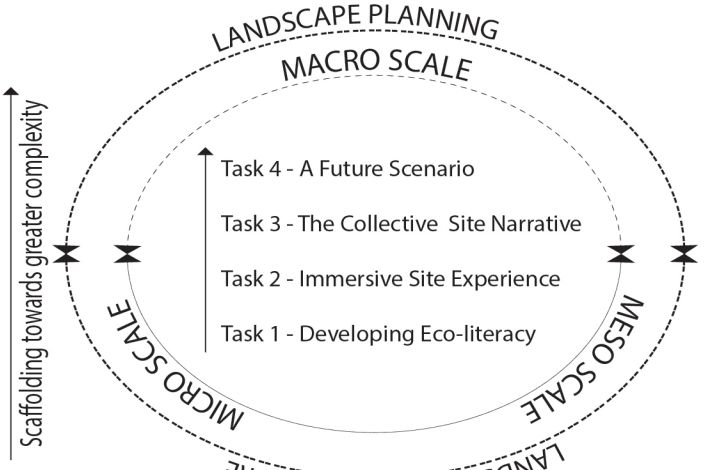
MALA 1, 2, 3, 4 BALA 1, 2, 3	5.0 Reflect on the personal and collective landscape narrative to communicate the site character and sense of place	'Landscape architects read and tell landscape through their tunnel vision of perceptions, concerns, and values (Kaplan 2009; Selman 2006; Whiston Spirn 1998)' (cited in Van Damme, 2019)
MALA 1, 2, 3, 4 BALA 1, 2, 3	6.0 Experiment with and speculate on scenarios for habitat creation	'education [that is] founded on systemic, holistic and complex thinking, that recognizes the interdependence between people and nature can facilitate the paradigm change required to achieve a more sustainable future' (Holdsworth et al. 2008, p.132)

with a comparison between the level 5 (2nd year undergraduate) and level 7 (1st year postgraduate) modules learning outcomes seen in table 1. This enabled us to set common learning objectives and competencies that would apply to both groups. Following this, a review of specific pedagogical strands and theories on Landscape Systems Perspective, Systems Thinking, and the core competencies of Education for Sustainable Development was carried out. Table 2 includes some extracts from these theories which support the rationale for each learning objective. This has been kept concise and limited to main sources for the purposes of this paper, but there is an acknowledgement that further research is available to support this alignment.

The second stage involved testing the validity of the pedagogy through its application in the vertical studio, carefully crafting a series of tasks against the learning objectives to support learners in meeting the learning outcomes. The tasks were developed using a scaffolded approach, where the complexity of the learning objective gradually increases along with the knowledge and skills required for each task. This was applied with the acknowledgement that the design process is non-linear, reinforced by Steintiz's framework of six models in Gazvoda (2002), and that systems thinking requires higher-order thinking (Fazey, 2019), in particular where the focus is a multi- or inter-scalar adaptive landscape system. With that in mind, each task was designed to engage with a particular scale range, aimed at supporting learners to develop interconnected thinking across the scale of the landscape system.

Students were asked to engage with each task across the 4-week collaboration. The following is a description of the four tasks referenced in Figure 1 and Table 3.

Figure 1
A scaffolded approach towards inter-scalar landscape systems thinking



	Vertical Studio Task			
Learning Objectives	**1. Developing Eco-literacy**	**2. Immersive Site Experience**	**3. The collective site narrative**	**4. A future Scenario**
1.0 Build baseline knowledge of ecological principles in order to:	***			
1.1 Analyse and interpret ecological principles from the site's spatial and physical context	**			
1.2 Understand how human activity impacts on ecological systems and biodiversity	**	*		*
1.3 Begin to apply ecological knowledge to enhance site's ecological context	**			**
2.0 Gain personal/collective emotional/physical experience of the site		***		
3.0 Understand and experience human influence on the site		***		
4.0 Experience the size/scale of the site and its placement in wider context(272hectares)	*	***		
5.0 Reflect on the personal and collective landscape narrative to communicate the site character and sense of place	*	**	***	
6.0 Experiment with and speculate on scenarios for habitat creation	*		*	***

Table 3
Mapping learning objectives and vertical studio tasks. The greater the number of stars, the stronger the learning objective features in the task

Task 1: Developing Eco-literacy
Scale: Macro-Meso (1:50,000 – 1:25,000)
Exploring principles for regional habitat networks facilitating species movement

Learning objectives: To build baseline knowledge of ecological principles in order to: analyse and interpret ecological principles from the site's spatial and physical context; Understand how human activity impacts ecological systems and biodiversity, and begin to apply ecological knowledge to enhance the site's ecological context.

In groups of 2-4 mixed between BA and MA, students were asked to focus on a particular landscape ecology principle and carry out an in-depth exploration of the site and wider area using mapping, layering, and drawing. This supported students' efforts to provide, in the first instance, an ecological response to the problems of the site that related to their principles and, in the second instance, a solution(s) to reconcile human activities with ecological preservation to both support the enhancement of biodiversity and facilitate a connection

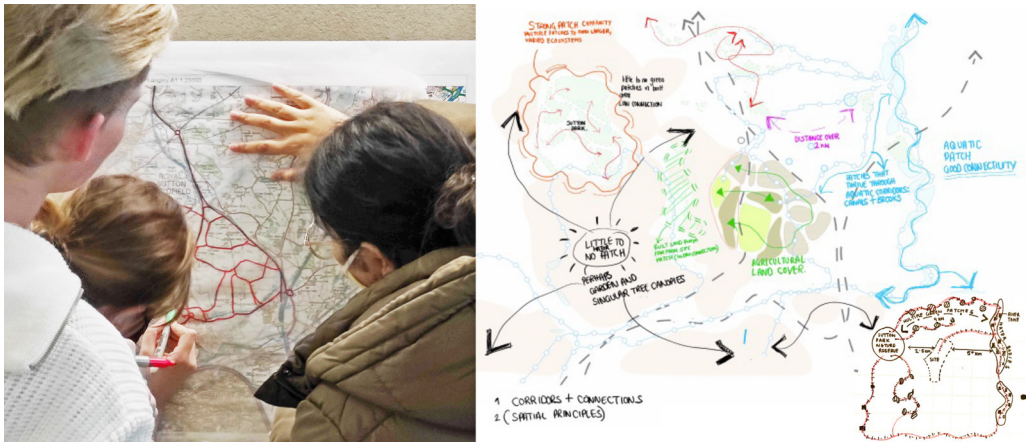


Figure 2
Task 1 output

Figure 3
Task 2 output

between the community and landscape. The task was supported by lectures that introduced landscape ecology principles to the students.

Task 2: Immersive Site Experience
Scale: Macro-Meso/1:50,000 – 1:25,000
Understanding and experiencing habitat composition and localised networks

Learning objectives: To gain personal, collective emotional, and physical experience of the site; to understand and experience human influence on the site; and to experience the size and scale of the site and its placement in a wider context (272 hectares).

The task focused on surveying the site. Following a guided visit by an ecologist, the students immersed themselves in the landscape, using drawing to capture the sense of place and gain an understanding of the intertwined processes and patterns of nature and humans. These activities also supported students in developing an un-

Figure 4
Task 3 output

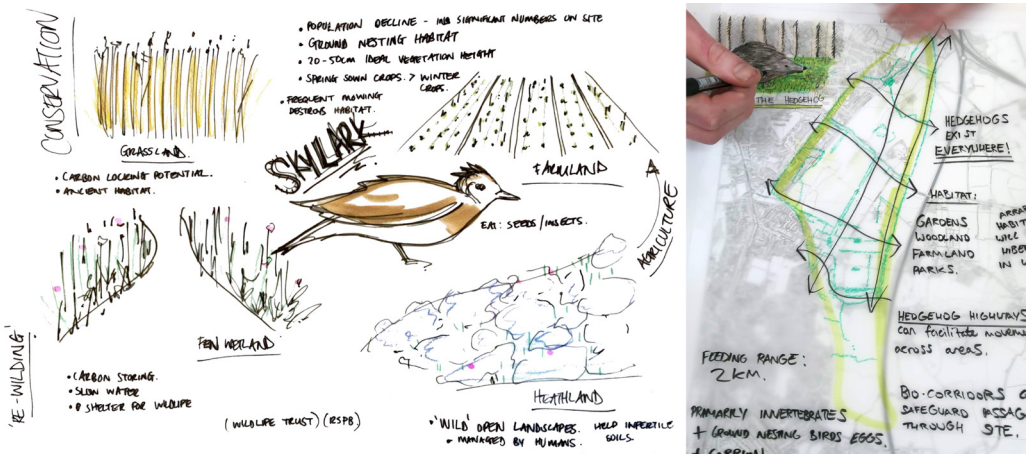


Figure 5
Task 4 output

derstanding of the landscape's character and gaining a personal perspective on their experience of the place through collecting objects, taking photos, and making sketches.

Task 3: The collective site narrative
Scale: Macro-Meso-Micro (1:50,000 – 1:25,000 – 1.5000 – 1.1)
Encouraging fluidity between scales of landscape with no definitive inter-scalar boundaries

Learning objective: To Reflect on the personal and collective landscape narrative to communicate the site's character and sense of place.

Back in the studio and again organised into small groups, we encouraged visual experimentation and the exploration of site narratives. This supported students' ability to communicate their understanding of both the subjective and objective qualities of the site. They were asked to produce a visual reflection of the site ex-

perience by reviewing their photographs, sketches, and journey collections (objects, textures, and soil).

Task 4: A future Scenario
Scale: Macro-Meso-Micro (1:50,000 – 1:25,000 – 1.5000 – 1.1)
Encouraging fluidity between scales of landscape with no definitive inter-scalar boundaries

Learning objective: To experiment with and speculate on scenarios for habitat creation.

Again, in groups, students were asked to develop a habitat mosaic sketch strategy that focused on improving habitats, specifically their structure, functionality, and connectivity, to enhance the life of a single species. They were prompted to consider a suitable scale for the design that would respond to the species' mobility and home range. This supported student's development of anticipatory competencies through the development of a future speculative scenario.

Tasks were designed based on the learning objectives. Once the tasks were designed, they were in turn mapped against each learning objective to ensure all objectives would be successfully met. As a result, the starred weighting system illustrated in Table 3 was integrated to identify how strongly the learning objective featured in each task. The mapping process highlighted that the learning objectives could be achieved through different means across multiple tasks. It was also acknowledged that by revisiting learning objectives across tasks, learners would have a greater opportunity to meet the objectives or advance their knowledge and skills in each area.

Discussion

Systems thinking competency

Our discussion is underpinned by observation of student dynamics, engagement in the learning process, review of student outputs, and our own reflections on the process.

As with McHarg's (1969) ecological method and Carl Steinitz and Peter Rogers's systems analysis model of urbanisation and change (cited in Carlsson, 2018), through this series of tasks, students are learning while working towards the creation of an environmental scenario. The scenario is devised by building an understanding of ecological principles and how human activity influences ecological processes in the overall landscape system before experimenting with a future for the landscape. Through this process, learners are challenged to reconcile competing interests between human and environmental processes within the overall landscape system. This can only be effectively achieved if problems and processes are analysed and understood first by identifying them and then by understanding their interconnected relationships and how they influence each other (Advance HE, 2021). This requirement is reflected in the scaffolding (attributed to Wood et al., 1976) of the learning objectives, where there is clear progression in the learning process. Learners are supported to engage with the unknown and uncertain aspects of the tasks and work towards greater control and autonomy in carrying them out. This is aligned with the learners' growing ability to engage with systems thinking in task

1, as it develops from an understanding of the landscape system through identifying its components and inter-relationships towards reflecting, speculating, and anticipating a new landscape future in task 4, which demonstrates complex systems thinking and anticipatory competencies simultaneously.

On examination of the learning process and task outputs, we found that this model supports a greater portion of students to develop interconnected thinking more quickly across the scale of the landscape system, from macro to meso. Some learners, however, predominately at level 5, remain focused on interactions and interventions across 'smaller' more tangible scales of the landscape system, while still engaging with interactions between components of the system. The findings also suggest that the approach supports learners to meet a wider range of ESD competencies, supporting the hypothesis that the vertical ecology studio transforms 'curriculum structures and subject-relevant content to support and enact sustainable development' (QAA & Advance HE, 2021, p. 8).

Sandri (2012) borrows from Meyer & Land (2006) to argue that 'a useful way to frame the role of systems in ESD is as a 'threshold concept' which can be defined as the key 'to understanding a particular disciplinary framework or theory', placing systems thinking central to sustainability education. The attributes of the threshold concept can easily be bridged to systems thinking, as both are troublesome and often present wicked problem(s); integrative, in the sense of transcending the boundaries of any one discipline or element; and transformative, as the learner experiences an irreversible change in their learning and worldview and an ability to see how the small actions impact the bigger picture. This expands its importance to another core aspect of ESD, which encourages a shift in the learner's worldview and supports the approach that 'the educator acts as a facilitator who empowers and challenges learners to change their worldviews' (Reickmann, 2018, p. 49).

Achieving other competencies for ESD

Through observation of studio dynamics and analysis of student feedback, it was found that the vertical studio provided students with a comprehensive set of competencies and values in addition to systems thinking. This was underpinned by a collaborative process and a range of transformative experiences, influenced by a diversified cohort and a non-linear, scaffolded approach. Through peer interaction and experiential learning, which acknowledges a social constructivist approach (Vygotsky, 1978), collaborative competencies were achieved. Accelerated learning and higher performance (Barnes, 1993) were evident. Simultaneously, by combining the cohorts and doubling student numbers, students were exposed to a wider range of design solutions and perspectives, further expanding their worldview.

The vertical studio model provided a suitable platform for peer learning and team-based learning, negotiation, cross-pollination of ideas, widening of skillsets, and expansion of knowledge. A symbiotic relationship between learners evolved, where undergraduates were challenged by the more evaluative thinking of those in the level above and were encouraged to reflect on the norms and values that

underlie their actions, while postgraduates had the opportunity to rehearse leadership and empathy and experience the untainted and unconstrained perspective of the undergraduate cohort. The collaboration has also allowed for breaking down barriers (Layden, 2014) between learning levels to create a greater sense of community, which felt particularly important following the impact of COVID-19.

In summary, in addition to accelerated learning of systems thinking, learners demonstrated advancement in normative, collaborative, self-awareness, strategic, and interpersonal competencies, which are all central to ESD theory (Wiek et al., 2011; Rieckmann, 2018).

Conclusion

The vertical studio challenges a potential shift in approach from traditional ways of teaching towards engaging students in group intellectual activities that aim to integrate skills and provide them with transformative experiences, resulting in learners meeting a range of competencies in both LA and ESD.

This project was a successful pilot that provides evidence to support the expansion of ESD-driven initiatives that encourage us to move away from existing, often siloed educational pathways. The vertical studio has pushed both cohorts beyond the module learning outcomes to generate transformative learning experiences and accelerated learning of systems thinking, which are both central to ESD and pivotal in landscape architectural education. Such projects can serve as leverage when trying to break down university modular systems, which may be an institutional barrier to instigating change. UNESCO (2014, p. 89) acknowledges that for ESD to be more effective, the educational institution must be transformed systemically and embed sustainability across the board (UNESCO 2014 in Reickmann 2018).

Acknowledgements

This project sits within a broader framework of initiatives within Birmingham School of Architecture and design aimed at embedding ESD in the curriculum at course level through prioritising interdisciplinary collaboration as a curricular and extra-curricular activity. The experimental sustainability studios have been an additional extra-curricular conduit for raising climate literacy and encouraging normative competencies amongst students and staff.

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Research through Design for Health and Wellbeing: An Exploration of BSc theses

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Abstract
There is now a large body of research exploring the health benefits provided by green spaces. However, the evidence still needs to be translated into design knowledge which can be of use to landscape practitioners. Recently, Research through design (RTD) has emerged as an approach able to bridge the gap between theory and practice. This exploratory study is based on an analysis of 17 Landscape Architecture BSc theses carried out as RTD projects between 2019 and 2021, on topics related to health and wellbeing and on a site around a hospital. Looking through the different strategies used by the students, some of the challenges of applying RTD to health and wellbeing issues can be highlighted. Primarily, although theoretical frameworks such as Attention Restoration Theory can provide useful anchors to guide and assess design products, the testing of design solutions remain problematic. Some recommendations for further research in this field are formulated.

Keywords
Research through Design, Health and Wellbeing, Student work

Introduction
Over the last fifty years, a considerable amount of evidence has been collected showing the wide ranging benefits of nature exposure on human health. Spending time in natural environments has been shown to reduce the risk of cardiovascular diseases, obesity, diabetes and mental health issues (WHO, 2016, 2021). Research has been carried out to explore the various pathways linking our time in nature to these benefits and this has been used to support policies in favour of nature conservation, green spaces development and nature prescriptions (EEA, 2020; EC, 2020; Fullam et al., 2021). Although we now know a lot about why or how green spaces are good for us, we still have not been able to pinpoint particularly which green spaces (Beute et al., 2020). Landscape architects interested in designing interventions which support the health of populations or encourage healthy behaviours still do not have clear guidelines explaining how to proceed. This is a clear case of an application gap, where theory and practice need to be bridged.

Recently, new approaches have been developed in order to do just that. Research through Design (or through Designing) is meant specifically to produce design

knowledge which can be of use to practitioners, based on theoretical or empirical knowledge (Lenzholzer, Duchhart & Koh, 2013). In order to produce this knowledge, design is used as a research method in alternance with systematic iterative testing (Nijhuis & Bobbink, 2012 ; Milburn & Brown, 2003). Although this approach has produced some promising results in specific fields such as climate adaptative design (Cortesão et al., 2020), it is yet to be applied to the topic of health-supporting design.

In the BSc Landscape Architecture theses carried out in Wageningen, students are asked to use a Research through Design (RTD) or RTD-like approach in order to produce designs and design knowledge. In 8 weeks, they have to investigate a specific issue related to a specific site and submit both a research report and design materials solving the issue identified.

In the last 3 years, I have supervised 17 BSc theses on the same site: the Gelderland Vallei hospital in Ede, Netherlands. Students were invited to design and develop a strategy for the transformation of the site into a sustainable working and resting place, actively contributing to the implementation and development of health-related concepts. They were free to focus in detail on parts of the park or consider the whole area for the site scale proposals. Similarly, they could choose to focus on a particular health-related issue (e.g.: accessibility, restoration, etc.), a particular population (e.g: staff or patients, particular disabilities, etc.) or consider health and wellbeing as a whole. The only firm requirement was that their project had to be carried out as RTD, specifically as a series of test and experimentations carried out iteratively. They had to create (and evaluate) design models to explore alternative solutions. Each iteration had to be rigorous, justified and discussed scientifically, using clear criteria.

Using their work, some preliminary considerations can be formulated for researchers interested in developing the potential of RTD to provide valid and usable knowledge to guide practitioners looking to design landscapes for health and wellbeing.

Methods

Introduction to the site

Hospitals are particularly important health centres where a wide diversity of people work, visit and rest. However, they are often confined to concrete islands and surrounded by car parks, which reduce both patient and staff's opportunities to improve their health using nearby environmental resources.

The Gelderland Valley Hospital (Ziekenhuis Gelderse Vallei or ZGV) is a general hospital in Ede, The Netherlands. It was chosen for its proximity to Wageningen University and its potential for development. The ZGV has more than 400 beds, around 2600 employees and an annual turnover of more than € 226 million. They take care of patients in West and Central Gelderland and East Utrecht, a catchment area of more than 260,000 inhabitants. Although it was recently redesigned, the site of ZGV suffers from a high proportion of impermeable surfaces (Fig. 1), increasing the likelihood of floods, noise and air pollution, low quality open spaces, an isolated character and an unsustainable energy system.

Specifically, it is surrounded by busy roads which create noise and keep the hospital separated from a large park in the North (Fig.2).

Analysis of the students work

The 17 BSc theses were analysed primarily for: the theories they used as conceptual framework, the populations they focused on, the types of assessment and criteria which they used to evaluate the design solutions they produced and the guidelines which they resulted in for the design of the site.

The analysis was conducted manually, using qualitative and quantitative indicators, such as the number of time a theory was used. The assessment strategies were highlighted manually based on the data found in the theses.

Results

Theories and topics

After a first field visit, students were asked to identify some issues on site and to find a theoretical framework to anchor their work. Although their main focus had to be health and wellbeing, they were also encouraged to consider issues related to climate change so that the proposed development would be resilient to changes in temperature/rainfall and energetically sustainable. Their design had to respect and support the biodiversity and ecology of the site as well as allowing for a multifunctional use of space.

Fig. 3 shows the theories and concepts students decided to focus on. About half of the students chose to focus on a single concept/theory, and the other half preferred to consider two or more theories in their work. When considering the nexus between two concepts, students either chose to combine both Attention Restoration Theory (ART) and Accessibility, or combine either of these with others. Thermal comfort was mostly combined with Accessibility, and Acoustic comfort with ART.

Overall, two main concepts or theories emerged: Accessibility and ART. These two

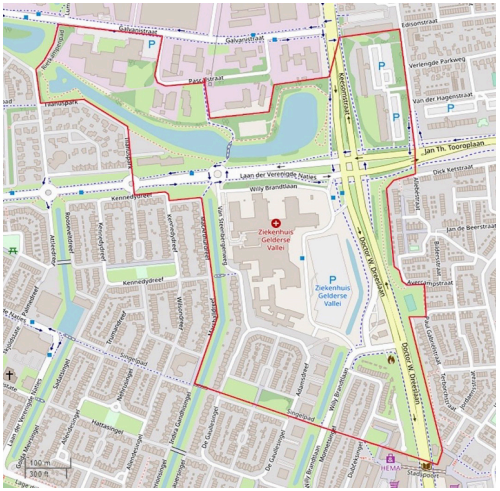

Figure 1 (above)
Main entrance of the ZGV (from https://www.geldersevallei.nl/contact/locatie/ede [accessed: 05/07/19])

Figure 2 (left)
Study site (via openstreetmap)

concepts show some of the main issues in both the site and the field of Landscape Architecture for Health and Wellbeing.

Accessibility
Accessibility is one of the primary environmental characteristic linking green spaces and the delivery of health benefits (WHO, 2016). Although viewing green elements through a window can have a small effect on health, studies have shown that being able to access these green elements and engage with them only multiplies these health benefits (WHO, 2016). Indeed one of the main reasons behind green spaces being good for our health is their provision of opportunities for physical activity (WHO, 2016).

Furthermore, the ZGV site suffers from many accessibility issues, particularly as the green space outside the hospital is not directly accessible to patients or visitors. Therefore, this concepts was particularly relevant to the site.

Attention Restoration Theory
Attention Restoration Theory (ART) is one of the main theories in Environmental Psychology which describes the health benefits of spending time in natural environments (Kaplan & Kaplan, 1989). Although it was formulated over 30 years ago, it continues to be validated through empirical work to this day (Ohly et al., 2016). It also provides some spatial considerations for the creation of restorative environments and as such, it is a theory well suited to the practice of Landscape Architecture.

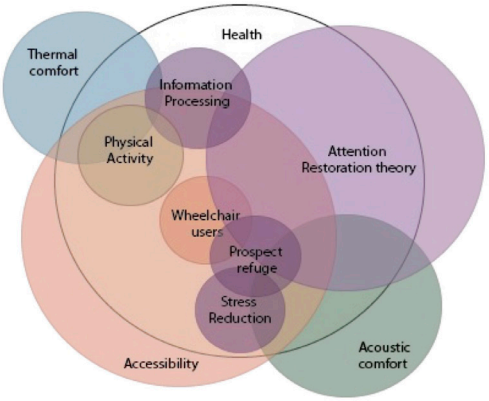

Figure 3
Diagram showing the concepts and theories used by the students. The size of the cercles show the number of students using that framework. The overlaps indicate the number of time the topics were researched together

Table 1 shows the repartition of the populations students chose to focus on.

Research strategies
The practice of post-positivist RTD requires the formulation of two types of intermediate design knowledge: design guidelines and design criteria (Cortesão et al., 2020). Design guidelines are recommendations based on theoretical or empirical knowledge, which can support the design to ensure a desired effect. Design criteria are operationalized concepts which can

Populations	n
Elderly people	4
Dementia patients	1
Hospital staff Staff and patients or surrounding residents (General population) Patients and visitors Wheelchair users Inpatients Overweight people	4 3 2 2 1 1

Table 1
Populations students chose to focus on (N = 17)

be used to assess that the design does indeed produce the desired effect.

An important aspect of RTD is its iterative process, which alternates design (following guidelines) and assessment (using criteria) (Cortesão et al., 2020). However, within that approach, many strategies can be followed. During their BSc thesis, students were found to follow either one of two main strategies.

Strategy 1: Nested scales
In this strategy, students planned their iterations as nested scales. In this case, they had to produce two sets of criteria which could each be applied at a certain scale. In their first iteration, students would create two alternative masterplans, or conceptual or zoning plans, and then use their "Large-scale criteria" to assess which alternative was best. They would then zoom in into their best large-scale design in order to choose a location to develop at the site-scale. At this scale, they could produce two alternative detail plans, including visualizations and cross-sections, then use their "Small-scale criteria" to find out which alternative was best. The output was then a well-justified master- or concept plan accompanied by a well-justified detail design (see Figure 4).

Strategy 2: Itinerary
In the second strategy, students planned their iterations as an itinerary where both designs were carried out at the same scale but in different locations. In this case, they only had to produce a single set of criteria which could be applied for both designs. In their first iteration, students would usually work on the connection between the hospital and the park, and create several alternative interventions to link the two.

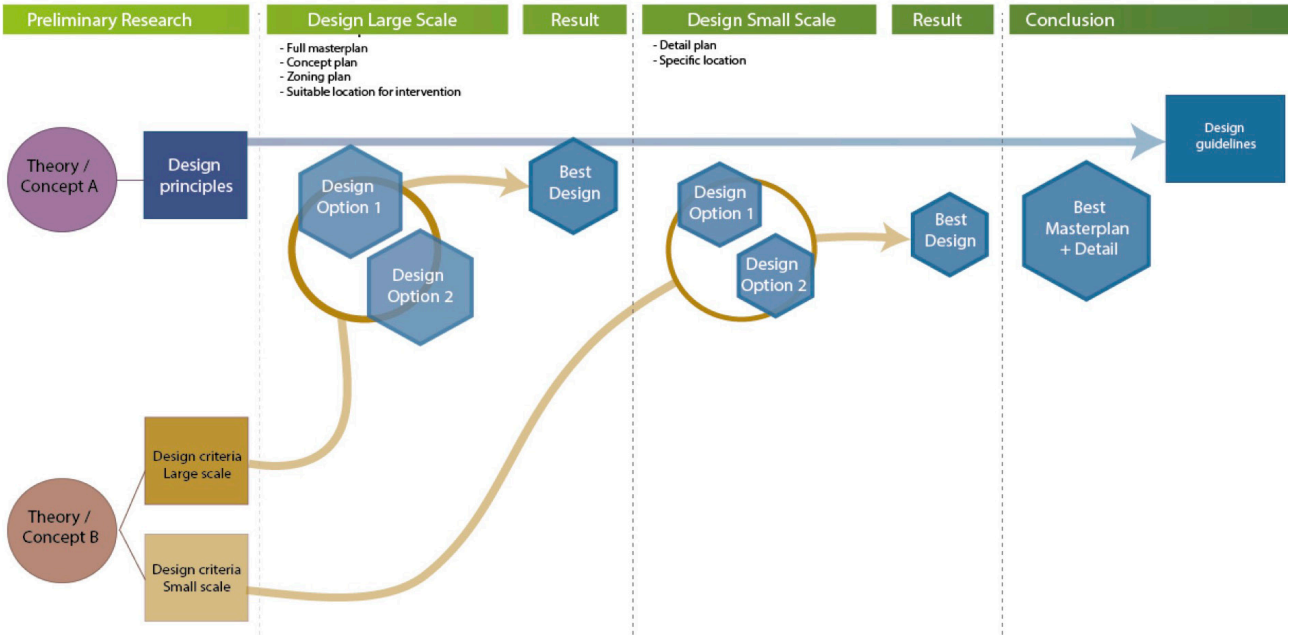

Figure 4
Strategy 1: Nested scales

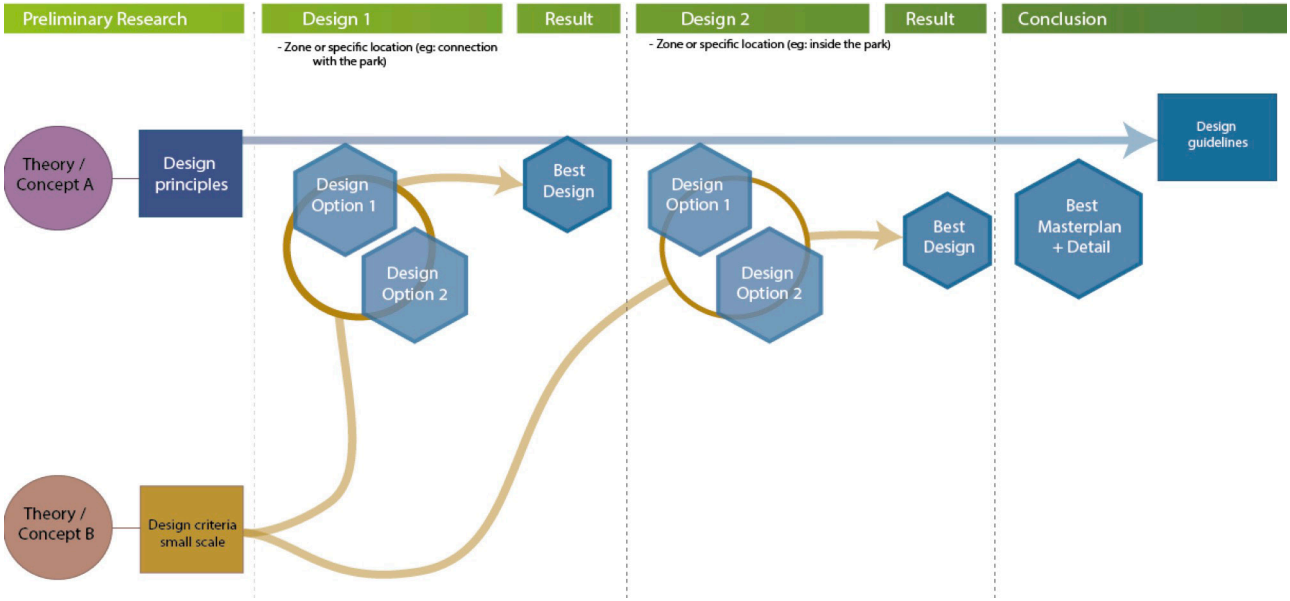

Figure 5
Strategy 2: Itinerary

Using their criteria, they could choose which intervention was more likely to be effective. Once that connection was established, they could move on to designing the inside of the park, following a similar process of producing several alternatives and assessing which one was best. The output would then be a well-justified design of the park including a connection to the hospital (see Figure 5).

Preliminary criteria and design principles
In order to test that their design achieved its goal, students had to operationalize theoretical or empirical concepts into applicable criteria. Most assessments were done through multicriteria analysis carried out by the students themselves.

For example, the concept of "accessibility" could be operationalized into quantitative indicators such as: the number and size of paths, the number of connection between paths, the distance to the entrance to the hospital, etc. Alternatively, qualitative indicators could be used such as: the likelihood of falling, sense of safety, aesthetics, etc. For these qualitative indicators, students discussed the benefits of limitations of each alternative in order to come to a decision. For the quantitative analysis, students could simply score each alternative and sum up the points to determine which alternative was best. In several cases, the assessment also allowed the combination of both alternatives into a "best of both worlds" final design. Additionally, design guidelines were formulated based on spatial interpretations of the literature and then refined through the design process. For example, the four characteristics of restorative environments as defined within ART could be interpreted into different guidelines: "extent" was translated into the connection of the design to the identity of the surrounding landscape, using typical and recognizable landscape elements like iconic trees or topography. It could also be

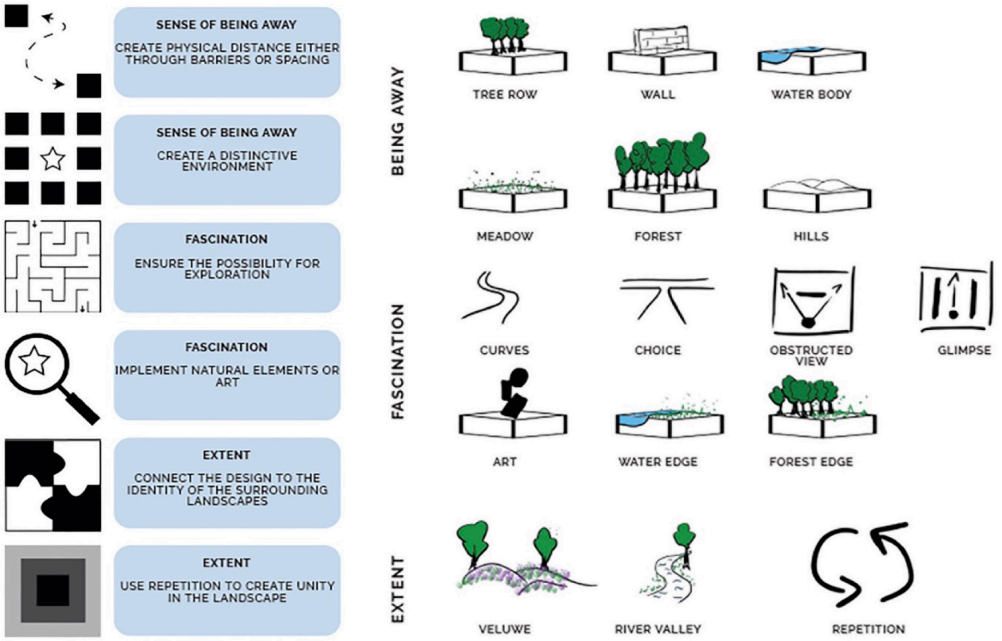

Figure 6
Example of design guidelines formulated by the students

achieved through the repetition of materials and patterns throughout the landscape to provide a sense of unity (Figure 6).

Discussion

Generally, students found the process of RTD both stimulating and challenging because of the strong tension between the creativity and the scientific rigueur which were required of them.

This is particularly true when considering the health and wellbeing effects of landscapes. Much of the literature on the topic comes from disciplines adjacent to the medical sciences, deeply rooted in post-positivism where quantitative approaches are preferred and randomized controlled trials are seen as the golden standard of evidence. As we move towards a more holistic understanding of health, it is hard to formulate general practical guidelines such as the ones produced through RTD. However, it is clear that implementing RTD can add a valuable creative and exploratory dimension to the process. In the RTD process such as it was carried out here, students had to validate their findings through rigorous discussions and systematic application of their well-justified criteria.

Some of the challenges stemmed from the difficulty of operationalising important concepts from the literature into design knowledge. For example, 'accessibility' could be linked to safety and aesthetic (qualitative assessment), or to the number of paths connections, width of path, number of barriers, etc (quantitative assessment). Although these criteria are not mutually exclusive and could all be used, their systematic application required time and refined discussions which were often

outside of the scope of the BSc thesis level. Without being able to test these constructs in the real world, students had to argue their choices.

They also discovered the importance of aligning design product and criteria so that they could test their designs in the most effective way. Generally, they found that concepts such as accessibility and visibility were best assessed at the large scale, whereas experiential criteria could only be applied at the site scale.

Generally, health effects are complex and depend on a variety of factors, some behavioural, social or cultural. Predicting the effect of design interventions is a difficult endeavour, which still remains to be carried out by experienced researchers and practitioners. Therefore, further research in the field should focus on exploring the RTD approach further. Firstly, more Research On Design, exploring successful design interventions for the health and wellbeing of populations and investigating their spatial characteristics could help produce some basic design principles for similar types of environments. Then, more assessment methods and design criteria should be defined, potentially inspired by participatory design or quantitative methods like the Perceived Restorativeness Scale (Korpela & Hartig, 1996) but applied to design scenarios rather than real sites. Finally other innovative methods have produced promising results such as the use of VR combined with physiological measurements (Wang et al., 2019) or agent-based modelling (Badland et al., 2013), and deserve further investigation.

Conclusion

By looking at the exploratory work of these BSc students, different approaches could be sketched out and theories with the most potential to create scientifically valid design knowledge to guide the design process of landscape architects willing to increase the health benefits offered by the spaces they conceive were highlighted. Research through design for health and wellbeing is a particularly challenging task. Health studies are deeply rooted in positivism and post-positivism where quantitative approaches are preferred. Additionally, the health benefits of green spaces are wide-ranging, complex and interrelated, which makes their translation into usable guidelines and criteria difficult. However, this endeavor is critical, particularly as we continue to deal with a global health crisis which highlights the importance of outdoor spaces.

Acknowledgements

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Abjuring Scales

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Abstract
The contribution provocatively contemplates substituting the term scale in landscape pedagogy for alternative concepts, like resolution. Dealing with this goal implies first thinking of the landscape as a complex system of relationships. This point is decisive concerning re-directing the articulated, dynamic, and profoundly unstable interactions between humankind, territory, and the environment. It, therefore, becomes fundamental to clarify the complexity beyond the relationship's identification and multidimensional value. The process involves a plurality of factors beyond the correlation between subject and object or object and object, extending it to the organisations of objects to exceed the most immediate possibilities of description.

Focusing on relationships reduces scales' significance because it forces us to recognise the variety, multidimensionality, interrelation, and systematicity present in the landscape, making these aspects operable through design. Consequently, it emerges to go beyond the scales, abjure this term, and consider possible alternatives.

Living digitally, we can, for instance, speak of 'resolutions'. This concept well renders the idea of collecting data on several levels with varying degrees of detail, allowing variable reading, from extensive considerations to samplings on otherness and smallness. The result is dissecting the characteristics of each situation, ascribing them to differentiated relational dimensions. To exemplify: the value of patterns and structures in the vast configuration can be associated with their density, quality, and aesthetic in any milieu part of a mosaic. Not less important, this perspective allows re-including some values sometimes forgotten in contemporary practice, like form-thinking and re-establishing the human presence and perception as central in design.

Keywords
Landscape design, pedagogy, cross-scale approach, relationships, resolution

Introduction
Dealing with the concept of scale concerning the complex universe of landscape architecture is challenging. This difficulty is compounded by the polysemy of the term landscape, its universality and its interdisciplinary nature. For this reason, even when approaching the landscape from the architect's point of view, the influences of other disciplines, such as geography, ecology or geology, and the internal differences between design or planning outline a vast

field of choices and possibilities. Consequently, this world has become so wide that one quickly misunderstands the sense and meaning of certain choices concerning the design and its cultural more than practical significance, especially regarding scale questions.

This problem is familiar and has taken on greater weight as landscape architecture has ceased to be a discipline linked to the design of limited objects – open spaces, parks and gardens – in favour of the 'transition towards public services' (Newton, 1971). Over the decades, this process has led to an ever-increasing problematic extension towards the questions of the environment, deepening the interaction and confrontation with 'other' disciplines. The result is a growing habit of dealing with other forms of knowledge traditionally accustomed to working on different themes and scales. Consequently, landscape architecture progressively assimilated new points of view and ways of thinking, not always in a clear and codified manner, including new scale paradigms.

However, these reciprocal contaminations and influences are numerous and very difficult to portray in a unitary framework. Their variety is deeply linked to the developments that, in different ways, have accompanied the birth and development of landscape architecture in European nations and world countries (Wolschke-Bulmahn and Clark, 2021; Treib, 2002). To be more transparent and objective is helpful providing some examples related to intending the concept of scale, allowing us to compare the Italian case to another European situation, like that of France. Here, for example, the tradition of dealing with the relationship between infrastructure, territory and architecture is well established, and thinking relationally and systemically is a shared attitude. This ability is the consequence of a pioneering approach in dealing with expertise and disciplines that contribute to breaking the boundaries within scales. For this reason, it is well recognised how this country has extraordinarily anticipated some direction comparable to the landscape urbanism approach, as recently described in the special issue of the magazine A+U titled "landscape urbanism in France" (2022). As illustrated, this analogy happened in a completely autonomous and unconditional manner representing the logical consequence of a consolidated ability to deal with issues of scale that date back to the foundation of polytechnic culture and the birth of modern engineering.

In contrast, in Italy, the lack of an authentic tradition in landscape architecture has emphasised the differences and made the genesis of the cross-scalar approach more difficult. Thus, paradoxically, a very articulated field of debate emerges in which the question of scale plays an essential role, especially in relationship with the more traditional competencies of architects and planners (Durbiano et Robiglio, 2003; Sampietri, 2008). Therefore, the question of scale became a conflict between disciplines and a problem in education. Moreover, it introduced dangerous simplifications regarding the importance of relationships for the landscape and their cross-scalar implications.

From these considerations, the following contribution is organised into four main parts. The first refocuses on the theme of

the relationship concerning the theoretical definition and the design of the landscape. Reframing the relationship issue leads to an insight into its implications concerning scale. The exposition clarifies how the multiplicity of interrelations identifying the landscape phenomenon finds an obstacle implicit in any attempt to limit its scope. The constraints associated with the notion of scale are thus highlighted and explored in landscape architecture education. Through this process, the possibility of identifying an alternative term to the concept of scale emerges.

Then, a second part leads to the provocative hypothesis that abjuring the term scale in favour of an alternative concept, like resolution, provides a more effective metaphor in contemporary landscape education. This section culminates in formulating an operating methodology based on the use of the concept of resolution.

It follows a third section explaining the practical experimentation of the theoretical assumptions practised in the author's teaching activity at the Architecture School of Politecnico di Milano.

Lastly, a series of provisional conclusions draw a summary picture and propose a developing interpretation of this content.

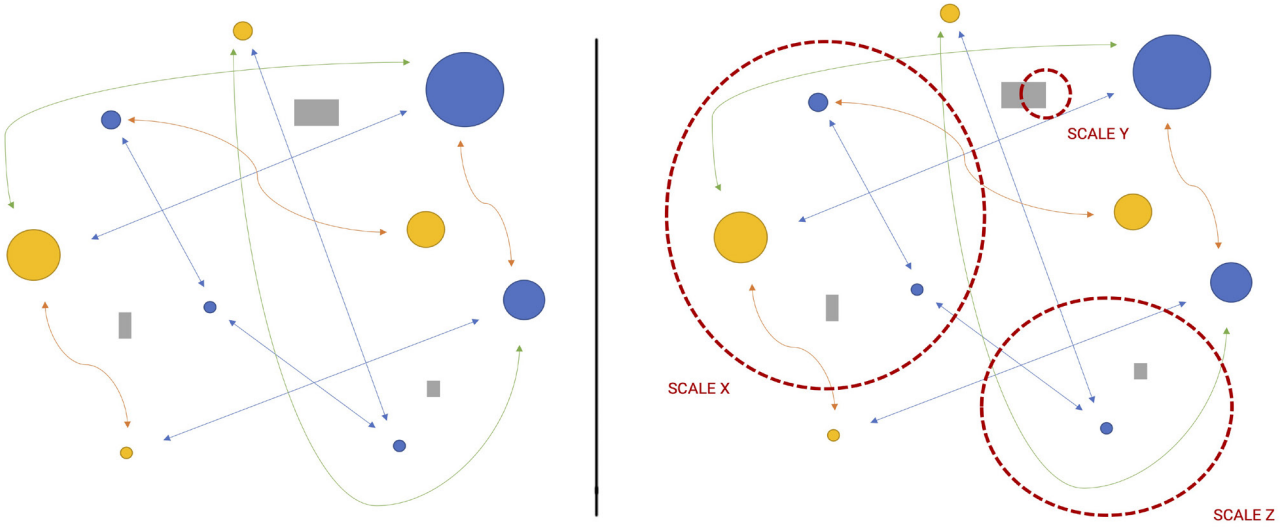
Landscape as interlacing of relationships

To trace the value of the concept of relationship about landscape requires a return to a definition. Indeed, it is necessary to emphasise what guarantees a real possibility of distancing the landscape from relative terms, such as territory or environment, and determine what produces this distance.

It is helpful to situate the landscape in a dialectical space oscillating between aesthetics and science, understanding this concept more as the expression of a way of thinking of space as a set of relationships rather than as a physical site or a territorial or geographical area. This operation makes the landscape more than a modification support, an ideal thematic horizon and a field of confrontation for contemporary design (Gambi et Gregory, 2000).

Therefore, the relationship issue represents a decisive aspect regarding implementing a theoretical and pedagogical theory that contemplates a notion of landscape comprehensive of the dynamic, interrelated, evolving and profoundly unstable interactions between man, territory and environment.

Deepening this concept leads to the Tractatus by Ludwig Wittgenstein (1954), where he provides a significant hypothesis on how to intend this system of interactions, i.e. relationships. He observes that "an atomic fact is a combination of objects – entities, things" (prop. 2.01). For this reason, "just as we cannot think of spatial objects at all apart from space, or temporal objects apart from time, so we cannot think of any object apart from the possibility of its connexion with other things". Therefore "if I can think of an object in the context of an atomic fact, I cannot think of it apart from the possibility of this context" (Wittgenstein, 1954: 2.01, 2.0121). These assumptions return consequentiality and logical structure capable of clarifying the density and plurality characterising the notion of landscape. It also emerges the dynamics that support it, with obvious re-



percussions in the relationship between entities belonging to different spaces, i.e. scales.

The Italian epistemologist Silvano Tagliagambe (2018) has explained the same assumptions less hermetically speaking directly on the landscape. He focused on the importance of an 'ontology of relations' regarding landscape design. With this definition, he refers to investigating how entities are grouped into categories to understand how the 'places in the space' assume an 'objective positions' concerning an equally relevant position of ourselves in relationship to our surroundings. This attention is necessary because nothing can be understood as an independent position in the landscape, having an autonomous meaning in its own right. Consequently, reflecting on the relationships guarantees the possibility of 'inscribing around us the variable scope of our intentions or gestures'. In this way, the activity of discovering the existing relationships assumes the meaning 'to read the world' and to 'prefigure' all the 'plans of action that we could undertake on it, combining constraints and opportunities, a sense of reality and possibility, achieving a harmonious balance between these two opposite poles' - in short: design.

Many scholars return to this topic, explaining how 'landscape design' is the 'design of relationships' (Bocchi, 2009; 2012); indeed, this assumption cannot be overturned. A distinction between design and planning is also recurrent in the literature, with different repercussions on the 'definition' of the scales employed. This fact has little importance in our discussion because, as has been observed, "planning and design are reciprocal processes; the lack of understanding of the big picture would lead to weak design. Such reciprocal processes have led to interdisciplinarity approaches with interconnection scales, from urban to regional and global dimensions-thinking globally and acting locally"

Figure 1
The diagram on the left provides an abstract representation of the landscape as a system of relationships between different entities. On the right, it is provided with a visual demonstration of how selecting particular scales implies missing some relationships from big to small objects or their organisations

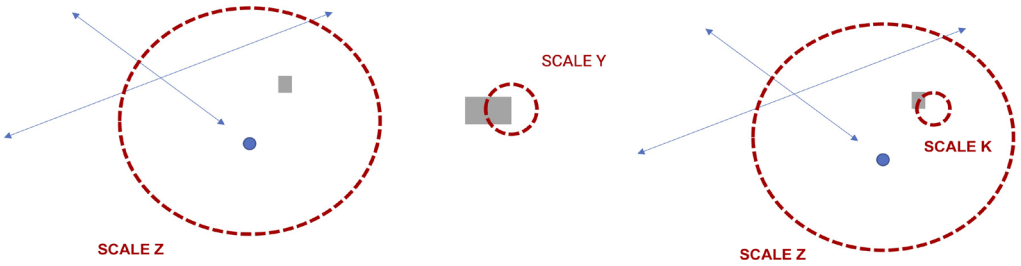


Figure 2
The diagram represents from left to right: scale 'Z' - Selection missing the relationships object/object/context. Scale 'Y' - Selection missing the intrinsic qualities inherent to one object. Scale' Z' - Choice limiting the recognizability of relationships.

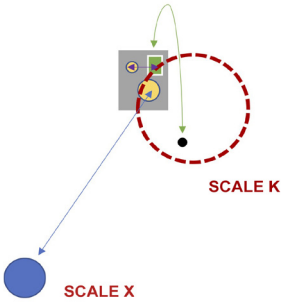


Figure 3
Scale 'K' - Example where a more detailed observation allows to recognise new forms of the relationship somehow related to the scale 'Z' previously explored without enough critical attention

(Samaneh Sadat, 2022). It can therefore be reasonably argued that there is no ideal scale of design or planning. What is required is a path that combines different scales, chosen according to the particular observatory from which the transformation is framed.

However, transcribing these concepts from theory to practice is not easy and requires considerable effort. This fact represents a significant obstacle in the education of landscape architects, and the rigidity in the question of scale furthermore limits it. A sophisticated synthesis is required to clarify the necessity of relationships, overcome the complexity that transcends their identification and explains their multidimensional value. This process involves a plurality of views and critical interpretations which are not necessarily related to the size or location of the site, the nature of the theme or the project programme but depend on the multiple relationships the site entertains with the context. Those are not limited to the relationship between subject and object, nor between object and object, but extend to the organisations of objects and the complex interconnections that transcend the most immediate possibilities of description.

When confronted with the proposal of a cross-scalar process, the recurring question from students is which is the project site or that is necessary, clarifying on which scale the problem is being addressed - global, regional, or local scale. This frequent experience gives the impression that it is easier to conform to an established way of looking rather than to challenge oneself by defining a personal and original way of looking that breaks the traditional conventions within which the problem of landscape architecture is assumed.

In short, the experience of teaching landscape design and the attempt to introduce students to reflect articulately concerning these themes is challenging. Significant difficulties lie in understanding the less apparent forms of relationships and, in doing so, transcending the limitations imposed by site, theme and programme. Conse-

quently, it is not easy breaking boundaries and switching between different scales, not to contextualise or frame, but to comprehend how acting on one part involves altering the entire system. These brief considerations illustrate how the landscape's multidimensionality struggles to emerge due to the difficulty of predicting how an operation concerning small and limited territorial portions may have effects that reverberate throughout broad and sophisticated geographical assets, nevertheless the opposite.

The question, therefore, is whether it is possible to abandon the term scale in favour of an innovative terminology that can make more explicit the nature of a multidimensional project in which the effect/action chain has consequences and potential repercussions at all scales concerning the problem involved.

From scale to the resolution

Reading a text by Michel Desvigne (2012: 25) helped to find a metaphor capable of explaining the need for a multi-scalar approach to landscape design and of considering a terminology analogous to the concept of scale but free of a tradition that limits its scope of application. He states: "perceiving the scale and making the right response of the right dimension is, in my view, the key to the success of a project for the recomposition of a territory. In methodological terms, a permanent gauging is needed, [this] obliges us to tackle all scales at once: implementing a strategy of organisation over the long term, looking at things on smaller scales […] for places in which pieces of city are actually going to be built, and carrying out concrete experiments on even smaller scales […]. This simultaneity of the work on a varying scale forces us to keep adjusting our gaze, so that each new point of view explains or questions the previous and permits the evaluation of hypotheses formulated for future development. So, adjusting the gaze and evaluating the interventions are indispensable in order to avoid the rock on which the development of territories comes to grief today".

The citation, despite a classic recall of the concept of scale, also considers the hypothesis of the need for constant adjustment, offering a more inspiring metaphor that introduces an optical process, which allows us to zoom in and out, focusing on the general and, at the same time, being able to concentrate on the particular.

Thus, in a world dominated by the digital experience, it is possible to think using the term' resolution'. The concept is well suited to describe the sense of an investigation that collects data at several scales and returns them in concise images, capable of fully orienting the project path. In this way, it is possible to perceive something tangible, which allows moving within an accumulation of data with a high density. Consequently, it is possible to make all the considerations required by exceptionally vast territories without sacrificing the opportunity to conduct specific research to explore the small dimension. This potentiality is enabled by the superabundance of data collected and their effective systemisation.

The metaphor of the resolution also becomes significant concerning the theoretical definition of design, offering a metaphor that describes the possibility

of dissecting the specific features of each situation by ascribing them to differentiated relational dimensions. This potentiality assumes great importance in a scenario where it is more challenging, especially for those involved in landscape design than planning, to identify a correct way to assess the infrastructure endowments, ecological features, and ecosystem services. In fact, a high-resolution model would allow better integration between what is possible to identify on a vast territorial asset and what takes place in a local situation. Consequently, the merits of the individual facts can be associated with the whole, highlighting continuities/discontinuities, resources/criticalities, and emergencies/labilities that are only understandable approaching the study of limited portions of space.

The term 'resolution' finds another reason reflecting the transition from digital to material form. In digital photography, there is, in fact, a substantial difference between the data we accumulate from the potential of a sensor and the possibilities of restitution on the screen or in print with a discard of information that, in most cases, will be imperceptible.

A mapping operation will therefore have to work at high resolution in collecting data, qualitative elements, references and observation and then produce some synthetic materials at differentiated resolutions. This process results from selecting valuable data to circumscribe a given theme and provide comprehensible restitution. This operation entails abundance, selection and discarding, and in this sequence lies the critical dimension underlying a mapping operation and a good design process.

From theory to landscape studio practice

This methodology describes how a teaching and design path was born and experimented with in the last academical years by the author within the Bachelor's and Master's degree courses of the AUIC School of the Politecnico di Milano. This formulation is not a definitive point in the process of experimentation but an intermediate point in the course of trials that continues to be refined and adapted based on student feedback and the results of design experiments.

The studio experiences are ordinarily opened with a relatively free and experimental investigation of the problem, which includes collecting information and formulating a personal critical position and point of view. Of course, the studio provides a critical contextualisation, poses a central issue and provides a focal location for the design experiment, but without imposing field limitations, defining selected sites or imposing constraints of any kind. According to this path, the first part of the studio consists of collecting the elements that enable highly subjective interpretations. The result is a set of maps, cross sections, diagrams, infographics, and a collection of graphic, iconographic, photographic and physical evidence supporting a critical position and allowing the formulation of a pre-visional hypothesis. These composite materials provide descriptions at different resolutions, allowing cross-scalar readings bridging to a strategic hypothesis capable of multidimensional effects on the landscape. Specific, more canonical design experiments typically follow this first comprehensive and rich exploration.

Similar paths are applied to the master's final projects, with greater complexity and detail.

Some provisional conclusions

Judging the goodness of this design and teaching process is complex. The validity of the term' resolution' is also uncertain. Students always ask what project site or the working scale, demonstrating a recrudescence into a methodology that requires working on a specific vision rather than enthusiastically accepting a path that involves becoming aware of the situation and identifying a plausible direction to approach.

Despite this, what is excellent and noticeable is an increasing curiosity induced by the perception of a less constrained and less dogmatic procedure, which undoubtedly produces more engagement.

This feeling creates a compelling perspective for investigating a phenomenon such as the landscape, which must be unrestricted within too precise limits without risking renouncing its true nature.

The hope is that this approach, less conventional and more experimental, can also accompany students outside the academy's walls, reinforcing the conviction that landscape design is first and foremost a cognitive process and only afterwards the formulation and implementation of a modifying proposal. It is, therefore, possible to recover the meaning of many forgotten, exploited and marginalised landscapes, allowing us to link every single realisation to the system of meanings it assumes with the complexity of the territory in which it is inserted. Moreover, this multi-resolution, hence multi-dynamic and multi-spatial exploration, allows us to re-establish a link between ecological themes associated with territorial structures to the places where human presence and perception become central.

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Merging landscapes' scales: A journey through pedagogical approaches in Landscape Architecture Studios in Indian Context

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Abstract
Landscape Architecture as a discipline in India is over five decades old. The scope of a landscape architect's work is broadly limited to urban contexts and focuses more on designed landscapes, and it poses a great constraint in terms of availability of opportunities in the practice to work across scales of landscapes. These landscape settings at design scale are limited within a boundary of tangible things. Curating and conducting Landscape Architecture studios at post graduate level in India is becoming an increasingly challenging task in the times of political, social, ecological and economic flux. The paper takes an overview of themes selected for the academic studios at Masters level program at BNCA, Pune (State of Maharashtra, India). The paper demonstrates the methodological challenges and opportunities occurring through the journey of 13 to 14 years. The study also reveals how the pedagogical approaches have undergone changes responding to the student-centric and program centric parameters such as the availability of digital tools, exposure to international academia, internal and external contexts, and prevailing issues specific to the place. The study employs interview method and content analysis method to analyse the data from the past and present studio works. The findings reveal the increasing significance of merging the landscape scales, deriving simultaneous and context-specific responses to various scales, and evolving the pedagogical approaches to accommodate not only the scales of change but also the changes in the landscape surrounding us. The dynamics of landscape architecture, the physio-cultural context of State of Maharashtra, India and the challenges of design pedagogy are highlighted in this paper through graphical and textual representation.

Keywords
Merging scales, design pedagogy, dynamics of landscape architecture, physio-cultural context, digital tools

Introduction
Landscape architecture as a discipline involves salient aspects of many allied disciplines such as ecology, art, engineering,

history and humanities, art and culture, law, digital science, etc. Landscape Architecture encompasses not only the tangible aspects of physical planning but also involves the intangible aspects of spatial and social planning (Gazvoda, 2002). It is an interdisciplinary and holistic discipline, which responds to time, place, and people. Corner (1999) describes landscape as an ongoing medium of exchange, as a medium that is embedded and evolved within the imaginative material practices of different societies at different time. The landscape pedagogies are derived with the primary objective of designing and planning of landscapes set within diverse and dynamic settings.

The External Context:
Landscape setting and its dynamics
The set of physical/ geomorphological setting of a place with its location, climate, soil, vegetation, hydrology, and other socio-cultural, economic, and political parameters pose an external context for landscape pedagogies to evolve in a certain direction. They represent and reflect the external context that they belong to or respond to over the years.

Each city/town/village is set within its own natural, historic, cultural, and political setting (Gupta & Diddee, 2000), with an array of landscapes and temporality of seasons. The human-beings and other living beings are an integral part of the landscape. They witness dynamics of natural and cultural landscape, with assets, issues, and the values. People embody in these landscapes their own values and experiences. Landscapes pose challenges and offer opportunities for people to evolve or transform with them. The changing landscapes in the era of climate change relate closely to equity and justice that is threatened rapidly and people witness the extremities of it as well. Human beings are one the most significant stakeholders who could respond to the dynamics of the external landscape but have little control over the same. At times, leaving nature to heal on its own too works without intervening into the dynamics of nature.

The Internal Context:
Landscape Architecture Education
The internal context on the terrain of Landscape Architecture Education, involves students, faculty, and the program itself at the core of it. Landscape Architecture Education has a key role to play in inculcating the right values and ethics towards making Landscape Architecture profession move ahead in the right direction in Design, Planning and Research (Sahasrabudhe, 2016).

The fast pace of advancement in the tools and methods of resolving and evolving spatial experiences at various scales and in diverse socio-cultural-natural contexts is making the field more challenging for novice and established practitioners, and for new and experience faculty both. At the same time, this phenomenon is offering the students and professionals of the field of landscape architecture, new ways of thinking, learning, and creating outdoor spaces. Frameworks are being evolved by the educators and researchers based on the existing frameworks. A landmark framework was evolved by Carl Steinitz (1990) in landscape architecture which he kept on evolving and modifying further, with his experience in landscape architecture education and practice. Stein-

itz's framework (1990) emphasises on application of theory, integrative approach, diverse-valued perspectives in landscape architecture education. Hollstein's paper (2019) investigates Steinitz's framework as a valuable heuristic for emerging disciplinary needs in landscape architecture.

Owing to the progressive, interdisciplinary and diverse nature of the discipline, pedagogical frameworks in landscape architecture must respond to the dynamics of scales and time, to keep the students informed about the current and future trends to become responsible designers and 'reflective practitioners' as Milburn, et al states it (2003).

Landscape Architecture profession in independent India dates to 1970s, which is a comparatively recent phenomenon. The education and profession of landscape architecture in India has come a long way with about six hundred Landscape Architects. Eleven institutes recognized by ISOLA (Indian Institute of Landscape Architects (ISOLA), a professional body of Landscape Architects, established in May 2003) are presently offering a master's course in Landscape Architecture and the numbers show a rising trend (Sahasrabudhe, et al., 2021).

The present paper deliberates and elaborates on the pedagogical journey of the author (as a faculty and coordinator) since 2006, of curating and conducting Landscape Architecture Studios, mainly of the third semester of a two year postgraduate (master's) program in Landscape Architec-

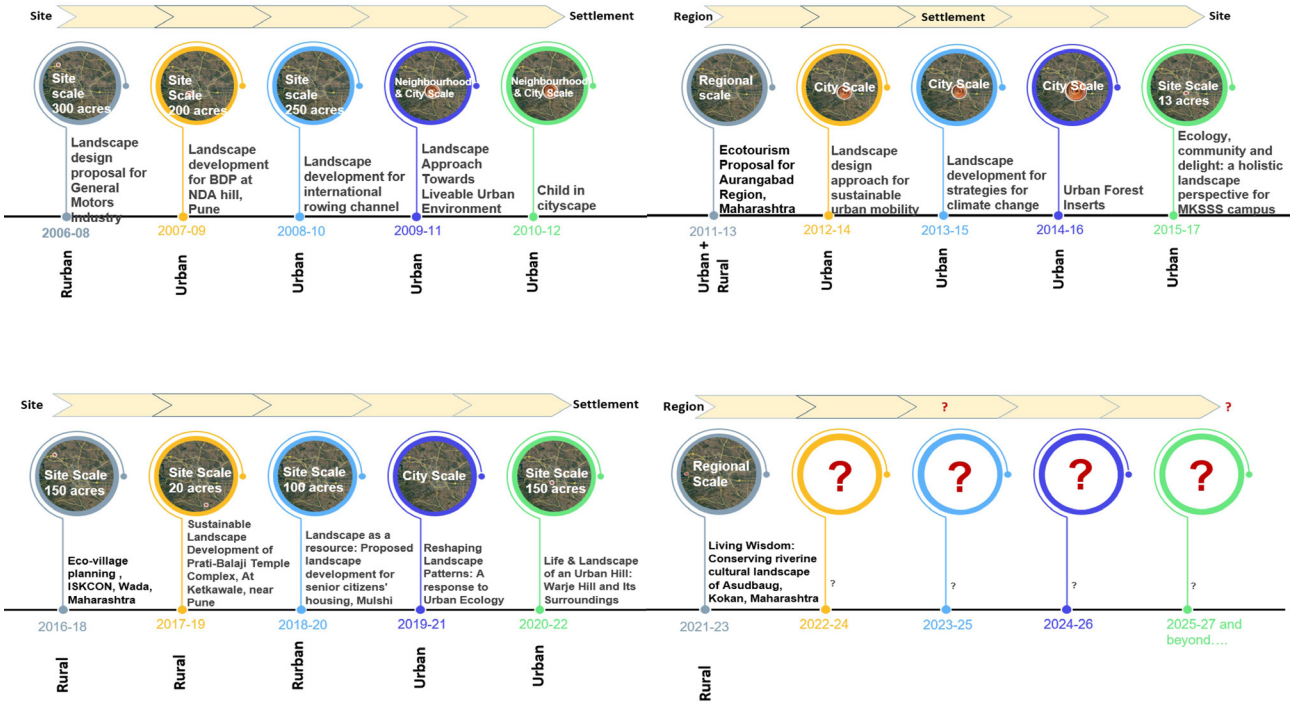


Figure 1
Chronological mapping of landscape architecture studios to understand the attributes of landscape scale and the external context

ture at Dr. B. N. College of Architecture for Women, SPPU (Savitribai Phule University Pune) (SPPU, n.d.), India (BNCA, n.d.).The institute is in Pune and the master's program in landscape architecture was started for the first time in Western India, in the state of Maharashtra in 2006.

Methods and data

The research inquiry aims to find out how scales of landscapes merge and how they are an inherent dynamic physical attribute of landscapes. The research variables viz. the internal and external contexts (as described in introduction of this paper) and their various attributes are investigated based on the chronology, spatial scales and themes of the studios.

The study primarily employs content analysis method to analyse the graphic data compiled from the past and present studio works done by students. The empirical data for the present study is collected through telephonic and in-person interviews of present and past (alumni) students (fifty students distributed across all batches) and faculty (ten faculty members including full time and visiting faculty appointed in present and past years) and open ended informal discussions with them from time to time over last five years (2016-2021). The interviews were significant with respect to note the pedagogical experiences by the participating students (current and passed out batches/ alumina) and the faculty. Both full time and visiting faculty were interviewed. The graphical data was collected in the form of drawings and graphic visualizations and the data was analysed based on the studio project briefs evolved for all studios since 2006. Content analysis and coding were the two methods used for analysis of data. The method of collection and analysis of dual data in the form of textual/ verbal data and graphic data used in the present research was significant as it involved inductive approach and mixed method approach.

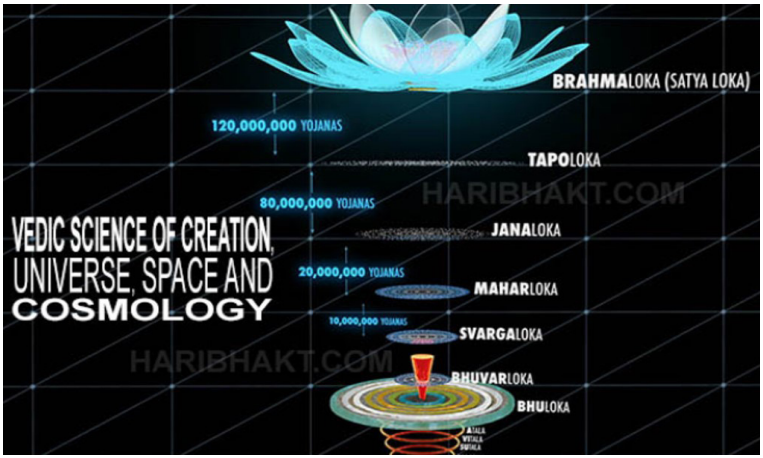


Figure 2
Concept of scale and datum as depicted in Indian mythology (Haribhakt, 2001-2023)

Studio themes for Semester three since the inception of the program in 2006 were mapped (Refer figure 1) chronologically to understand how they have responded to local, regional, and global scenarios. The paper takes an overview of the themes selected for the academic studios at master's level program at BNCA, Pune (State of Maharashtra, India).

The idea of scale and 'nestedness'

Scales is also depicted symbolically as they appear in Vedic Hindu Mythology (Refer Figure 2). The concept pf '*lokas*' or worlds also impart a temporal and three-dimensional attribute of datum to the attribute of scale. Here, the *Bhuloka/ Janaloka* (Earth) stands as a datum. Above is *Swargaloka* (Heaven) and below is *Patalaloka* (Nether) and earth is seen in between.

From the chronological and contextual analysis of the data, the 'Nestedness' of various scales from macro to micro in Landscape Architecture Studios was understood (Refer Figure 3). Each level offered its own experiential association for its stakeholders and users.

Analysis

The transitions and merging of scales.

The present study analyzed the data gathered from the Landscape Architecture studios since 2006. It was noted that natural landscape features offer continuity and nestedness of scales into each other. The content analysis of the qualitative graphic data was carried out by creating matrices. The data gathered through the interviews and discussions was analysed through the coding process. Both the analysis together brought forth that the teaching-learning process is more effective, when understanding of a two-way relationship between scales and merging them is embedded in the pedagogical approach (Refer Table 01). This was found to help students significantly in comprehending the tangible boundaries at site (micro) scale to intangible boundaries at bigger (macro) scale.

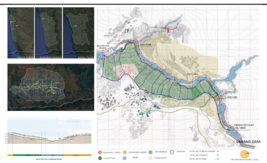
A set of student-centric and program-centric parameters emerged from the analysis of interviews of present and past (alumni) students and faculty (Refer Table 02). These parameters were referred to as 'challenges' while curating and conducting studios.

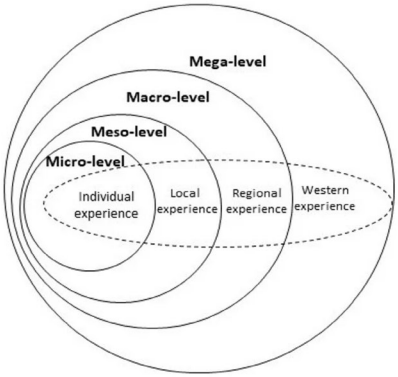
Results

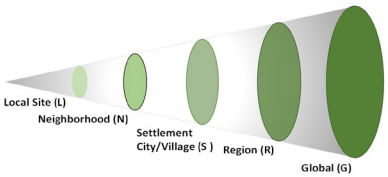
The pedagogical strategies evolved over the last 15 years, in the wide spectrum of the external and internal contexts were mapped, listed, and analyzed. It was found that working with various scales of landscapes helped significantly in effectively addressing these parameters. It was revealed that pedagogical approaches essentially involved merging of Landscapes' scales as part of the studios. The relevant, multiple strategies were applied in the studios based on the context and the student-centric and program-centric parameters. Whilst results of the present research align with some prior research that identified the involvement of multiple educational strategies work in a multidicipinary nature of landcape architecture education (Joaquina Ramos, 2012). The paper extends the past research by anlyzing the parameters and strateies in detail.

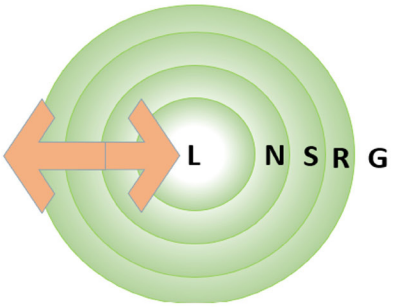
The analysis brought forth ten pedagogical strategies that the faculty practiced while responding to various themes of

Table 1
Nestedness of scales of landscapes

Context	Illustration	Scales of landscape
Urban		The transitions from one scale to another, connecting a river as a linear system of corridor of urban open spaces to a design of a park along the same river is seen as an important response from students.
Rural		Responding to a rural local context for a riverine village setting in *Konkan* in Sahyadri Mountain ranges offered a great opportunity to understand how local to global scales can be merged to get an authentic understanding of its people and to generate a sensitive and holistic response to the context. Here the concept of tangible boundaries at site level were proposed to be dissolved into intangible ones. Merging of scales and boundaries was based on traditional wisdom and cultural patterns.
Responding to local, regional, and global		Considering all these important attributes of landscape scales, the scope and themes of Studio project progress from Semester 1 to 4 starting with local site to neighborhood to settlement to region to global.







studios and the challenges posed by the existing scenarios (Refer table 3 a, b and c). The findings revealed that the strategies also encouraged merging of multiple landscape scales. It was noted that the process of evolution and progression of strategies over a period resulted in overcoming the constraints and challenges as listed in Table 2.

The findings reveal the increasing significance of merging the landscape scales, deriving simultaneous and context-specific design, and planning responses to various scales, and of evolving the pedagogical approaches to accommodate not only the scales of change but also the changes in the landscape surrounding us.

Discussion

The paper demonstrates the methodological challenges and opportunities occurring through the journey of fifteen years. The study also reveals that the pedagogical approaches have undergone changes and evolution responding to the student-centric and program centric parameters, with the evolving external and internal context. Significant aspects such as availability of digital tools, platforms offering virtual interaction, access to digital data, exposure to international academia, and prevailing issues specific to the place have also influenced the changes happening in the strategies for the teaching-learning process. The ten strategies revealed (Refer Tables 3 a, b, and c) from the present study are discussed below:

1. Tactile way of working with drawing leads to a deeper involvement of students in thinking and asking questions as a first step. Working on studio themes such as 'Children in Cityscapes' demanded a sensitive attitude towards society and offered a comprehensive base for students to

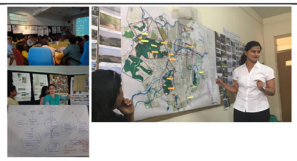
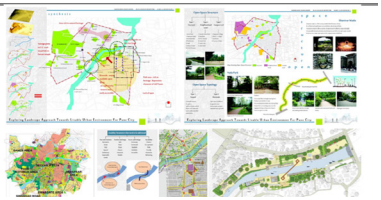
Sr. No.	Parameters Identified	Type of Parameters
1	1. Cultural Background of students and expectations from the family 2. Educational background of students 3. Non-fluency and difficulty expressing in English language. 4. Average to poor graphic skills-set 5. Gender of students (only women/girls) 6. Perception about the program 7. Perception about the profession 8. Financial and cultural constraints 9. Centralized admission process across the state and direct student allotment	Studio- centric
2	1. Prescribed curriculum by the University 2. Prescribed structure and conductance of the program 3. Prescribed timeline and examination pattern 4. Impermeable nature of the curricular structure 5. Limited resources (availability and access to data) and funding for research and innovation 6. Very limited or no professional avenues for passed out graduates in small towns and rural areas	Program-Centric

Figure 3 (above)
The four nested levels: Micro, Meso, Macro, and Mega (Yahya & Hassanpour, 2022), Nestedness of landscape scales and tangible and intangible boundaries

Table 2 (below)
Parameters identified and addressed while curating and conducting studios

create a responsible yet creative landscape design response.

2. Participation, interaction with peers and users is a great strategy to understand the ground reality, various perspectives of the same situation. Inputs from stakeholders, government authorities play a significant role in evolving participatory pedagogical approach to create valuable and realistic solutions.
3. It is not only the outcome but the process through which students learn is also very crucial to the pedagogical approach in Landscape Architecture studio.
4. Capacity building and skill development of students in terms of graphical thinking and representation was emphasized as a significant strategy to improve the design expression by students. With time, the availability of software came handy. However, hand done graphics and physical models were encouraged to overcome the standardization and monotony of software generated graphics.
5. Working on real time projects with real site, real client, etc. was made an integral part of the pedagogical approach and such opportunities were very effective to understand the tangible and intangible boundaries of landscape scales.
6. In Indian context, with its vast cultural, physiographic, ecological, and economic diversity, it was important to embed literacy with respect to the same in studio pedagogy to impart a holistic understanding of landscape scales and the lives they affect. It imported a strong sense of temporality and change as an integral part of the Indian Eco-cultural Landscapes.

Sr. No.	Existing Scenario/ Challenges (EXC)	Evolved strategies (EVS)	Examples/ Illustrations from studio works
1	EXC: Accepting the given	EVS: Asking the right questions and finding answers to them	
2	EXC: Prescriptive Approach	EVS: Participatory Approach	
3	EXC: Focusing only on solution/outcome	EVS: Emphasizing on Process and outcome both –A holistic approach	
4	EXC: Manual to Digital Graphics	EVS: Hybrid Graphics	
5	EXC: Hypothetical Projects	EVS: Live / Real -time Projects	
6	EXC: Embedding Visual values	EVS: Embedding cultural, ecological, and economic literacy going beyond the visual values	

7. A paradigm shift in conventional pedagogical approach based on Western/ European/ Colonial understanding of landscapes primarily as a visualscape was necessary. This was achieved

Table 3-a and 3-b
Pedagogical strategies practiced in landscape architecture studios

through works on rural vernacular cultural landscape setting, exploring indigenous design and planning vocabularies rooted to its local context and are inspired by the traditional living wisdom. This also was connected to the stakeholders matrix and circular economy. Living non-humans such as birds, animals, fauna were expressed as significant stakeholders along with human beings and abiotic factors in the studio process. This pedagogical strategy leads to thinking about and responding to a larger world which is not human centric and not consumeristic.

8. Going global was practiced as a key strategy in studios with themes which dealt with climate change, resource planning, urban mobility, livability, etc. The key was to use the nestedness attribute of landscape scales where in the global issues were sought through Landscape Architecture design and planning strategies at the local level and the process driven pedagogical approach.
9. BNCA (BNCA, n.d.), being the 'Only women's institute' poses a great challenge in this professional world of gender equity. In India, women/girls still go through their own context specific cultural and financial constraints. Only women institutes like BNCA are preferred by students and their parents for its safe-secure environment, women friendly infrastructure, financial assistance, etc. and its long-term commitment to women empowerment and philanthropic background. But at the same time, it poses its own gender-based challenges. To enable the women students to sail in the profession, collaborative learning is encouraged and joint studios, workshops, travel are practiced extensively to enable them to interact with the outside and global world and to know different perspectives. It surely widens up their critical and creative thinking capabilities. It also builds up their confidence to communicate at various scales and contexts.
10. Finally, the last strategy evolved so far is to engage in the online teaching-learning practice during Covid-19 pandemic. It was a constraint transformed into a valuable opportunity which is to stay and continue now as a blended mode of teaching-learning strategy. It was found to be a constructive and

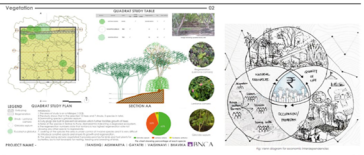
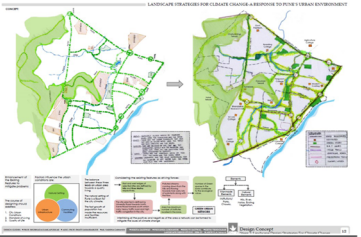
Sr. No.	Existing Scenario/ Challenges (EXC)	Evolved strategies (EVS)	Examples/ Illustrations from studio works
7	EXC: Catering only to human beings	EVS: Catering life on earth as a whole	
8	EXC: Focusing on local context to global context (Bowring & Swaffield, 2004)	EVS: Addressing the 'Glocal'	
9	EXC: Individualistic Learning	EVS: Collaborative Learning	
10	EXC: Offline to Online mode of teaching learning	EVS:Blended mode of teaching and learning	

Table 3-c
Pedagogical strategies practiced in landscape architecture studios

effective way to work together beyond physical boundaries, in a cross cultural interdisciplinary virtual ambience. One such recent studio dealt with the question 'Where do children play?' (Focusing on public playscapes for marginalized communities in Urban India). It was conducted as a collaborative virtual exchange workshop. The new post covid era and the virtual world offers a lot of hope in terms of new ways of learning as the learning continues for students and faculty beyond any tangible boundaries.

In the context of the present paper (Refer Figure 04), it would be interesting to read the metaphor of the 'Russian Traditional Matryoshka Dolls'; depicting mother nature nursing its small children and future generations to live on earth (Wikipedia, 2022). The preset research gave a valuable insight that merging of scales of landscapes means merging the qualities of nestedness, interlinking, interdependency, interaction, and dynamism.

Conclusion

To summarize, the pedagogical journey in curating and conducting Landscape Architecture studios since 2006, brought forth the significance of merging various scales of landscapes to engage with and to effectively deal with dynamics of landscape context that surrounds us. Natural landscape settings inherit qualities of continuity and nestedness of scales into each other. These qualities are very significant in evolving pedagogical approaches and strategies for making the teaching-learning process holistic. Such a process offers a rigorous yet creative and empathetic learning experience for students.

Figure 4
Metaphor of the 'Russian traditional Matryoshka Dolls" (Wikipedia, 2022)-Nurturing the nestedness of landscape scales (image: https://www.google.com)

The pedagogical journey is a continuous and evolving process. Teaching-learning process and its participants must take help from the merging quality and capacity of landscapes' scales.

A way forward is to dovetail local into global as "glocal" and explore opportunities of working on SDGs (Sustainable Development Goals), ecological frameworks, ecological, cultural, and economic literacy, gendered issues, community issues through effective pedagogical strategies which are context-specific and merging of scales of landscape in Landscape Architecture Studio projects.

Acknowledgements
The graphic data for the study was extracted from the landscape design studio works at semester three at master's level at BNCA, Pune compiled since 2006. The author wishes to acknowledge the co-faculty members and the students for sharing their studio work and participating in the present research. The author also wishes to thank BNCA, SPPU and Prof. Anurag Kashyap for their support. The author is thankful to Prof. Alpa Nawre, University of Florida and Prof. Caroline Lavoie, Utah State University for the collaborative studios.

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0004
CONTEXT MATTERS

‘Invisible infrastructure’ – or why some professions are more equal than others

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Abstract
Despite recent celebrations of the anniversaries of many university programmes, most landscape architects know that the discipline and profession should be better placed than it is to address the impacts of many of the crises with which society is currently faced. It is time for the discipline to turn its attention to understanding the sort of ‘invisible infrastructure’ which lies behind many other successful fields – and how to build up a similar visibility.

All successful professions are embedded in a wider societal context upon which their ultimate success depends. Established disciplines and the professions they serve sit at the centre of a network of interrelationships across many different domains, reaching far beyond the discipline itself. Their supporting ecosystems ensure the continuing visibility of these disciplines, keeping them in the public consciousness, while the infrastructure supporting them remains largely invisible.

The hidden ecosystem behind landscape architecture, and indeed all other professions, can be analysed into that which affects the discipline directly within its academic environment, the *Academic Comfort Zone*, and the *Local Neighbourhood* with the profession and related industries. To be visible in critical societal contexts and current crises, it is also necessary to address civil society and the media the *Wider Society Zone*, in order to reach the *Power and Influence Zone*, and affect politics and legislation.

The paper calls for the development of a Europe-wide strategy by discipline and profession to address these awareness issues to enable them to assume a pivotal role in addressing today’s societal challenges.

Keywords
Invisible infrastructure, professional ecosystems, European cooperation, awareness raising, societal challenges

A time for celebration, but also for reflection

Recently European landscape architecture academia has been in celebratory mood. Just over a century ago there were no university landscape architecture pro-

grammes, now there are some one hundred. The centenary of the first programme at Ås in Norway was marked in 2019, and over this first century of landscape architecture education much has indeed been achieved: doctoral programmes, regular academic conferences, an increasing number of specialist publications together with a peer-reviewed journal, JoLA, while landscape architecture academics sit on faculty boards and university senates alongside their peers from other disciplines.

While the discipline has achieved much over the last century, what of the profession it serves? It was almost 50 years ago that Geoffrey and Susan Jellicoe wrote their monumental work: 'The Landscape of Man' (1975) in the introduction to which they suggested that:

> *"The world is moving into a phase when landscape design may well be recognised as the most comprehensive of the arts."*

Half a century after the founding President of IFLA's prediction, one could expect that today the profession would be thriving and that the many graduates of Europe's landscape architecture programmes would be in great demand. All the more so, as in the almost 50 years since the publication of 'The Landscape of Man', the climate and biodiversity crises are surely demonstrating the potential of landscape architecture to address these challenges.

Furthermore, the coming into force of the European Landscape Convention in 2004 highlighted the importance of the landscape in the field of European policy. The profession, the discipline and its graduates could thus hardly wish for a more fortuitous combination of circumstances to help position themselves at the centre of contemporary public discourse.

Yet, while one might expect that these developments would mean that politicians, the public and the media would now be queueing up to call for the services of the profession, the reality is a different one. The queues of people beating a path to the door of landscape architecture are conspicuous only by their absence. This ought to be a reason to take a break for a moment from celebrating within our academic bubble and to reflect on why this is.

Uncovering the 'hidden ecosystem'

The paper is on a critical reflection on the gap between the discipline's own perception of its potential for addressing many of today's societal challenges and the actual way in which landscape architecture is viewed by society in general.

The approach has been to focus on uncovering the normally invisible societal structures into which a professional discipline is embedded by constructing a simple model of these structures and their mutual interactions. This has the advantage of being both straightforward enough to allow the complexity of the situation to be easily grasped, while sufficiently flexible to be expanded so that the detailed structure of the various fields and their interlinkages can also be taken into account.

The model was then used as the basis for illuminating the position of what is perhaps the most successful professional discipline in terms of its societal acceptance: medicine. This was compared with the situation

with regard to landscape architecture in Germany, where the profession has been long established and is relatively well developed in institutional terms.

Professions in their societal context: illuminating their invisible infrastructure

All successful disciplines and the professions they serve are embedded in a wider societal context. It is this supporting ecosystem, as much as their academic credentials, that ensures their continuing visibility and maintains their presence in the public consciousness. Yet the infrastructure supporting these ecosystems itself remains largely invisible, partly because with well-established professions, it hides in plain sight and is taken for granted; but also because it may be only weakly developed and is thus easily overlooked.

The starting point for this investigation of the 'societal ecosystem' is provided by academia, in the form of the *'academic comfort zone'* of those involved in the recent celebrations of landscape architecture programmes.

Distant from this, in another largely self-contained area, are the politicians who, in the case of landscape architecture, are resolutely failing to recognise its problem-solving potential. Between these two domains lies a seemingly unbridgeable gap (figure 1). To understand how this can be crossed it is necessary to chart the unseen infrastructural ecosystem which lies between.

Academia's closest neighbours, the profession and its associated industry lie within a *'local neighbourhood'* zone, where connections are likely to be the strongest and most frequent. Beyond this lie two 'sub-systems' of great importance: civil society and the media, which occupy what might be described as the *'wider society'* zone. This is complex and its interlinkages are extensive. These connect, to what has been termed the *'zone of power and influence'*, which over the long term is exerted via institutions and legislation.

The resulting model of the 'professional ecosystem' within its societal context (see figure 2) comprises seven domains, which are all interlinked and are loosely arranged in four 'zones'. Although highly simplified, the model has the advantage of making explicit the 'invisible infrastructure' which otherwise usually remains hidden, thereby making it possible to highlight and investigate this in more detail. Its generalised nature also means it can be used to compare the societal roles of different professions with landscape architecture in seeking reasons for its lack of political influence.

All professions play a comparable role in society, yet some are far more equal than others

Although within academia, landscape architecture has achieved a degree of success over recent years, as the recent anniversary celebrations illustrate, graduates entering the profession cannot expect to achieve the same level of societal recognition as some of their fellow students in other disciplines.

When using the 'invisible infrastructure' model to investigate why landscape architecture is not enjoying the level of professional success that IFLA's founding president might reasonably have expected

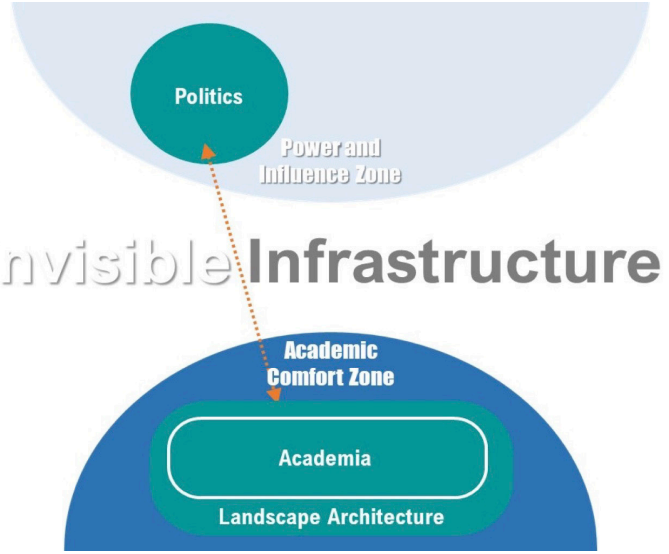

Figure 1
Invisible infrastructure can bridge the gap

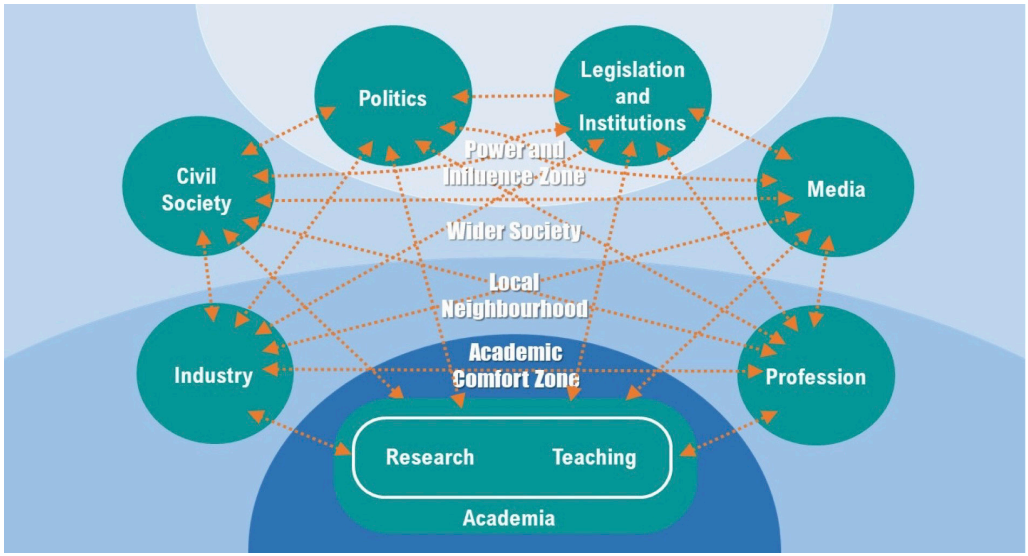

Figure 2
The 'professional ecosystem' within its societal context

some half-century ago, it would appear sensible to compare it with the most successful professions within the professional ecosystem and draw lessons from them: the obvious candidates are medicine or law. both long established and widely respected.

To gain the maximum benefit from such a comparison, it is advisable to compare like with like by using the situation within one country as a case study, where other societal factors can be expected to be similar. Whereas the professions of medicine and law have achieved an almost

similar level of recognition throughout Europe, the closest landscape architecture comes to a comparable situation is in north-western European countries, where the profession has arguably established the most stable institutional foundations. Germany was the second country in Europe to establish a university landscape architecture programme, and has since developed a regulated profession and a reasonably well-established institutional structure and a significant number of study programmes.

In Germany more than 60,000 school leavers apply annually for 11,000 medical study places[1]. Applicants are often not able to study where they wish, indeed some even move to another country. However, this need not be a disadvantage as medicine's invisible infrastructure starts to be effective even within the domain of academia. The longevity of the discipline means that the medical school curriculum, both nationally and internationally has become very similar and has remained so over a long period, albeit with special focus on the diseases typical of the region.

In landscape architecture, by comparison, there are some 950 first-semester students in Bachelor programmes in Germany and about 420 in Master programmes (data from 2013 to 2018). Generally, applicants are able to select their place of study and restrictions are rarely imposed.

Graduates from German medical schools have to pass a state examination after completing their studies and are able to work as doctors, but need to get practical experience in their special field involving several further years of practical education. Directly after the state examination, they are expected to become members of the doctor's chamber. By requiring every graduate to join the chamber, Germany currently has more than 400.000 registered doctors, working in different fields of medicine. These are represented by the Association of the Scientific Medical Societies (AWMF), which "combines 175 scientific member societies and 3 associated societies from all medical specialties". The AWMF is highly visible and influential as it "advises the government of the Federal Republic of Germany as well as the German federal states on all topics of scientific medicine and medical research and classification[2]".

Landscape architecture in Germany is also a regulated profession organised by the chambers of architects, but to be able to apply for membership, graduates need at least two years of professional experience, and have to prove that they have worked in all necessary phases of landscape architecture projects. As not all employees of offices become members of a chamber, which are organised by the states, Germany has only about 8.000 registered landscape architects[3].

So far this comparison only covers academia and the professions, and this only at a fairly superficial level, but the general direction is clear (figure 3). There is not space to repeat this through all the domains of society's professional ecosystem. In the case of landscape architecture, the 'industry' includes landscape contractors and nurseries, and, perhaps, manufacturers of street furniture and outdoor lighting. However, these all pale in comparison

[1] https://www.gesundheitsforschung-bmbf.de/de/begleitforschung-fur-den-erfolg-von-kompetenzbezogenen-auswahlverfahren-der-hochschulen-8228.php (accessed June 30, 2022)

[2] https://www.awmf.org/en/awmf.html (accessed June 30, 2022)

[3] »In the total of 16 Chambers of Architecture some 139.000 architects, interior designers, landscape architects and city planners are registered (as of 1st January 2020). Of these almost 8.000 are landscape architects« From: https://bak.de/kammer-und-beruf/berufsbilder-der-fachrichtungen/landschaftsarchitektur/#:~:text=In%20den%20insgesamt%2016%20Architektenkammern,Davon%20sind%20fast%208.000%20Landschaftsarchitekten (accessed Feb. 10, 2023)

beside the pharmaceutical and medical equipment industries.

Again, in the case of the media and civil society simple anecdotes will have to suffice: thus to understand the relative roles of medicine and landscape architecture in the popular imagination, one only needs to mention the large numbers of medical soap operas on television as compared to the total absence of 'landscape architecture dramas' (although there is a landscape architect as a character in a Turkish soap opera). Similarly, there are many NGOs representing patients' interests as well as many auxiliary healthcare professions, from paramedics to first aid societies which form an integral part of the medical ecosystem, while although there may be gardening clubs and allotment societies, such amateur organisations are rarely associated with landscape architecture.

In the domain of legislation and institutions, there is much to highlight in the field of medicine, but perhaps reference to the statutory requirement for health insurance is sufficient to illustrate how closely integrated medicine is into the 'power and influence zone' of the societal ecosystem. Landscape architecture, by comparison, has little to show with the exception of environmental impact legislation, and in Germany the statutory requirement to implement compensation measures in the case of such impacts.

Wherever one looks into the various domains of the societal ecosystems of medicine and landscape architecture, it becomes clear that medicine is deeply embedded in the system, whereas landscape architecture is largely 'on the outside looking in'. If this is true in Germany, then it is still more true in many other European countries. The same applies not just to the structures within the various domains but

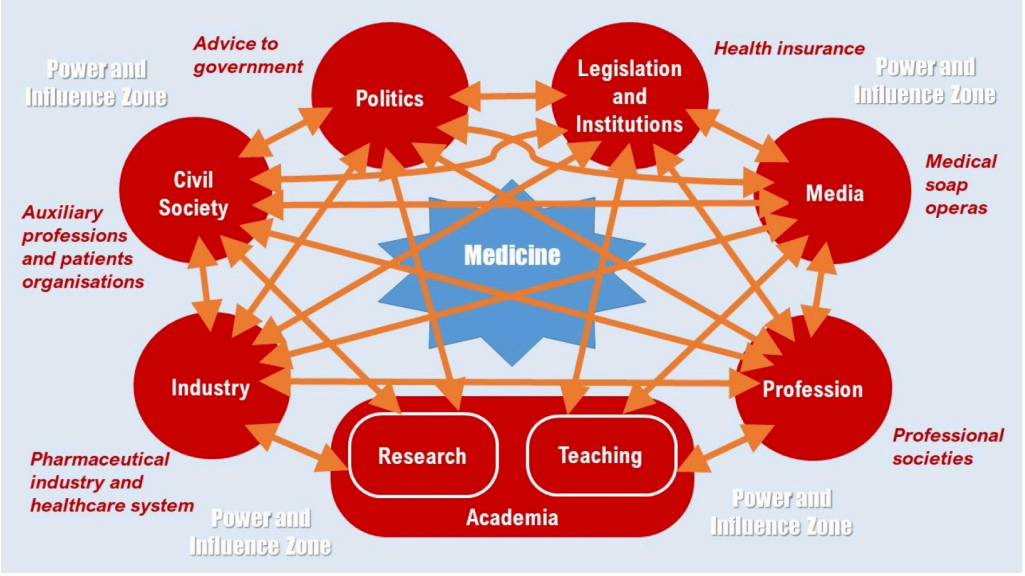

Figure 3
In the 'medicine ecosystem' all links are strong and the influence is pervasive

also to the interlinkages between them, to the extent that in the case of medicine in Germany and indeed elsewhere, the various 'zones' previously identified – from 'academic comfort' to 'power and influence' – are only very weakly differentiated in the case of medicine where they merge imperceptibly into one another. Here the links between all the domains are almost equally strong. Were such comparisons to be undertaken between landscape architecture and other professions, it is to be expected that similar results would emerge, if not perhaps as pronounced. The question is, at a time when landscape architecture ought to be coming of age as a profession, what if anything can be done to render the invisible visible and to assist the discipline in escaping from its comfort zone?

Bursting the bubble

As landscape architecture is a relatively young profession compared to medicine, this could suggest that time alone might be a major factor in affecting the development of the sort of invisible infrastructure which medicine enjoys. If so, then simple patience alone might solve the problem. It could also be argued that it is the very existential nature of medicine that has allowed it to become so deeply embedded in contemporary society, yet the urgency of the crises facing society today and the conviction that landscape architecture has something significant to contribute to addressing them ought also to be enough to suggest that waiting cannot suffice, but that decisive and concerted action at a European level is called for.

The blueprint for this action can be drawn up using the model of society's professional ecosystem outlined above. This can help decide which parts of which domains need to be focussed on to better understand how the operate, and which linkages ought to be targeted to develop and strengthen them. Having highlighted the recent academic celebrations, suggests that it would make sense to begin within the 'academic comfort zone' and to reach out from there by strengthening the 'local neighbourhood' links. The German case also provides a model here: the so-called *'Hochschulkonferenz Landschaft'* or *HKL*. This serves the role of improving links between academia, the profession and the associated industry. Its origin in 1979 lay in efforts to resolve a conflict about the nature of education which the universities were at the time providing. That an organisation set up to address a specific issue has survived for over 40 years is perhaps some indication of its significance, even if it has suffered somewhat from neglect over recent years.

What is needed is an equivalent European organisation to bring together not just European landscape schools but also practice and the industry in order to strengthen the network starting with the *'local neighbourhood'*. This grouping then needs to develop a strategy for reaching out into the *'wider society'* in order to build the missing invisible infrastructure and thereby to render landscape architecture more visible to politicians and decision-making institutions.

Small steps towards raising awareness

It cannot be the role of this paper to plot out exactly what 'needs to be done' but rather to draw attention to the pressing need to take action. To be successful such

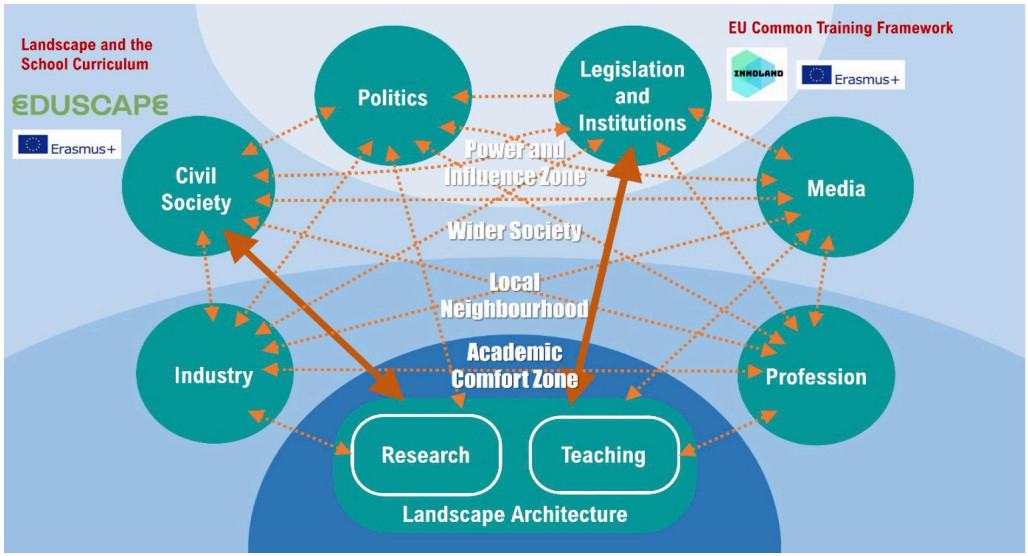

Figure 4
Some small initial steps towards strengthening the 'landscape architecture ecosystem'

action needs to be taken by the profession, the discipline and the industry working together at European level. Ambitious as this may sound there are already important precedents. The successes of ECLAS itself, the celebration of which formed the starting point for this analysis, demonstrates the power of European collaboration. 2023 marks ten years since the end of the LE:NOTRE project which provided a further illustration of what can be achieved through considered and concerted action. 2024, marks the 20th anniversary of the coming into force of the European Landscape Convention, Article 6 of which calls on signatory states to raise awareness of the importance of landscape.

The occasion of these two anniversaries provides an opportunity to start working actively to promote awareness of the importance of landscape architecture as a key means of, not just implementing the Landscape Convention, but of addressing the urgent crises which society is facing.

Educators are perhaps the best people to rise to this challenge. While not wishing to water down the call for concerted action between academia, the profession and the industry at European level, one can perhaps point to some examples where small steps are already being taken to forge links from academia to both civil society and the domain of legislation and institutions. These take the form of two Erasmus+ projects.

'EduScape' has the objective of using the topic of landscape to bring new approaches to school education. The vision is not just to introduce landscape as a subject in the curriculum through which to teach about issues such as climate change, but to use landscape as a medium through which much of the school curriculum could be taught. Targeting of school education is a means of bringing the subject of landscape into the homes of all families with school-aged children – a large proportion of civil society.

The domain of legislation and institutions is harder to penetrate, but the InnoLAND project has as one of its key goals the preparation of a Common Training Framework (CTF) for landscape architecture, which could lead to the automatic recognition of landscape architecture qualifications across the EU and the EEA. CTFs are a mechanism foreseen within the EU's Professional Qualifications Directive (PQD) to enable the Europe-wide recognition of qualifications, other than those of the medical professions and architecture, which are already covered by the PDQ. This would provide a vital piece of invisible infrastructure for the landscape architecture profession.

These two examples can be seen as small pieces of a jigsaw which may help to improve the situation (figure 4). However not only should they be replicated across Europe, they need also to be embedded in a wider long-term strategy involving academia, the profession and the landscape industries. InnoLAND involves universities from five countries, but also IFLA Europe and ECLAS, through the LE:NOTRE Institute, so this could be seen as a first step, but both have finite contract periods and building better invisible infrastructure for landscape architecture requires a long-term strategic commitment from all concerned.

Transdisciplinary approach in higher education in landscape architecture: Case Study of master's degree program from Bosnia and Herzegovina

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Abstract
At the core of landscape designing and planning is the involvement of various stakeholders' visions and needs for space. That is why it is important that the study programs of landscape architecture contain a transdisciplinary approach in its content and learning method. In order to improve higher education in landscape architecture in Bosnia and Herzegovina (BiH) this study a) identifies the level of transdisciplinarity in legislation, b) assesses the level of transdisciplinarity in landscape architecture academic study programs, and c) evaluates how various experts in the field perceive the need for multidisciplinarity and interdisciplinarity in BiH.
To achieve these objectives, a mixed-method approach was used for collecting and analysing of both qualitative and quantitative data, a) text analysis method to identify the presence of landscape planning practice in urban space planning-related legislation, b) content analysis of the transdisciplinarity aspect was used to evaluate actual study programs in landscape architecture and c) open-ended questionnaire was designed for different professional field experts in BiH.

Through legislation framework analysis, it is noticed that transdisciplinary approach is only partially applied in spatial planning normative acts of BiH. It is recognized that the approach is insufficiently implemented in higher education curricula in landscape architecture. Both are reflected on the apprehended planning approaches of experts in broader field of designing and planning. Findings of this research are significant for the improvement of the profession and education in the field of landscape architecture engineering in BiH. Specifically, the results indicate a need for a more transdisciplinary approach in academic programs and legislative frameworks, as well as greater multidisciplinary and interdisciplinary cooperation in landscape planning.

Keywords
Urban space planning, legislation, landscape planning practice, landscape architecture curricula

Introduction

Understanding the transdisciplinarity approach in landscape architecture is convenient to explain in relation to terms of multidisciplinarity and interdisciplinarity. Multidisciplinary approach in landscape architecture involves incorporating the knowledge of other professions with distinct responsibilities, without interfering in the decision-making and problem-solving processes of the landscape architecture profession. Multidisciplinarity is characterized by the use of knowledge from specific disciplines, while interdisciplinarity involves the analysis, synthesis, and integration of knowledge from multiple disciplines into a coordinated and coherent whole (Choi and Pak, 2006; Padurean and Cheveresan, 2010). An interdisciplinary approach would involve joint work among various professional areas, in order to seek common solutions and make decisions together. Contrastingly, a transdisciplinary approach entails the integration of knowledge and broader aspects of sociology, theory, and culture in the process of seeking solutions and making decisions, transcending professional and disciplinary boundaries. Transdisciplinarity integrates knowledge from various disciplines and transcends disciplinary boundaries to include traditional, empirical, and cultural knowledge in decision-making and understanding (Nicolescu, 2012; Nicolescu, 2014). Seeing landscape architecture as such is important for sustainable landscape designing and planning. Assessing to what extent the transdisciplinary approach is present and respected in landscape planning of Bosnia and Herzegovina (BiH) can be beneficial for measuring the development of the profession at the national level.

Three main legal norms are governing planning and land use, development, planning and implementation of planning documents in BiH: Law on Physical Planning and Utilization of Land for Federation of BiH, Law on Spatial Planning and Construction of the Republic of Srpska and the Law on Spatial Planning and Construction of Brčko District. The unique strategy for spatial development on the state level for BiH, as a consequence of insufficient institutional communication, does not exist. Systemic integration of transdisciplinarity approach in spatial planning procedures is connected to a maturity of institutions, level of interinstitutional communication and openness of institutions to citizens (Nowotny et al., 2001). The importance of involving different stakeholders in designing and planning has been recognized only partially in the legislation framework existing in the landscape planning practice in BiH. Consequently, as not being recognized on the higher governing levels this approach is insufficiently implemented in higher education curricula in landscape architecture. Thus, this study aims at providing insights that will help improve integration of transdisciplinary approach in the education and profession in this professional field.

Bosnia and Herzegovina's society is in a transitional phase, from a socialist to a democratic and capitalist society. It is assumed, that integration of transdisciplinary approaches into academic education systems and relevant legislation has been insufficiently achieved so far. It seems that although professionals recognize the necessity for comprehensive planning and design methods, the transdisciplinary approach has not been systematically

integrated into education and normative legal acts. In order to evaluate the level of transdisciplinarity in the field of landscape architecture engineering in BiH, it is important to examine the extent to which multidisciplinarity and interdisciplinarity have been applied in professional practice. This understanding can be acquired through the expertise and practical experience of professionals in the field (Choi and Pak, 2006). Based on these insights, the better understanding of the presence or absence of transdisciplinarity in education and practice is achieved. Therefore, the study aims at a) identifying the level of transdisciplinarity in legislation, b) assessing the level of transdisciplinarity in landscape architecture academic study programs, and c) evaluating how various experts in the field perceive the need for multidisciplinarity and interdisciplinarity in BiH.

Methods

Transdisciplinarity in landscape architecture has been analysed through the three-dimensional prism of interconnected fields: education, legislation, and professional practice (Figure 1). Each of the above-mentioned dimensions answer questions that are the subject of this research. Hence, this research attempts to answer three questions: a) how landscape engineering is recognized in spatial legislation in BiH, b) what is the presence of a transdisciplinary approach in landscape architecture education and to what extent are landscape architecture curricula are transdisciplinary and c) how landscape architecture professionals are perceived by other professional in similar scientific fields.

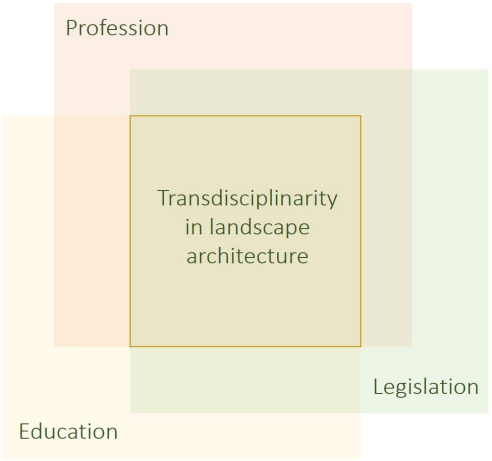


Figure 1
Transdisciplinarity in landscape architecture observed through three dimensions

Legislation

The aim of the legislation analysis is to evaluate the recognition and incorporation of the concept of transdisciplinarity in the pertinent spatial planning laws and regulations in BiH concerning landscape architecture. Sector of spatial planning follows national administrative structure and thus Legislative framework is consists of the following laws of the three administrative units (except Federation of BiH that have laws on the cantonal level) and their subsidiary laws: Law on Physical Planning and Utilization of Land (Official Gazette of Federation of BiH, no. 2/06, 72/07, 32/08, 4/10, 13/10, 45/10, 85/21, 92/21), Law on Spatial Planning and Construction (Official Gazette of the Republic of Srpska, no. 40/13, 2/15, 106/15, and 3/16, 104/18, 84/19) and the Law on Spatial Planning and Construction (Official Gazette of Brčko District, 29/08, 18/17, 48/18, 54/18, 10/20, 29/20 a 40/20). To fulfil objective, a corresponding text analysis of these legislation was conducted. Legislative content analysis was used to see whether and how often following terms appear in the context of landscape and landscape architecture in

general: landscape, landscape architecture, landscape values, urban landscape, historical urban landscape, landscaping, landscape architecture facilities, graduate engineers of landscape architecture. An exception was made in the analysis of the law in Brčko District, since the law does not recognize the terms landscape and landscape architecture, instead uses term horticulture.

Education

The content analysis was applied to compare the presence of transdisciplinarity approach in two master's study programs in landscape architecture, one at the University of Sarajevo Faculty of Forestry (University of Sarajevo Faculty of Forestry, 2022) and other the University of Kassel in Germany (University of Kassel, Germany, 2022), both evaluated with minimum 120 European Credit Transfer System (ECTS). First program was chosen as currently the only and most affirmed landscape architecture program in BiH. Second study program was chosen as suitable for comparison because of its comprehensive and well-established spatial planning disciplines and strong emphasis on practical experience. The University of Kassel enjoys a good reputation and is recognized nationally and internationally for its academic achievements. Both of the universities are state-funded with education tradition of 60 to 70 years. Content of the curriculars was analysed based on criteria determined in this study. Criterions for classifying a course as transdisciplinary included: a) presence of collaboration with non-academic actors during course, b) treatment of real-world problems, c) or usege of the transdisciplinary teaching methods. For example all courses, whit engagement of other teachers, experts and nonexperts into teaching process, or courses organized as projects, excursions, and practical exercises with a civil society context, as well as the master's thesis, were classified as transdisciplinary.

The evaluation of the transdisciplinarity of the academic programs was based on the proportion of transdisciplinary courses and events in the total number of study courses and events, both mandatory and elective, offered by the two universities.

Professional practice

The questionnaire method was used to determine the level of multidisciplinarity and interdisciplinarity in the field of landscape planning and design in BiH. Online questionnaire was sent to relevant professional groups as listed by the Chamber of Engineers in BiH (https://ikfbih.ba/). Specifically, the questionnaire was addressed to two groups of companies in BiH, Group A: those that work in spatial planning and designing, including architectural, construction, traffic engineering; and Group B: those that work in b) horticulture and landscape architecture engineering (Table 1).

The questionnaire was designed to investigate the degree to which company managers recognized the necessity for cooperation across all phases of planning and design, as mandated by mentioned relevant laws, as well as the extent to which a multidisciplinary and interdisciplinary approach to planning and designing of open spaces had been developed. The questionnaire was sent to a randomly selected sample of 18 companies in BiH, nine mainly involving civil engineering and architecture (Group A) and nine mainly

	Group A (*N*=9) (Architectural, civil engineering companies)	Group B (*N*=9) (Landscape architecture and horticulture engineering companies)
1.	Select the professions from which you employ personnel in your company: a) landscape architecture; b) horticulture; c) architecture; d) civil engineering; e) urbanism; f) geography-spatial planning; g) mechanical engineering; h) archaeology; i) sociology; j) medicine; l) defectology; m) psychology; n) traffic engineering; o) hydrology; p) electrical engineering; r) art; s) forestry; t) agriculture.	
2.	Select the type and frequency of professional cooperation when you engaged or hired landscape architecture engineering companies.	Select the type and frequency of professional cooperation when you were engaged by architectural, construction, traffic engineering firms.
3.	Select the type and frequency of professional cooperation when you were engaged by landscape architecture engineering companies.	Select the type and frequency of professional cooperation when you engaged architectural, construction, traffic engineering companies.
4.	If the answer to the previous question includes collaboration in some specific types of planning and design, select when collaboration is achieved in the stages (1) creation of the concept, (2) project development and content creation or (3) final design stage.	
5.	Please rate to what extent you agree with the statement: Cooperation of your profession with experts in the field of horticulture or landscape architecture is necessary in the country of your professional activities.	

Table 1
Questions addressed to legal bodies in BiH in period of 2022

involving landscape architecture and horticulture (Group B). The table 1 shows the questions that were analysed for the purposes of this paper.

Results

Legislation

The results of the text analysis conducted as part of this research are presented in Table 2. In the Law on Spatial Planning and Land Use of the Federation of BiH, the term landscape is mentioned four times in total, including the words landscape values and experts in landscape architecture. Landscape values are mentioned in the context of the obligation to respect these values in planning at various planning levels, while experts in landscape architecture are mentioned in the context of the right of taking a professional examination.

In the Law on Spatial Planning and Construction in the Republic of Srpska, the term landscape is mentioned a total of 13 times, including the terms valuable landscape, urban and historic urban landscape, conditions for landscape design, landscape architecture institutions, landscape architecture graduate engineer. Valuable landscape was mentioned as an element of definition of important zones and places and as a statement that its treatment is specified in spatial planning documents. Historic urban landscape was defined in the law as an urban area with a historic layer of social, cultural and natural values and features. It is also mentioned in the definition of land use plan elements for which the obligation to prepare a Regulatory Plan or urban project for zones, areas or places within the historic urban landscape zones is determined. Law de-

termines that Regulatory Plan defines the zones of the historic urban landscape. Urban standards for construction and landscaping are determined by the zone, which are, among other conditions for landscaping. Term landscape architecture facilities is mentioned four times. The law defines that green and recreational areas include, in addition to landscape architecture facilities, public green areas, green zones having various recreational and protective purposes, green areas of residential units, special purpose green areas, areas for outdoor recreation and sports (playgrounds, picnic areas, promenades, sports fields, swimming pools), green areas on the banks of rivers and lakes. In terms of this law, landscaped facilities are built or planned urban units such as: park, square, garden, cemetery, boulevard, tree line, urban park, regional park, forest park, beach, wharf, school yard, kindergarten yard, zoo, dendrological and botanical gardens, landscape areas within residential blocks, parterres, etc. According to the law, the details of landscape architectural facilities are included in the urban projects, while parkways and other similar works on landscape architecture objects do not require a construction permit. The law stipulates that the preparation of a spatial planning document may be entrusted to a legal entity that, among other things, has at least one licensed landscape architecture graduate engineer.

Law on Spatial Planning and Construction in Brčko District does not contain any terms related to landscape or landscape architecture. However, it does mention horticulture planning as mandatory part of urban project.

Although analysed laws do not directly address the issues of landscape and landscape architecture at the satisfactory level, this does not mean that these issues are not included into sectoral policies at all. Explanation can be found in the subside laws; however, they are not the subject of this analysis.

Education

The results of the curricula content analysis are presented in Table 3. The master program in Landscape Architecture at the University of Sarajevo Faculty of Forestry offers one study module - Landscape architecture - with 32 different courses, which carry in total 145 ECTS points including master thesis. This master program seems to have a strong focus on natural aspects of landscape architecture, particularly ecology and plants. It is also worth noting that there is no requirement for an internship during studies.

Table 2

Results of the content analysis of spatial planning related legislation in BiH

	Law on Physical Planning and Utilisation of Land FBiH	**Law on Spatial Planning and Construction RS**	**Law on Spatial Planning and Construction BD**
Landscape, Landscape architecture	landscape values (3) experts in landscape architecture (1)	valuable landscape (2), urban landscape (1), historical urban landscape (4), conditions for landscaping (1), landscape architecture facilities (4), graduate engineer of landscape architecture (1)	
Horticulture			horticulture planning (1)

	Uni Sarajevo		Uni Kassel	
	Number	ECTS	Number	ECTS
Courses	32	145	119	711
Transdisciplinary courses	9	55	52	381
Transdisciplinary obligate courses	5	43	0	0
Transdisciplinary elective courses	4	12	52	381

Table 3
Transdisciplinary courses in Landscape architecture study programs

On the other hand, the Master program in Landscape Architecture and Landscape Planning at the University of Kassel offers four different modules for specializations. These specializations cover a wide range of topics, including:

1. Urban Planning / Urban Design with focus: planning and design strategies oriented towards open space design, design methodology and technology (development and innovation).
2. Landscape architecture and open space planning with focus in free inductive or experimental approach to promote corresponding innovative design results.
3. Environmental planning and landscape management with Concepts and planning strategies for dealing with environment-related protected goods (air/climate, water, soil/rock, plants, animals, ecosystems, landscapes).
4. Landscaping and plant use, with focus on planning and design strategies for landscaping and vegetation technology (development and innovation).

One of this four programs can be chosen as master specialization during the master program. With a total of 119 courses, which carry in total 711 ECTS points, the program at the University of Kassel appears to be quite comprehensive. Due to University numerous offers of different specialisations and neighbouring study fields, there are several focal points of the courses such as: ecological and natural aspects, technical aspects and execution, urban development, design, and conception.

It is important to note that both master's programs require 120 ECTS credits to obtain a master's degree.

At the University of Sarajevo, 9 out of 32 or 28% of the courses, including the master's thesis, included collaboration with non-academic actors, addressing real-world problems, or partial use of such teaching method in their curricula. The University of Kassel, on the other hand, offered 119 or 44% of courses that included a transdisciplinary approach in whole or partially. Based on ECTS credits, which represent learning based on defined learning outcomes and the associated workload, at the University of Sarajevo the main burden of learning and workload is on non-transdisciplinary subjects, with 55 ECTS or 38% of the required credits. In contrast, at the University of Kassel, the proportion of transdisciplinary subjects is larger, with 54% of the required ECTS credits being fully or partially transdisciplinary (Figure 2).

This indicates that the two programs have different approaches to integrating transdisciplinarity into their curricula. The University of Sarajevo has a lower percentage of transdisciplinary courses, but still a significant number of courses with a transdisciplinary aspect. In contrast, the University of Kassel has a higher percentage of transdisciplinary courses, indicating a greater focus on transdisciplinarity throughout the curriculum.

It is important to note that ECTS credits do not necessarily correspond perfectly with the actual workload or learning outcomes of courses, as these may vary depending on the specific context and delivery of the course. In addition, the share of transdisciplinary subjects in the study program depends on the individual candidates and their choice of subjects. Therefore, beside the quantitative analysis based on ECTS credits, it may be useful to consider qualitative factors, such as the depth and quality of transdisciplinary collaboration.

Practice

Similar answers of group A and group B indicate that both groups engage multidisciplinary and interdisciplinary approach in landscape design and planning practice (Figure 3). According to this answer both. On the one hand, architectural and civil engineering companies mostly employ construction engineers (77.8%), followed by urban planning and traffic (55.6%), architecture, spatial planning - geography and landscape architecture (44.4%), forestry and electrical engineering (22.2%) and hydrologists (11.1%). On the other hand, companies dealing exclusively with horticulture and landscape design employ the largest number of horticulture engineers

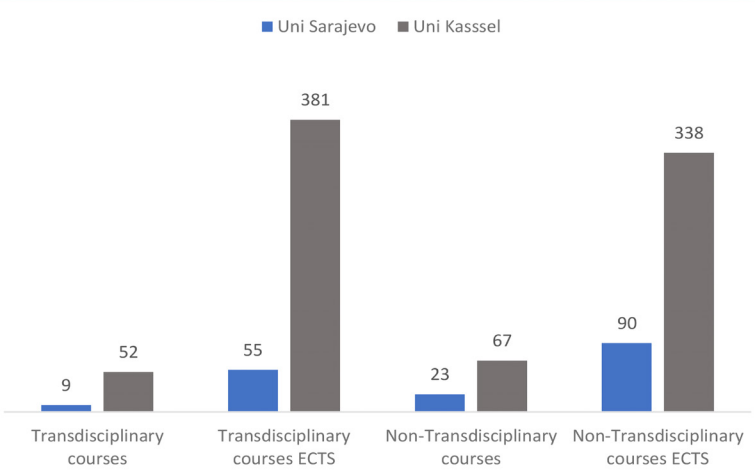


Figure 2

Comparison of absolute number and ECTS values of transdisciplinary courses

(88.9%), followed by landscape architecture, forestry, and agriculture (44.4%), less construction and spatial planning (22.2%), and the least professions such as mechanical engineering, traffic, hydrology, electrical engineering (11.1%).

Differences in collaboration needs between the professions arose in relation to the level of project documentation, as observed through answers on question two and three. Although the experiences of groups A and B differ, one of the main results is that both achieve the highest level of cooperation and mutual engagement in the phase of the main project development and during project implementation (Figure 4). Higher level project documentation (urban project, regulatory plan, urban plan, city plan and special purpose area plan) in the largest number of cases over 54%, does not include cooperation with horticulture and landscape architecture engineers. It is important to highlight that only 20% of respondents in group A reported they were hired by companies dealing with landscape design, while 100%

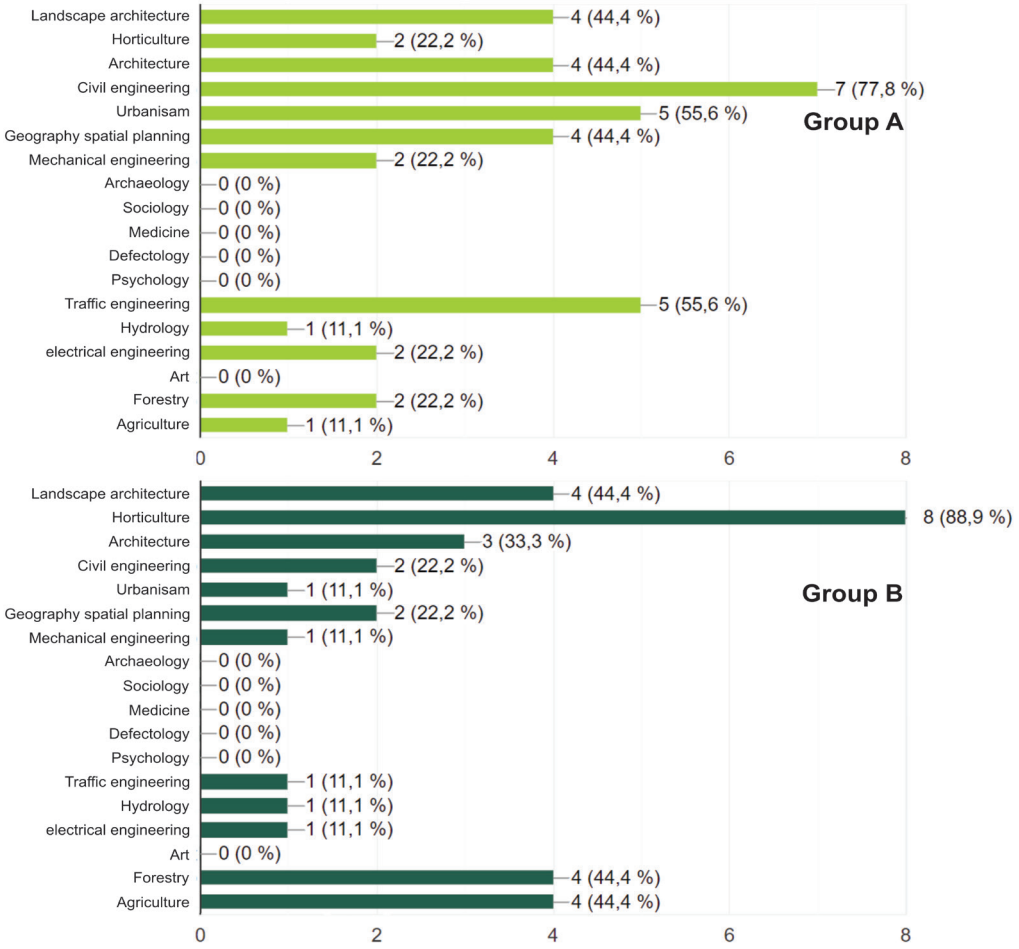
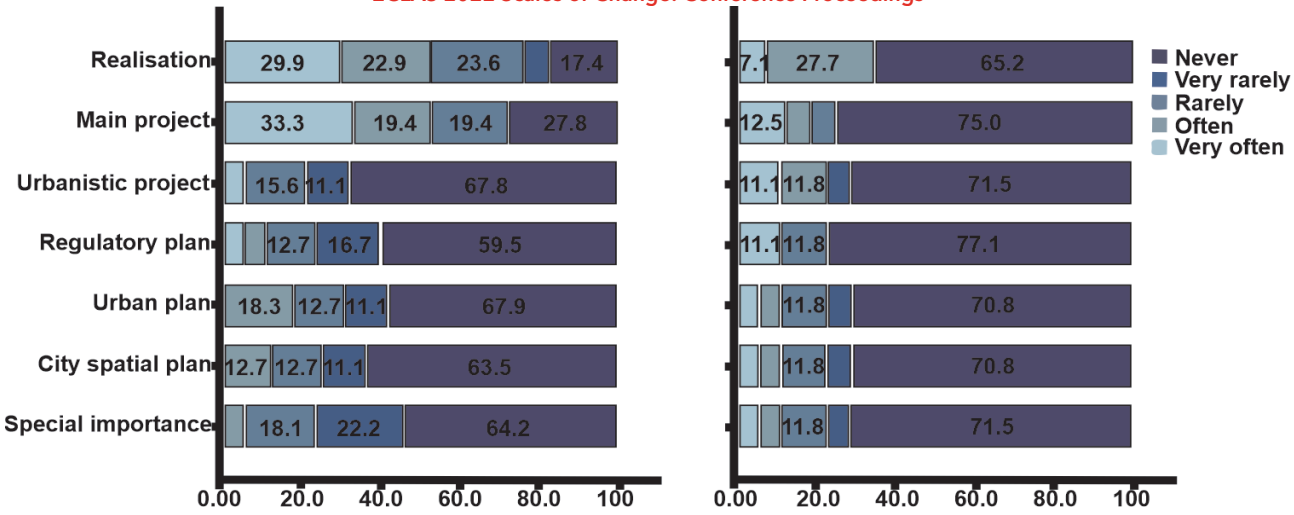


Figure 3
Selected professions from group A (architectural, construction, traffic engineering companies) and group B (landscape architecture engineering companies) employ personnel

of respondents in group B were hired by civil engineering companies.

Answers to question four showed that at least 30% of respondents had very rarely to never cooperated in either phase of project development (Figure 5). Up to 20% of respondents were cooperating in all project phases and only 10% in concept creation. The main result is that the cooperation in second and third phase is rarely achieved (<45%) and almost never in first phase of concept development (<35%).

Finally, answers on question five show that there is a recognized need for the cooperation between group A and group B. The most of respondents from group A (60%) strongly agreed that professional collaboration is necessary, while other 40% disagree or they have no opinion.



Discussion

Legislation

Barriers in transdisciplinary practice are recognized in some literature (Guzman Ruiz A., et al, 2017), which leads to understanding that different socio-institutional barriers can hinder transdisciplinary in general. Leaning on defined barriers and based on research results, this paper identified barriers that hinder transdisciplinary in legislation, education and practice related to landscape architecture in BiH. Identified barriers are referred to:

- Insufficient research into the potentials that such projects provide, lack of knowledge and information.
- Ignorance and little organizational commitment.
- Insufficiently addressed in strategic and planning documents.
- Complexity of administrative structure, unclear roles, and responsibilities.
- Lack of political will and affirmative action.

The answers to recognized issues can be seen through activities aimed at increasing information and research on the advantages of transdisciplinarity and the disadvantages of its absence, expanding the network and trust among interested parties and stakeholders.

Education

Based on the analysis of the master's program in Landscape Architecture at the University of Sarajevo and the University of Kassel, it was found that the University of Kassel offers a higher percentage of courses that fully or partially include a transdisciplinary approach. Although the University of Sarajevo offers a relatively lower percentage of transdisciplinary courses, it should be noted that the number of courses and electives in the program is smaller, which may limit the possibilities for developing and implementing a transdisciplinary approach. Additionally, strong orientation of study program to ecology and natural sciences at the University of Sarajevo further restricts opportunities for students to engage with transdisciplinary topics relevant to landscape architecture.

Figure 4

Achieved cooperation through engagement between legal entities. Graph on the left: Type and frequency of professional cooperation when architectural, construction, traffic engineering companies engage landscape architects (Question 2). Graph on the right: Type and frequency of professional cooperation when landscape architecture engineering companies engage civil and architecture engineers (Question 3). Answers are combined opinions of two groups (N=18)

The organization of the master's program in Landscape Architecture at the University of Kassel, with its specialization-oriented study modules and a rich offer of courses and events, invites professional knowledge and experiences exchange. The program's structure allows for a diverse range of professional backgrounds from the teaching staff, which provides new perspectives and solutions.

By comparison of two programs it is evident that there is a greater need for integration of transdisciplinary approach in landscape architecture program in BiH. Real-world projects and assignments that require students to deal with civil society and its impact on the planning process provide a solid foundation for students to critically understand the role and significance of their future profession. This approach in spatial planning studies, linking academic knowledge and real cases, impacts students' awareness of the significance of civil society and its influence on the planning process (Van der Knaap, 2022).

Practice

In many cases landscape design, planning and implementation solutions require new, highly complex, approach and often global context (climate change and sustainability, circular economy, inclusiveness, energy efficiency). Planning involves integrating areas concerning science, technology, social problems, policy, education, and aesthetics. However, based on the results attained through this study, excluding phases of the main project development and realization, cooperation is rarely to never achieved. The explanation for this situation is the absence of binding legal norms and insufficiently developed awareness of experts during their education. Most companies engage or hire experts' groups for implementing certain project following a multidisciplinary approach.

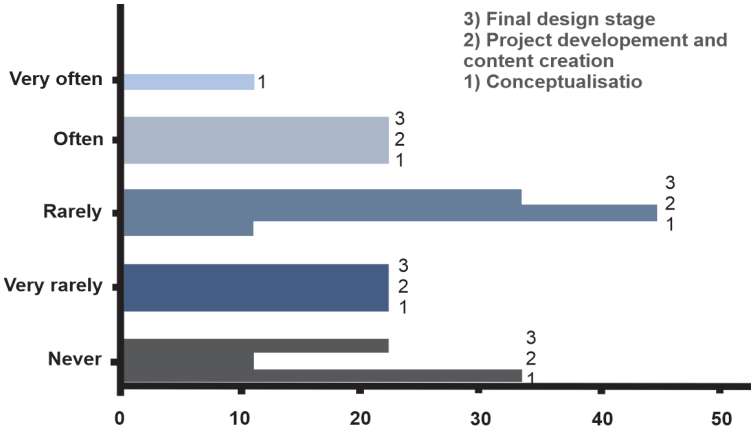


Figure 5
Collaboration achieved in the different stages of project development. Answers are combined opinions of two groups (N=18)

Conclusion

Based on the conducted research and the obtained results, it can be concluded that transdisciplinarity in landscape architecture, in the broadest sense of meaning, is insufficiently covered with legislative framework related to spatial planning at entity/district level. This conclusion is predicated on the observation that the field of landscape architecture is not dealt subject in the legislation to a sufficient extent and in key provisions (e.g., referring to planning documents at different levels of planning, and supervisions).

Tackling complex landscape planning problems requires creative solutions, reliance on stakeholder involvement from initial phase of planning and design, until implementation of project. Results showed in this paper do not show strong cooperation in all phases of planning.

The establishment of a diverse educational environment and a comprehensive array of courses is a fundamental prerequisite for the development of a transdisciplinary approach and the cultivation of students' awareness about the role of all stakeholders for landscape design and planning. In this regard, a comparative analysis of the master's programs in landscape architecture offered by the University of Kassel and the University of Sarajevo reveals notable distinctions. Specifically, the University of Kassel has demonstrated a more extensive and transdisciplinary oriented structure of the master's program, while the master's program in landscape architecture at the University of Sarajevo lacks crucial real-world projects and tasks and a strong bond with civil society. In addition, greater degree of diversification in the course curriculum is necessary to facilitate an all-encompassing and nuanced understanding of the landscape architecture program and to enable the implementation of a transdisciplinary approach in higher education. The present study provides valuable insights into the level of development of landscape architecture engineering as a profession in BiH based on the content of academic programs, legislation development in the field of special spatial planning, and the type and intensity of cooperation between experts in this field. The findings of this study suggest the need for improvements in incorporating a transdisciplinary approach in the curricula of landscape architecture, as well as in the legislative framework.

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0005
BEYOND THE FIELD

Introduction to "Beyond the Field": What this could be and what scale, time and Dr Robert Sapolsky might have to do with it?

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Abstract
This paper addresses the need to shift the focus in spatial planning and design research, education and practice from the boundaries of the research field to the research questions. To this end, a literature review was conducted both within and beyond the field. The question, 'why do we do the things we do?', explored in Sapolsky's (2017) book *Behave: The Biology of Humans at Our Best and Worst*, served as inspiration for crossing different fields of research in search of relevant knowledge and action. What drives land use / land cover change? Is the proposed question intended to help us navigate the necessary collaboration and exploration within and beyond our field to identify and bring about the land uses needed for our common future?

Keywords
Spatial planning and design, land use / cover change, question, scale, time

Introduction
As a spatial planning theorist and, more recently, a geodesign researcher, educator and practitioner, I will start by answering the question in the title by using the Cambridge Dictionary (2023) definition of the term "field" as an "area of activity or interest". In general, performing an activity or conducting an investigation require the use of certain knowledge and tools/methods (different knowledge and tools are used to explore and generate chemical reactions than those used to explore and reduce inflation rates).

This short essay starts with a brief literature review of the field of spatial planning and design: where it stands in relation to other similar fields and where its scope ends and another area of expertise begins. It then moves on to take a brief look at disciplines with relatively well-established fields positioned far beyond our own – neuroscience, psychology and biology – to find possible inspirational guidelines for navigating our blurry field in search of relevant interests and action. Finally, the essay suggests the use of questions on land use / cover changes as a means to address the complex challenges in reaching a more sustainable human-nature interaction.

What is the field of spatial planning and design?

Delineating the field of "spatial planning and design" can be a difficult undertaking. Some approach it from the edges in order to reach the core. For example, in 1959 Edward C. Banfield stated that (1959, p. 361): "The word 'planning' is given a bewildering variety of meanings. To some it means socialism. To others, the layout and design of cities. To still others, regional development schemes like TVA, measures to control the business cycle, or 'scientific management' in industry. It would be easy to overemphasize what these activities have in common; their differences are certainly more striking than their similarities. Nevertheless, there may be a method of making decisions which is to some extent common to all these fields and to others as well ...". Herbert Simon's (1969) definition of design: "Everyone designs who devises courses of action aimed at existing situations into preferred ones", was highlighted by Steinitz (2012, p. 3) as the best definition of design, and seems to start from the core of the field but can expand in different directions. Other scholars see problems with this development. In 1973, Wildavsky writes (1973, p. 127): "The planner has become the victim of planning; his own creation has overwhelmed him. Planning has become so large that the planner cannot encompass its dimensions. Planning has become so complex planners cannot keep up with it. Planning protrudes in so many directions, the planner can no longer discern its shape. He may be economist, political scientist, sociologist, architect or scientist. Yet the essence of his calling – planning – escapes him. He finds it everywhere in general and nowhere in particular. Why is planning so elusive?"

Many other attempts to define the field in the context of post-World War II welfare state activities and their perceived failure (some identified by Alexander, 2016) enriched the discourse. However, these did not lead to a clear direction and consequently contributed to the accumulation of different understandings of what and how we should research, understand and act in the area of spatial planning and design (Sandercock, 1998; Дабовић, 2017).

What do we generally know about our field today, half a century after Wildavsky's diagnosis? In general, we refer to "spatial planning and design" as a hodgepodge of professions, disciplines and related institutional technologies concerned with various spatial aspects and scales of organizing and managing future human/nature interactions for specific community goals (e.g. landscape architecture, transportation and mobility, housing, tourism, environmental, regional, metropolitan, community, coastal, rural and urban planning and design). So, what are our areas of activity and interest? We can research the causes of deforestation in a watershed, plan a rail line between two regional centers through a mountain range, redesign a contaminated parking lot, or push for the electrification of personal transportation in the city to combat air pollution.

What does scale have to do with our field and "beyond" it?

In spatial planning and design, we often look at scale (small and large) to say, this is a job for a regional planner or for a landscape architect.

Why scale matters?

Scale implies different planning and design tasks that require different knowledge, research questions, goals and, consequently, different tools for proposing solutions. However, the contexts in which we can understand who created the problems and how to solve them can be quite different. For example, the deforestation process mentioned above may be caused by the construction of new housing blocks, but the context of the designation of that area can be very different. We can designate an area very far from a city for the construction of houses for immigrants from war zones or for a new luxury housing and commercial area with all the necessary public services. While the institutional technologies for land acquisition and the technical knowledge to construct the buildings may be very similar, the context is different and different aspects and scales of spatial equity are explored. The rail line connecting the two regional centres mentioned may pass through a mountain where, according to the inhabitants of the nearby small rural settlements, lives a deity who mustn't be disturbed. What knowledge and which scales should be employed to determine the route of this rail line? Similarly, the opening of a mine for lithium extraction can be declared a "public good" because it increases the national GDP, provided we ignore the environmental damage it causes in the region. Similarly, subsidising the purchase of electric cars as a measure to reduce air pollution in a particular city may ignore the impact of this decision on the future development of public transport, as well as the impact of lithium extraction, the problems surrounding the treatment of spent lithium batteries, and a possible global increase in CO2 emissions from the fossil-fuelled power plants used to generate the electricity used by the cars.

Who should be involved in identifying and solving these "wicked" problems (Rittel and Weber, 1973)? Do we go beyond the field in trying to answer these questions and solve these problems? Perhaps, instead of looking for the boundaries of our field, we should be finding the questions that will help us locate the meeting points' ?

What do time and Robert Sapolsky have to do with "Beyond the Field"?

Beyond our field of research, constructive question(s) can be found, such as those posed by Robert Sapolsky (2017) in his book *Behave: The Biology of Humans at Our Best and Worst*. According to the Stanford University profile page, Robert Sapolsky is a professor in biology, neurology, neurological sciences and neurosurgery. These fields concern our knowledge of living beings, but Sapolsky is not exploring their boundaries. He was curious to learn how humans can be so compassionate and altruistic, but also so brutal and violent. Sapolsky explores the example of how a person holding a gun behaves in an ongoing crisis (e.g. rioting) when a stranger runs excitedly towards them and there is no way of telling if the stranger's expression is frightening, threatening or angry. He believed that if we focused our interest on understanding how behaviour occurs, we could learn how to deal with problems related to tribalism and xenophobia, hierarchy and competition, morality and free will, war and peace. Hence Sapolsky's question: why do we do the things we do? In answering it, he started

from the study of various neurobiological factors and the activity that takes place in the area of the brain called the amygdala, a couple of seconds before the behaviour occurs. However, he knew that the sensory apparatus was stimulated earlier by something in the environment, so he asks what sight, sound or smell caused the nervous system to exhibit that behaviour a couple of minutes before. Even answering these questions is not sufficiently explanatory, because hormones can act hours to days earlier and change the individual's response to the stimuli that trigger the nervous system. Behaviour can even be affected by structural changes in the nervous system in preceding months, in adolescence, in childhood, in the foetus and in the person's genetic makeup, but also by the mother's pregnancy, relationships and events shaped by her past experiences.

Sapolsky's area of interest thus expanded to include factors beyond the individual to understand how culture shaped the individual's group, what millennia of ecological factors shaped that culture, and what evolutionary factors shaped our species' behaviour millions of years ago. In this way, the focus on the triggers of behaviour shifts along the timeline, spanning from seconds to millions of years. His conclusion is – there is no one brain region, hormone, gene, childhood experience, or evolutionary mechanism that explains everything. Neurons, hormones, genes, environmental stimuli, culture, etc., are studied in different fields of human behaviour, but that doesn't limit them to operating on multiple levels of causality. Furthermore, knowing that the triggers for the "inappropriate" behaviour which had already occurred are fixed but can be changed, Sapolsky makes a strong case for radically reforming the United States' criminal justice system, which is based (to his best knowledge) on mid-19th century neuroscience. His message is, "Those who do not study the history and science of human change are destined not to be able to repeat it." To summarise, he traversed many different fields – neurobiology, endocrinology, genetics, psychology, biology, anthropology, law and criminal justice – without leaving his field of activity and interest, human behaviour.

Can we be inspired by this post-disciplinary guideline? What could be our question, area of interest and subsequent actions? What question would elicit encounters with other fields to understand complex processes and propose beneficial changes? Should we be interested in how land use and land cover occur? Should we study the long history of humanity and the science of land change? We might try to reconstruct what triggered the occurrence of a particular land cover/use over days to millions of years. In the example given, we might explore whether there was an urgent private interest behind selling the forest land to the planning authority to build the new luxury housing block, or an urgent response by the local parliament to meet demands to provide housing for immigrants, or whether it was a mid-term decision by part of the local government to allow housing to be built as a means to launder money from organised crime? What triggers change in land cover/use, at what scale and time frame? Personal crises? Pursuit of beauty, justice, profit or prestige? Floods? Forest fires? Diseases? The market? Law? Urbanisation? Urban planning? Subsidies? Corruption? Climate adaptation? All of these factors operate

at multiple levels of causality, on different scales, and over different time periods. Can the research driven by the question – what drives land use/cover change? – help us navigate the necessary collaboration with other similar fields of research, decision-making and action towards identifying and creating the land uses needed for our common future? What implications will this have for spatial planning and design research, education and practice? On an individual level, would we be able to present ourselves as, for example, person X, associate professor of geodesign and spatial planning theory, regional planner, environmental and social activist, expert in the Public Prosecutor's Office, without feeling lost?

Discussion and conclusions are open. All comments are welcome:

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The Biopark: a sequence of temporary landscapes active in progressive decontamination of polluted soil

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Abstract
A problem in contemporary cities is polluted soils due to the contamination of formerly peripheral industrial areas, which are often uninhabitable and hazardous to health.

The idea of the Biopark was born by imagining a particular landscape that coincides with an environmental infrastructure for the decontamination of soils, in which the aesthetic and poetic characteristics of the landscape are based together with technical reasons belonging to scientific disciplines such as chemistry, biology, and botany.

The Biopark idea thus enriches the legitimacy of landscape design by adhering to objectives of rehabilitation and redevelopment of places in an environmental and ecological sense.

The paper presents the work carried out together with a group of students during the Architecture Design and Construction Laboratory at Politecnico di Milano in the academic year 2018/19.

The Biopark simulates soil decontamination in a real polluted context. It corresponds to a sequence of specific temporary landscapes built on the presence of differently contaminated soils to which the project associates various botanical essences capable of progressively decontaminating them.

Plant species cannot eliminate all types of pollutants in the soil, so it is necessary to add other decontamination techniques based on bacteria or fungi.

The shape of the Biopark will be an evolving shape that changes according to a program of decontamination techniques that are applied for a specific time and mapped on differently contaminated areas.

Soil contaminated by the same pollutant can be decontaminated by various botanical species, designing temporary landscapes that work for the future and the progressive return of places to habitability.

Keywords
Environmental infrastructure, Soil remediation, Temporary park, Biopark, Interdisciplinarity

Introduction

The Laboratory that proposed the Biopark project described in this paper joined the AUIC School's teaching project: "Ri-for-mare Periferie. reforming the Milano Metropolitana suburbs" which focused on the Porto di Mare area, south of Milan, and its urban and agricultural countryside surrounding, the disused Chiaravalle railway line and many abandoned farmhouses.

The project themes proposed to the students were exercises in which architectural and landscape practices establish a close link with the territory, its potential, and its criticalities in the function of urban and environmental redevelopment objectives.

The hypothesis was that public space could assume the role of environmental and social infrastructure through an interdisciplinary project. In particular, the project concerned the area known as Porto di Mare, with its problems of polluted soil and social due to the presence of the so-called Drug Forest. In this area, a landscape active in soil reclamation, named Biopark was designed by the students with the awareness that it would have been necessary to involve different and complementary skills like agronomists, botanists, biologists, environmental engineers, and chemists to improve and control the project choices.

The reclamation of these places becomes fundamental for their return to public life. The Biopark project adheres to this objective by proposing a landscape that coincides with an in-situ reclamation environmental infrastructure.

"Soil remediation" is a sequence of actions to eliminate or reduce pollutants concentration in soil, subsoil, and groundwater. (Legislative Decree 152/06, Art. 240)
"Contaminated site" indicates an area where the concentration values of contaminants exceed the maximum allowable concentration. The permissible values of pollution levels are according to the possible activities at such sites, the biological characteristics of the visitors, and the expected exposure time.

Bioparc is active in soil decontamination by introducing phytoremediation and biodegradation technics.

The phytoremediation techniques are different by combining appropriate plant species with specific pollutants in specific areas.

This gives rise to the Bioparc landscape that changes over time and gradually returns the park to collective use. The plants remain for the time necessary for the decontamination process, so with the time of the seasons and the time of plant growth, the time of the decontamination phases comes into play.

Methods

The design of a Biopark in Porto di Mare
'Porto di Mare' is a place located on the bounder between the urban fabric and the Southern Agricultural Park. This area owes its name to a project from 1917, never completed, which envisaged the construction of a river port to connect Milan first to the river Po and from there to the Adriatic Sea. Today it appears as a peripheral and fragmented edge, between the built areas and a vast system of green

areas marked by the permanence of some farmsteads and the existence of productive and artisan activities.

The fact that this area has been used as a quarry and as a landfill has led to major environmental problems. Many regeneration projects, which remained only on paper, have followed one another over the years. (http://www.riformaremilano.polimi.it/?page_id=3828)

The Porto di Mare site was proposed for the laboratory studio because of its environmental and social problems and its strategic position about the more general objective of redeveloping Milan's peripheral areas. The starting hypothesis was to consider the public space to build opportunities for redevelopment of the suburbs.

The idea of Biopark was proposed as a sort of design guide so that the students could verify its potential, defining it as the construction of an active landscape in the production of environmental quality and the reclamation of polluted soils. It is a park whose landscape changes over time through sequences of application of botanical decontamination techniques producing the return of the restored areas of the park for public use.

The Biopark is like an environmental infrastructure of soil decontamination represented by a sequence of temporary parks. The study of the site and the state of soil contamination is the basis for the design of the Biopark.

The students visited the area and described the historic production activities, associating the areas with presumed pollutants typically characteristic of these activities. Some students retrieved actual data on the state of pollution collected through a characterization campaign of a part of the area under study. This information became the basis for planning the in-situ remediation of the place through the construction of a Biopark.

The design of the Biopark requires specific knowledge, therefore, the students researched the processes that exploit the natural metabolic capacities of living organisms to restore a polluted environment to the conditions permitted for its safe habitability for health.

Even at this stage of gathering the information needed to carry out the project, the students became aware of the interdisciplinary nature of the proposed landscape project, as they had to acquire tools and knowledge not strictly belonging to our discipline.

Hence the need to construct functional knowledge tools to facilitate the correctness of the interconnected and complex choices that the design of a Biopark requires. Therefore, a vegetable manual was produced in which the students listed the plant species that can act differently on different types of pollutants and described them according to the different phytoremediations they can practice, the times of their development, and their botanical characteristics.

The plant species were been contextually described according to height, bearing, flowering, and leaf colors, so that the sequence of plant species in the same area, their composition, juxtaposition,

and permanence time turn out to be a combined synthesis of technical choices about decontamination effectiveness and of aesthetic objectives in landscape construction to produce over time a sequence of temporary parks that follow one another until the final phase of returning the entire park to collective use.

The choice of in situ soil remediation techniques

Phytoremediation and biodegradation techniques are accordingly evaluated, chosen, and sequenced to create a park capable of producing environmental and aesthetic quality, progressively restoring the possibility of living there.

The question of the temporary and incremental use of the park in the function of its decontamination guides the design choices.

The Biopark design process, therefore, coincides with the construction of a Chronoprogram describing a sequence of decontamination techniques applied to each polluted area.

The Chronoprogram coincides with one of the possible sequences of temporary landscapes associated with a specific soil pollution state.

The phytoremediation techniques are divided into phytostabilisation, phytoextraction, phytodegradation, phytostabilization, rhizofiltration, and rhizodegradation. In phytostabilisation, for example, the pollutant is retained by the roots or in the soil near them in a harmless form, preventing possible dispersion.

In phytoextraction, heavy metals in the subsoil or water are absorbed and accumulated in plant tissue, which can be removed by removing the plants. In phytodegradation, organic contaminants and pesticides in the subsoil are absorbed and degraded within plant tissue.

In designing the Bioparco, the selection of plants takes into account their growth time and aesthetic value in the landscape composition. All plant species are chosen and planted according to their decontamination effectiveness. Some plants will remain even after their decontamination task, while others will be replaced by plants effective in decontaminating the soil from other types of pollutants.

By having different plants with similar decontamination capacities, the compositional choices of plants can maintain some freedom in responding to decontamination efficiency and at the same time in considering the aesthetic characteristics of the plants as flowering, colors in the seasons, foliage, growth speed, size, and posture.

The plant species acting on the same pollutant may therefore be different. Furthermore, it may be the case that pollutants require the use of different plant species for different periods in the same area. For these reasons, the landscape design can maintain compositional and aesthetic freedom in establishing the sequence and choosing the association of the different plants while remaining linked to their decontamination effectiveness. Landscape design is a function of soil decontamination.

Figure 1
Chronoprogram presents the list of pollutants in each "Amoeba" with the sequence of plants associated with them for decontamination over time

Given the objective limits of the effectiveness of phytoremediation on certain types of pollutants, for instance, the hydrocarbons, a different technique is adopted, the Biopiles, which use bacteria or fungi for decontamination processes.

The Biopile technique involves removing the polluted soil layer, preparing it by adding nutrients and microorganisms, enriching it with oxygen through movement, and storing it in tunnels where the right conditions of humidity and temperature can be achieved. Then the soil is placed back in its original place. This approach is based on the ability of bacteria to degrade contaminants into components that can be absorbed by other living organisms or transformed into less toxic substances.

The Biopiles are therefore part of the Biopark project, which establishes and regulates their temporary presence in specific areas by incorporating them into the landscape design.

Results

The search for information about the area, the study of decontamination techniques, and the idea of a Biopark led to the identification of several tools necessary for the design of a prototype park conceived as an environmental infrastructure capable of in situ soil decontamination over time.

To find the figure that identifies the Biopark, the students identified the image of the "Amoeba" whose sinuous and fluid, fluctuating and adaptable shape lends itself to organizing the composition of areas characterized by different soil pollutants.

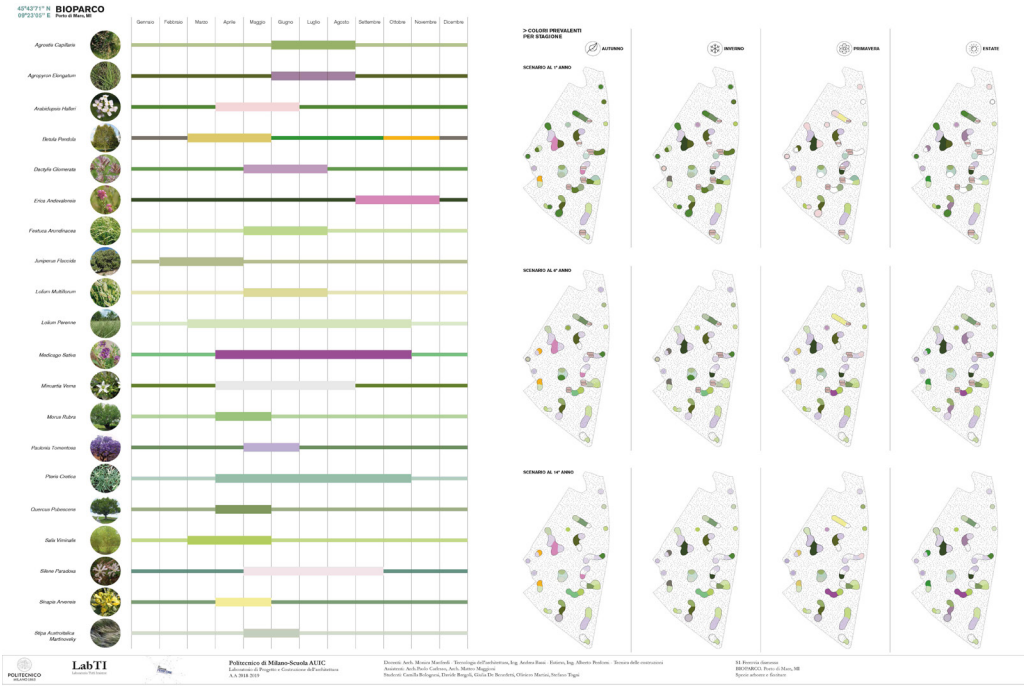

Figure 2
The three scenarios with the coloring of the "Amoebae" in the four seasons

The most polluted areas are temporarily isolated in circular enclosures.

The Biopark is a sequence of decontamination actions organized over time, visible in the Chronoprogram that shows the progressive decontamination of individual "Amoebae" at the time of the three scenarios chosen to represent the Biopark that are at the first, sixth, and fourteenth year. The Chronoprogram exhibits the polluted "Amoebae" in an abacus describing them through their shape and the type, amount, and location of pollutants present in the soil. In some cases, decontamination by Biopiles is employed, so students designed the tunnels housing the Biopiles. Polluted areas and their pollutants were associated with specific decontamination techniques described in the Chronoprogram. It represents one of the possible sequences of temporary parks that design the landscape of a Biopark. (Figure 1)

The Chronoprogram shows the gradual return to public use of the fenced areas during the decontamination of the park.

Another important drawing shows the list of plants for decontamination, each described with the colors of their flowers and foliage in the four seasons. The colors of the plants used for decontamination within the individual "Amoebae" are described in the three scenarios, at the first, sixth, and fourteenth year during the four seasons. (Figure 2)

Finally, the "Diary of an Amoeba" is a graphic account of the sequence of landscapes taking shape within one of the "Amoebae" chosen as an example. It is a

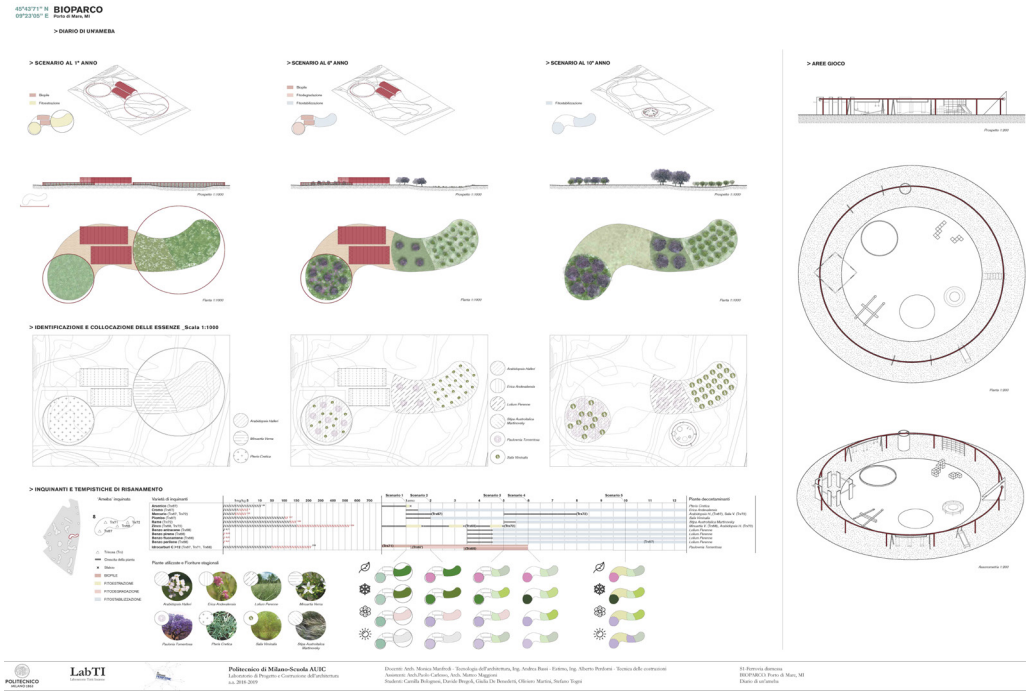

Figure 3
Diary of an "Amoeba"

sort of zoom-in of the general Chronoprogram describing the location and type of pollutants, the bioremediation techniques adopted, and the colors in the four seasons of the employed plants in the four seasons, in a more precise way, considering five scenarios: in the first, second, fifth, sixth, and tenth year. (Figure 3)

The result of the work is the definition of some tools to design a Biopark that can be considered a prototype to imagine other Bioparks in places with similar characteristics.

Discussion

Phytoremediation and biodegradation are in the process of evolution and study having positive and negative aspects, so the Biopark project is also affected by its critical points and advantages. The cost is lower than that required by traditional decontamination processes, both in situ and ex-situ, but the time required is longer. For example, climatic factors may affect its effectiveness, but phytoremediation preserves the environment in a natural state. Furthermore, it offers the possibility of reusing decontaminating plants as biomass by feeding them into a dedicated waste-to-energy plant.

To properly assess the economic and environmental benefits of these different soil decontamination techniques, it would be necessary to select economic parameters and determine what importance to attach to them in the comparison. A multi-criteria analysis could be used.

The complexity of the project of a Biopark, which envisages a gradual reappropriation

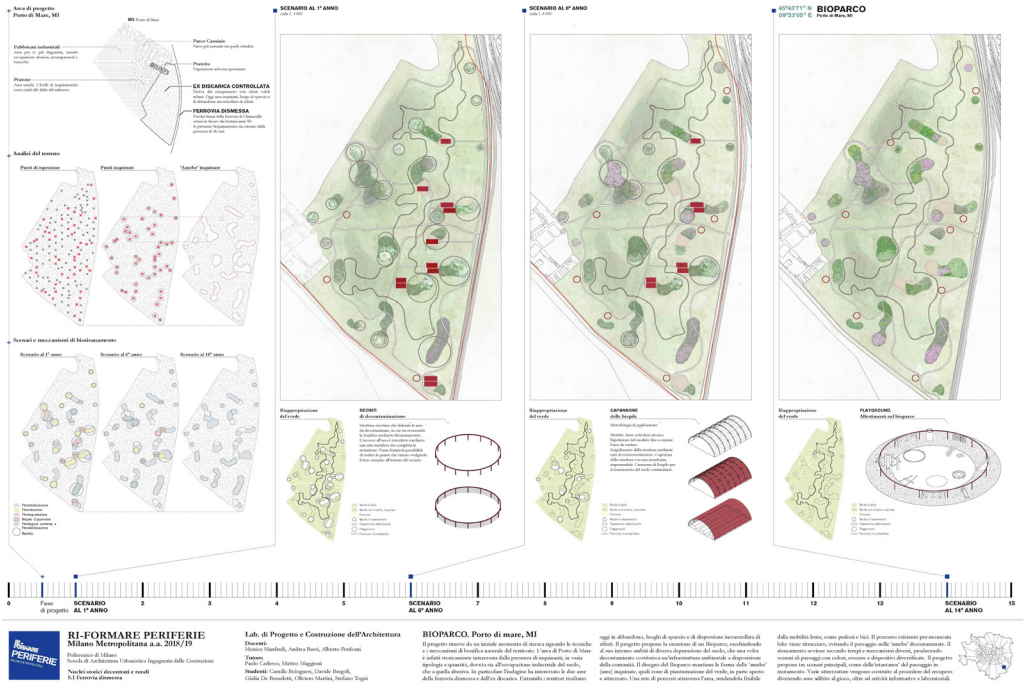

Figure 4
The Biopark summary table with scenarios in the first, sixth, and fourteenth year

of the sites by people, also suggests improving the regulatory aspects concerning the permanence of people on contaminated sites based on the dangerousness of pollutants and exposure times assessed for groups of people and activities carried out.

What has been exposed here does not claim to have exhausted the possibility of defining a Biopark but has tried to describe and investigate it, at least in part.

Conclusion

The Biopark summary table describes the soil analysis with the identification of the "Amebae"; the scenarios with the applied bioremediation techniques showing the gradual return of the Biopark areas to public use at the first, sixth, and fourteenth year; the design of the fences that isolate the contaminated areas before decontamination, allowing park users to watch the decontamination process; the design of the Biopiles' tunnels; the design of the children's games that are placed in the park once the remediation work is completed being the children the most sensitive to pollution. (Figure 4)

The Biopark defines the tools and methods for transforming in situ soil reclamation into the construction of a landscape with productive-economic value, returning uninhabitable spaces to public life and producing psychological and mental well-being as well as physical public health.

Transforming the technical requirements of environmental reclamation into the founding form of the landscape design and project that correspond to defining the aesthetic character of the Biopark on

its infrastructural capacity to improve environmental quality.

The Biopark is presented as a good practice that aims to bring aspects belonging to different disciplines into a new formal unity and to become a legitimization of the aesthetic and functional form of a future landscape-infrastructure-environment.

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The influence of urbanisation processes of the City of Prague on the arrangement of surrounding settlements in the peri-urban landscape

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Abstract
The paper deals with the influence of urbanization processes on the arrangement of settlements in peri-urban areas, specifically around Prague, the capital city of the Czech Republic. The core of this research is a mapping of the changes that the peri-urban area has undergone, a description of the problems that have arisen due to these changes, and a critical evaluation of the consequences of those changes. Specifically, this involves an intensification of use of the peri-urban area for various functions (e.g. transport, agriculture, etc.), by which other functions (e.g. recreational, ecological) are limited. The research focuses on several selected localities. The article identifies and describes the main changes based on preliminary studies (in landscape cover, patterns of public space), which serve as a basis for further research. The further ambition of the research is to document and critically evaluate these changes to serve as a planning basis to provide recommendations for regional policy instruments. The side ambition is to contribute to the discussion what is meant by habitability (the quality of space characterizing it as habitable).

Keywords
Peri-urban area, landscape structures, landscape mapping, public space, permeability

Introduction

Peri-urban context

Conditions for the emergence of the peri-urban landscape began to develop after the removal of Prague's city walls along with the associated fortress district. The ownership of the individual plots was reflected in the colourful mosaic of the agricultural landscape. The consequences of post-war changes within the collectivization of agriculture are still visible today. Since 1948, the average size of land blocks has increased from 0.23 ha to 20 ha in 2014 (Podhrázská 2014). Based on the land cover map, most of the areas around the city are used as agricultural areas (see Figure 1). In the Czech Republic, almost 73% of such land is leased or rented (Hofman et al. 2021), as the continuity of farmers managing the land has been interrupted. This

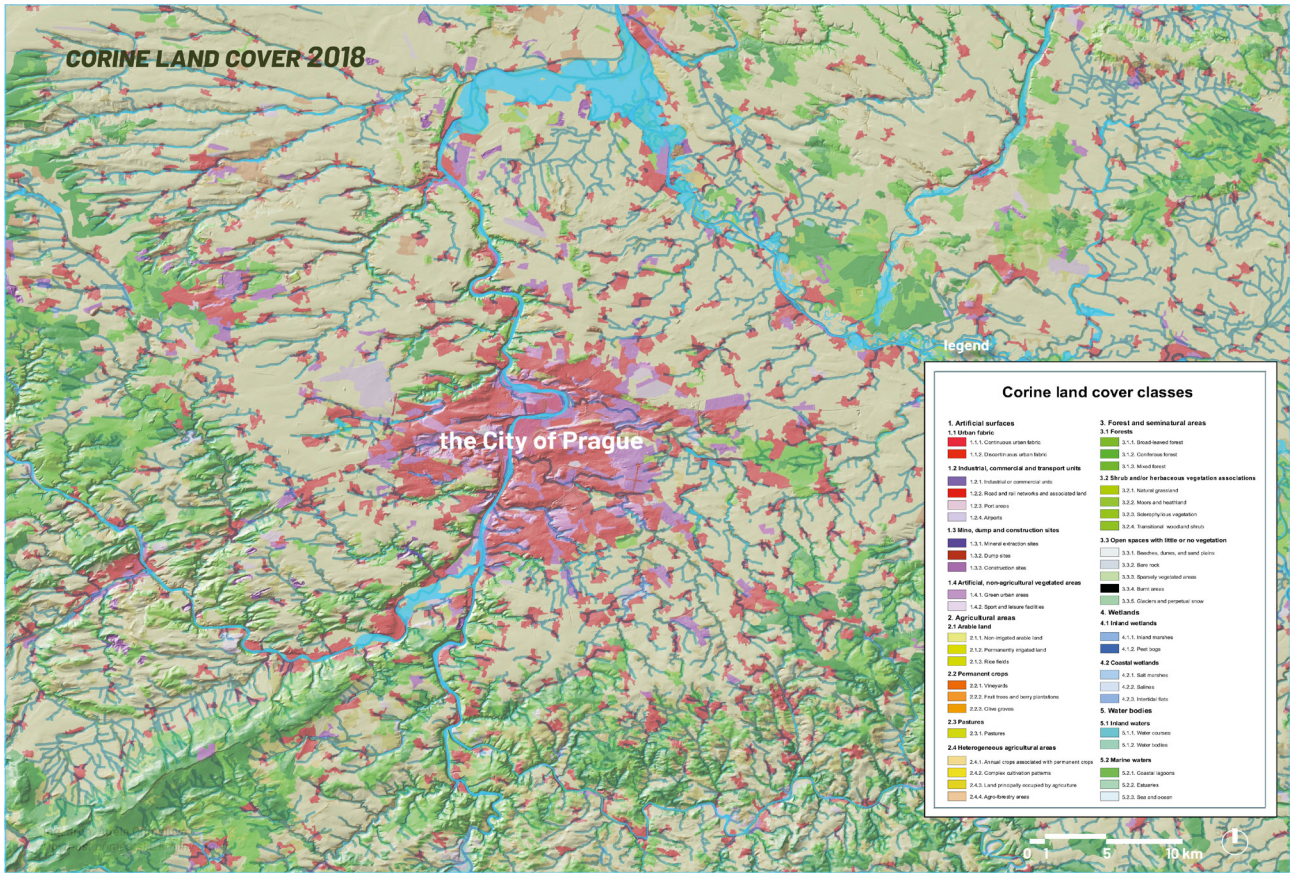


Figure 1
Land cover map displayed with terain model and river system, beige colour indicates use for agriculture (source of the data: CORINE Land Cover dataset)

fact is related to 2 important milestones in Czech agriculture – collectivisation after 1949 and transformation after 1989 (Majerová 2000). The soil is gradually degraded by use of industrial agriculture methods carried out with heavy equipment, which results in soil compaction and further reduction of its retention capacity (Walmsley et al. 2020). The land fund is a common wealth from which profit should flow, as from any other fund. We must realize that we are dependent on the soil for our existence and act accordingly. However, the land fund is being irretrievably destroyed by the wanton manner in which it is occupied.

Urbanisation is the process experienced by rural populations as they develop an urban life, the expansion of urban built-up areas, and the creation of an urban environment (Gu 2019). One of the processes of urbanization that affects the peri-urban area is suburbanization - "a process in which the population and some of its activities move from the city core to the hinterland. This process causes significant changes in the social and physical environment of cities, especially in the target and source areas of suburbanization" (Ouředníček 2003). This process is influenced by possible modes of transport; its development is already relat-

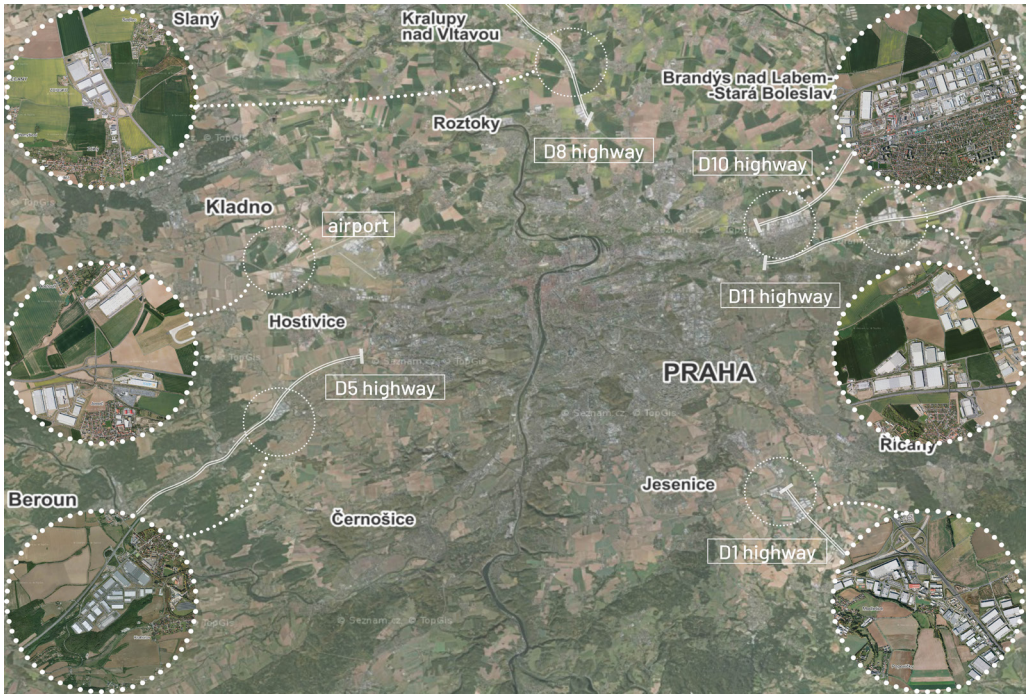
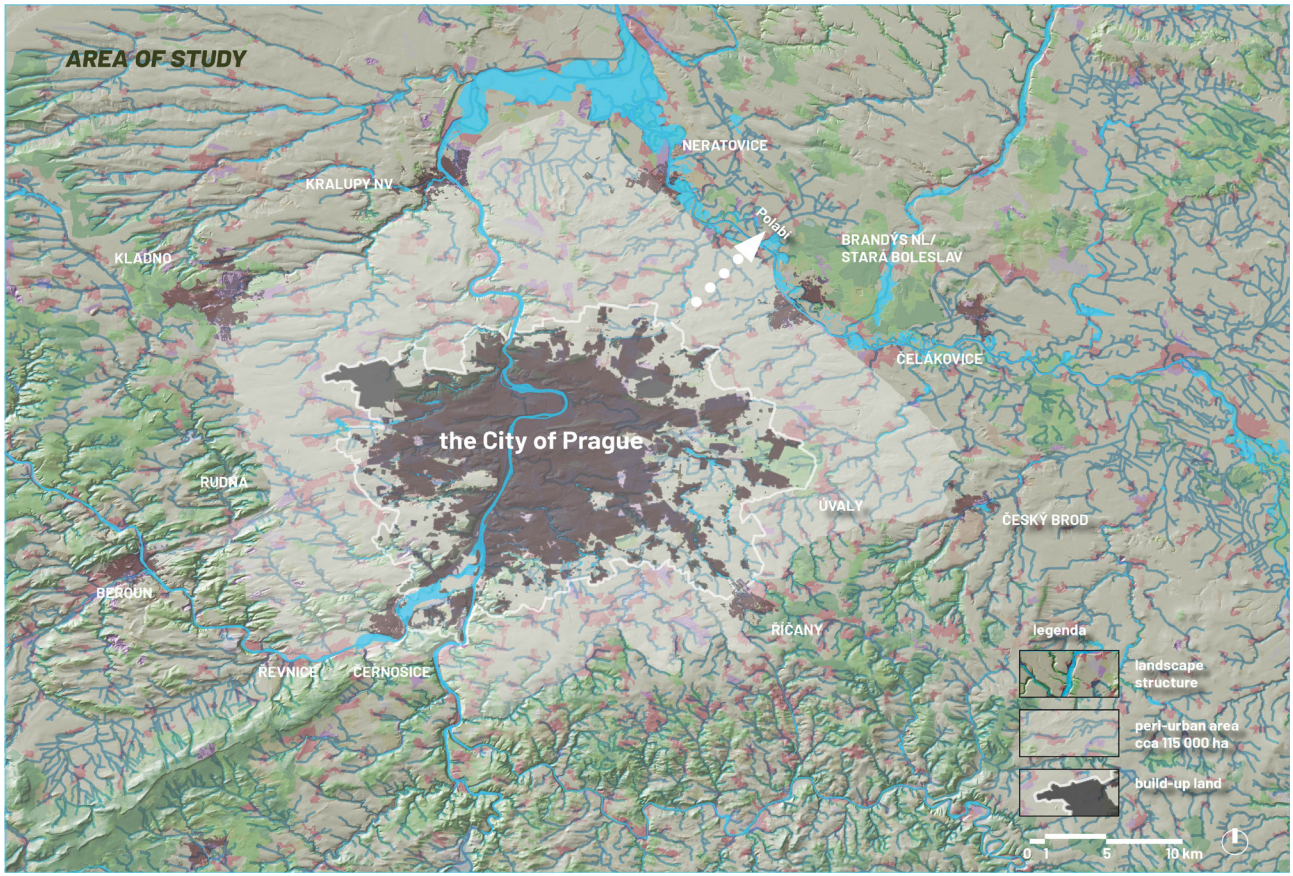


Figure 2
Examples of logistics centres clusters around Prague transport nodes (source of the map: mapy.cz)

ed to the implementation of railways into cities, because it enables commuting to workplaces from greater distances. Around Prague, residential construction is being developed along the southeast corridor, in the direction of Říčany. The first examples of radical changes caused by suburbanization can be found in North America, where the affordable passenger car and the spread of the dream of homeownership gave rise to residential construction (Muller 1977). In the Czech environment, the development of suburbanization is related to the political and economic transformation at the beginning of the 1990s (Ouředníček 2003). The market environment enabled the development of commercial construction and the availability of mortgages enabled the development of residential construction.

Access to the European Union in 2004 resulted in the relocation of economic activities from old member states to new ones (Valkanova 2019). The spatial consequence was the creation of logistics centres, mainly in infrastructure-secured areas (Figure 2: along the D8 corridor, the area around the airport, the area along the D5, D1 corridor, and the area between the D11 and D10 corridors). As a result of different concepts, a vague terrain, a chaotic space spontaneously filling the territory, a place without a function, and/or a place intentionally deprived of function can arise (Haluzík 2020). We often come across this vague terrain in areas where further construction is planned, including transport infrastructure. Currently, building plots on the outskirts of Prague are still more available and cheaper than in its centre; see the price map (Institut plánování a rozvoje hl.



m. Prahy 2023). The processing of the price map was based on an analysis of plots in terms of their characteristics and agreed prices (Hlavní město Praha 2022). Location in the area and transport accessibility also play a role. For this reason, construction and the process of suburbanization are taking place in these places.

Literature review

The research works in the framework of habitability. This term was popularized by the architect Ladislav Žák – "habitability is the result of conscious, protective or creative human care." (Žák 1947). This term refers to a key quality of the surrounding landscape, but its meaning is not entirely certain. Therefore, the ambition of this work is to contribute to its understanding.

There are a number of other definitions that define the landscape from different points of view, an ecologist, geographer or artist will define the landscape differently (Antrop 2018). However, the definition of the Landscape Convention is key, it recognizes that the landscape is the result of human action. Landscapes are primarily a cultural phenomenon, not a natural one (Schama 2007).

Figure 3
Determination of the area of study for the research purposes using GIS (author: Adéla Chmelová)

As a result of dynamic expansion processes, we can still find remnants of earlier landscape structures in the peri-urban area. Therefore, the research understands the concept of the peri-urban area as an area at the edges of settlements with features of both urban and rural environments (Adell 1999). This work understands the peri-urban area as an ecotone – an interface between the urban and rural landscape. Richard Forman and Michael Godron (Forman and Godron 1993) state that the ecotone exhibits features of both environments as well as features completely specific to this ecotone. The definitions used for peri-urban area are:

- The transition between the city and the open landscape formed by a heterogeneous mixture of settlements, business centres, cultivated fields and natural vegetation. (Forman a Godron 1993)
- The transition between the city and the rural area formed by a highly heterogeneous mosaic of settlements, cultivated areas and isolated enclaves of original vegetation (Lipský a Romportl 2007)

The PLUREL project was devoted to research of the peri-urban areas, there is a comprehensive publication from this programme devoted to the process of landscape transformation, i.e. peri-urbanization. They define the peri-urban area as:

- The transition zone between urban and rural areas (Piorr et al. 2011)

Problem statement

Scientific significance and actuality lie in the fact that the landscape changes dynamically in the interface zone of the settlement, in the sense of the built-up area (ČNR 1992b) as well as that of the open landscape. Some older landscape structures will no longer survived but gave way to new ones. This change needs to be understood.

Research gap

The strategic goal of this work is to supplement knowledge in the field of description and explanation of phenomena that affects the arrangement of settlements in the landscape structure in the peri-urban area. The specific goal is to clarify what factors most influence the change of the peri-urban area.

Methods

1. As a first methodological step, the research reviews literature in the field of peri-urban areas, which was introduced in the previous section.
2. The next key step is a determination of the area of interest (Figure 3). The peri-urban area does not logically end at the borders of the cadastre, but can go beyond the cadastral borders. In the case of the city of Prague, it is found within the territory of the Central Bohemian Region. The research for planning documents did not focus only on spatial planning documents of the city of Prague, but also on spatial planning documents of the Central Bohemian Region (IPR Praha 2021; AURS, spol. s r. o. 2018). This spatial data is used for determining the area of study, and is processed using geographic information systems (GIS systems). Data is most often accessible as a WMS service (Czech Geological Survey, Czech Office for Surveying, Mapping and Cadastre, etc.). A relatively homogeneous area is defined

– mainly flat areas with agricultural land use, including settlements. The individual layers overlap each other and determine the type of landscape that differs from others in its individual characteristics.

3. A large-scale field survey aimed at collecting sign characteristics of the peri-urban landscape was carried out (Figure 4 and Figure 5). Subsequently, several locations were selected for further analysis.
4. The core of this research is to document changes in the physical structure of the peri-urban area of Prague. This change is demonstrated in several case studies (currently focused on the areas of Hostivice, Třebonice, Vysoký Újezd, Ořech, Lochkov, Modletice-Doubravice, Kolovraty, Běchovice, Horní Počernice-Zeleneč, Líbeznice, Ďáblice-Březiněves, Zdiby). Maps and aerial maps from the 20th century (key year 1953, but also the 1990s) and 21st century (primarily 2000, 2010, and the present) will be analysed and compared with GIS to illustrate the change. Various thematically focused maps will be produced (for example, land cover change and change of public space patterns).
5. Based on partial analytical map outputs, conclusions are formulated concerning what changes have occurred in the physical structure of the peri-urban area of Prague. This is going to be further used as an information base to answer other questions - which factors most influenced this change and in which areas did the most significant changes occur, and how did they affect habitability.

Figure 4
Narrow entrance to the valley in contrast with the fact that is leads to the most popular place for recreation. Praha-Lochkov

Figure 5
The natural need for connection is not respected. Praha-Řeporyje

6. We build on the realization that the newly emerging physical structures in the peri-urban area are a direct consequence of changes in society, some of which do not arise with an initial intention of increasing the quality of public space but as a reaction to disruptive uses of the landscape (noise barriers, insulating greenery). Today there are different approaches to how municipalities strengthen their recreational facilities (for example, green belts around individual municipalities, walking circuits, forest parks, etc.). These approaches are critically evaluated (are they beneficial or not and in what way?).
7. The conclusions are used to help formulate recommendations (e.g. assessing the potential of an area so as to expediate target investments and implement interventions). The recom-

mendations can serve as examples of good practice for solving similar situations in future. Ultimately, the work will help practically to better understand the concept of habitability.

Results

The field survey revealed that:

1. The remains of the historical landscape structure are still visible. For example, former main roads can be recognized by the old surviving fruit trees that had been planted alongside them during the period of Maria Theresa. The fine pedestrian road network that has disappeared can be guessed from the paths that people still take in the field, or from historical maps as will be elaborated later. Important routes that once served pilgrimages are still recognizable by the accompaniment of chapels. These routes are degraded by their current way of use, as they are interrupted by new roads for motor vehicles. Some of the chapels on the pilgrimage routes either disappeared or had to be moved due to heavy traffic on the roads.
2. Some municipalities have used the historical structure, and further strengthened it through landscaping (e.g. creating walking circuits supplemented by alleys with compositions of different tree species in the landscape around Kolovraty). In recent years, it has become possible to record several attempts to revitalize the original paths. However, questions remain as to whether the original roads, as they were recorded on maps of the Stable Cadastre from the first half of the 19th century, will stand up in the current context?
3. The road network is sometimes discontinuous, which causes problems when moving through the peri-urban area. For example, during the construction of the D0 motorway - the Prague ring road - a large number of vegetation structures were cut through, as was the previous road network. Some municipalities in the Prague hinterland (e.g. Třebonice, Doubravice near Modletice) lost their connection with neighbouring municipalities and thus found themselves isolated. In the Modletice transport hub, warehouses and production facilities completely surround the original historic residences. Users solve such discontinuities by creating their own paths, especially through large agricultural areas. It is surprising that the basic connection directly from the house to the nearest road leading towards the open landscape is often missing.
4. The established archetype of the settlement, which is anchored by path connections within the system of landscape structure, is transformed. The public space of the newly built up peri-urban areas does not connect to the road system and often ends as dead-end streets without any possibility to enter the open landscape. In some cases, it is surprising that any pedestrian connection between neighbouring settlements has been preserved. Green belts created around settlements also contain paths used for recreation (Líbeznice, Zeleneč).
5. Isolated enclaves of residential districts, commercial or storage areas are located in the peri-urban area. Logistic centres, warehouses and transhipment centres have been created near impor-

tant transport hubs - areas that, due to their size, disrupted the natural permeability of the landscape; their character can rightly be described as the result of "black box urbanism" (Valkanova 2019). One of the side effects of their operations is light smog in the night hours (Česká televize 2018). Municipalities located near such centres (such as Zeleneč, for example) reacted in their own way, surrounding themselves with an insulating vegetation belt. Other cases of municipalities creating forest parks to strengthen their system of public spaces can also be found (such as the forest park called "v Panenkách" near Běchovice, and a forest park in Satalice).

6. The operation of motor vehicles on high-speed roads is also noticeable, not only by their physical presence and noise, but also by the consequences related with their construction. The construction of transport infrastructure entails large volumes of earthworks; the excavated soil is then deposited on the nearest free land (hills in the surroundings of the municipalities Hostivice, Ořech or Zlatníky-Hodkovice). This changes the natural geomorphology and creates new mountains in the landscape. Although these mounds have been created randomly from residual material, they have a unique role in connection to neighbouring settlements. In the flat landscape around Prague, they are visually significant, they serve as recreational areas with vantage points. Finally, villages close to transport infrastructure are surrounded by anti-noise barriers (Průhonice) which are the current type of fortification.

Figure 6
Different users of the peri-urban area together. Hostivice (author: Adéla Chmelová)

7. A significant area is occupied by agricultural land. Any abnormality in the cover of agricultural plots becomes a target of attention. For example, a field of poppies near the road leading to Březiněves caused a stir as people stopped to admire it.
8. The most frequent users are residents of adjacent residential areas engaged in sports (running, skating or cycling) or recreation (walking, often with a dog). Other groups consist of vehicle drivers and farmers (Figure 6).

The map sources research revealed that:

- Paths that have physically disappeared are still visible in the cadastre and are often in the possession of local municipalities.
- The land cover change is primarily connected with newly built-up areas. An important milestone was the construction of the Prague ring road, which resulted in an interruption of the road network. The earlier logical structure of roads that connected neighbouring villages often disappeared.
- Research in this field can be problematic because the capital city of Prague and the Central Bohemian region are two different regions according to the territorial definition, and this causes

incompleteness or in some cases the complete absence of data.

The absence of coordination and conceptual thinking at the landscape scale causes problems in the peri-urban area (Frejlachová a Špičák 2019), the consequences of which include land acquisition, reduction of land retention, light pollution, discontinuities in the road network, and the loss of ecological functions of the landscape.

Discussion

1. The results show that the historical layers are vulnerable. Historical layers (old roads, small sacral monuments) often appear like a bag of bones dropped in the landscape instead of being integrated within the area.
2. Differences in the peri-urban area are caused by different approaches by the management of the individual municipalities. Some perceive the strengthening of landscape infrastructure as a priority, while others are passive. We need to accept the development of the area, its transformation for the current use while building back respect for the landscape context.
3. Connecting the road network into a continuous system has great potential. The importance of entrances to the open landscape, which often serves as the closest recreational facility for residents, is essential for a city of the size of Prague. There is also great potential to restore old roads whose routes are preserved in the cadastre. But it always depends on the given territorial context. It is paradoxical that even though the transport infrastructures connect a wider region, they have a great impact and limit the immediate connection between neighbouring settlements. One of the means of integrating this necessary infrastructure through areas around settlements that also expresses respect for this infrastructure as part of the peri-urban area is to create parallel routes to accompany this circuit. Sections of the road network around the Prague ring road could potentially be connected into a continuous route.
4. Isolated enclaves are demanding on civic amenities and technical infrastructure. Thus, the context of the original settlement is significantly transformed and the connection with the landscape context is significantly disrupted. Thus, utilitarian buildings collide with the vibrancy of small villages. When such a settlement is in such close proximity to commercial centres, should not the newer public space be humanized to become part of the original settlement? There are examples of residential areas that are completely isolated from public amenities. In the case of Vysoký Újezd, the municipality has exceeded its original size several times while the core public space remains the same size.
5. Commercial activities such as shopping centres, warehouses and production facilities have a significant influence on the formation of the settlement. Two cases (Zeleneč, Líbeznice) show us that the archetype of the settlement is changing - from an urban structure around the core gradually transitioning into gardens and agricultural areas to a clear demarcation of settlements set hard against disturbing elements (commercial areas, high-speed roads).

6. High-speed roads have a great impact on the permeability and arrangement of the territory as well as the image of the landscape and its ecological functions. Indirect consequences in the form of dump hills can become crucial to new planning and ecologically valuable sites.
7. There is potential for adapting agricultural areas to recreational use. At the same time, it is necessary to respect the requirements of moving agricultural machinery. One possibility is to create a colourful mosaic of cultivated crops within a system of pedestrian paths. To accomplish this it is necessary, for example, to modify the subsidy system, which would motivate farmers to create it.
8. Several types of users are evident in the area. Their presence proves to us that this land is significantly important. The challenge is to balance the requirements of all who use it.

Based on the field survey, there are areas that are currently problematic in terms of road network connectivity and accessibility (Třebonice near D0 highway). One possible solution is to use existing traffic infrastructure to lead other landscape infrastructures (such as green infrastructure, pedestrian and cycling road system). Some sections along the D0, the Prague ring road, are already accompanied by pedestrian connections but these connections have the character of "desired paths" (Richards a Ingold 2022) rather than regular routes (Hostivice-Sobín).

It is correct to understand the territory as an interface, because different, often contradictory, requirements are meet therein. These stretch from requirements rather typical for the city environment (commercial and storage use), to requirements for recreation and spending free time, to requirements for high-speed roads, to requirements for agricultural use and landscape ecological functions. Together, they create a uniquely rich mixture with characteristics specific only to it.

Conclusion

The peri-urban area is an expression of contemporary society. The function and operation of our society has a fundamental influence on the arrangement of the physical structure of the area. The suburban area has undergone many changes, the most obvious of which is the loss of continuity of landscape structures. The development of transport infrastructures is responsible for a large portion of these changes. Its networks break the older connections between individual settlements while enabling transport over greater distances and creating easily accessible transport hubs, where further construction is strategically located. This situation conditions the emergence of other development activities.

For example, the presence of vegetation is crucial for large-scale constructions such as logistics centres. Planting plays a major role in integrating structures into the environment by reducing their visual intrusiveness and repairing damage to ecosystems (Robinson and Wu 2016). Vegetation areas must be considered early in the planning process. Vegetative elements require time to achieve their spatial and functional effect, therefore, their establishment should have priority in the entire construction process. An interesting

example of this can be found in the UK, where Japan's Toyota teamed up with the Derbyshire Wildlife Trust to create a nature reserve and biodiversity action plan within an almost 23.5 hectare car plant site. The site has become part of a wider wetland management plan along the Trent Valley to promote biodiversity. As an example, one goal is to establish breeding pairs of eagles, for which nesting platforms were built with the help of Toyota employees. So too the Burnaston factory seeks to protect and improve the local environment through the use of renewable energy, for which innovative and energy-efficient technologies have been introduced (Thomson a Bates 2022).

For sustainable industry, the term "factory as forest" was introduced, which is associated with the statement of Janine Benyus – "When the forest and the city are functionally indistinguishable, then we know we've reached sustainability." Unfortunately, current practise in the Czech environment is that near industrial developments, vegetation is scattered about only as a desperate attempt to block the view or as an attempt to camouflage warehouses with climbing plants. Neither of these methods fulfils sufficient aesthetic or ecological functions.

The planning goal should be to eliminate subsequent solutions in the landscape (see Zeleneč), but rather to strive for construction solutions (especially for larger investments with a significant impact on the surroundings) that will not have a negative effect, but will, on the contrary, enrich its surroundings.

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A new understanding of being physically and virtually en route

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Abstract
Digitalisation transformed educational landscapes into complex hybrid spaces that are extending beyond the campus. Therefore, a comprehensive understanding of these spaces is needed, which in this paper is referred to as perceptions and practices *en route*. Based on a qualitative study with students at Osnabrück University of Applied Sciences (HSOS), five different types of perception and practices *en route* could be identified. Students of HSOS perceive it either as an "exhausting obstacle", a "monofunctional tunnel", a "spare room", a "public park" or a "mindful movement". These perceptions and practices *en route* are not necessarily determined by the mode of transport, the amount of travel time or the quality of the built environment, but rather by the individual production and utilisation of spaces *en route*. Students have different strategies to make use of the time and space *en route* that are not necessarily bound to 'productive' activities but can still contribute to better learning and studying experiences. Therefore, spaces and practices *en route* are an integral part of educational landscapes. For the profession of landscape architecture these findings allow understanding and designing commuter landscapes.

Keywords
Space *en route*, spatial typology, perception, educational landscapes

Introduction: The space *en route* in educational landscapes

In times of digitalisation, the university extends beyond the campus: Due to the widespread dissemination and use of information and communication technologies (ICT) a virtual layer has been added to the physical world that can be entered anywhere anytime, allowing new hybrid learning spaces to emerge (Lamb et al., 2022, Schwanen et al., 2006). Thus, universities are no longer distinct places, but part of multi-faceted networks of spaces and pathways that can be described as educational landscapes (Holloway and Jöns, 2012).

Being physically on the move in these landscapes means travelling in hybrid spaces. This offers the possibility to make travelling more multifunctional by engaging in new activities and practices while being on the move (Tully and Alfaraz, 2017). Therefore, the nature of commuting might change fundamentally.

Simultaneously, universities are increasingly obliged to contribute to sustainable development. The commute of students and staff accounts for a large share of universities' CO2-emissions (Pérez-Neira et al. 2020). To meet sustainability goals, universities need to change unsustainable mobility patterns.

In light of these challenges, not only educational landscapes will change but also the way university members move and commute within these landscapes. Spatial planning, in particular the discipline of landscape architecture, has tools to shape this process and identify potentials for more sustainable, multifunctional ways of moving. However, the authors of this paper suggest that in order to actively use these potentials, a comprehensive understanding of commuter spaces that includes not only qualities and characteristics of the physical space, but also individual practices and perceptions is essential. We refer to this integrated understanding as the spaces and practices *en route*.

While there is rich literature on commuting spaces and practices in other scientific disciplines (e.g. Stein et al., 2022, Keseru et al., 2018 or Pawlak 2020), research from landscape architecture remains scarce. To contribute to this field and provide insights into the individual production and utilisation of spaces *en route*, the key question of this paper is:

How can the spaces and practices *en route* be understood and described and what are implications for landscape design?
The results of this paper were generated as part of the research project EN ROUTE at Osnabrück University of Applied Sciences (HSOS). In a transdisciplinary process, researchers from various disciplines use the HSOS as a case study to develop concepts and strategies on how students can be on the move in physical and virtual learning spaces and thus make educational landscapes more sustainable and resilient.

Methods
In order to gain meaningful insights and to comprehensively understand the use and perception of the space *en route* in the case study of HSOS, the research team chose a qualitative research design (Creswell & Poth, 2018) and used a three-step mixed-method approach: Participating HSOS students kept a mobility diary, that provided the basis for in-depth interviews that followed. Building upon these steps, a typology of spatial perception and practice *en route* was developed within a design research process.

Mobility Diaries
Based on action space research (e.g. Hägerstrand 1970), the participants kept record of their mobility behaviour for one week during the semester. A digital mobility diary was provided that focused on the question: Who does what, when, where, how often, how long and why? In addition to information on time use, means of transport or relevant locations, the students were also asked to provide background information on their activities, the necessary equipment, other people involved and the motivations for their behaviour.

Semi-structured Interviews
Subsequent to the mobility diaries, a total of 26 semi-structured interviews were conducted. The interview guideline covered

questions regarding online and offline studies, place(s) of residence, relevant learning spaces, and commuting. The aim of the interviews was to understand the behaviour and to learn more about the individual backgrounds. The format provided an appropriate balance between consistency and flexibility (Patton, 2015). All interviews were recorded and transcribed verbatim.

Sampling & Analysis

Data collection was conducted in two cohorts in May/June 2022 and November 2022. Various sampling methods (e.g. public invitation, snowballing) ensured that the research group was as heterogeneous as possible in terms of gender, age, faculty etc. to reflect the different behaviours and attitudes towards commuting. Thematic analysis (Braun & Clarke, 2006) was used to analyse the qualitative data collected. This method summarises the most important features of large data sets and highlights similarities and differences within the data set (Braun & Clarke, 2006, 2013). MAXQDA – a qualitative data analysis, management, and modelling software – was used to systematically code, thematise and analyse the data. During the analysis, data was constantly cross-checked among the research team to increase validity of the codes and categories in use.

Design Research

Based on the mobility diaries and the interviews the research team designed a typology that groups patterns of spatial practice and perception. Inventing this typology is based on an iterative process as known from design research (Prominski, Seggern 2019). This process benefits from the interplay of rational and intuitive strategies. The types were designed based on the knowledge of the first interviews (rational), expressed in drawings (intuitive) and described by characteristic names. The typology was then checked with the data from the second cohort of interviews (rational).

Results: Typology of spatial perception and practice *en route*

Based on an initial literature review, the research team assumed that the perception of the time and space *en route* would strongly depend on factors such as the means of transport (e.g. Ettema et al., 2016), distances and travel time (e.g. Lyons & Chatterjee 2008), the possibility to use the transport time, often facilitated by ICT (e.g. Pawlak et al. 2021, Malokin et al. 2021) or the qualities of the surrounding environment (e.g. Chan et al. 2021). However, the mobility diaries and interviews revealed that the way students use and perceive the time and space *en route* is not necessarily determined by mere "objective", external conditions nor by sociodemographic factors. Individual dispositions, motivations and valuations must equally be taken into account. The research team identified five types, which differ from one another in terms of the evaluation of being on the move, use of the time *en route*, function of ICT use, perception of the space *en route* and motivation for choice of transport mode. Tab. 1 provides an overview over the categories that were used for coding as well as the characterstics of the five types.

In the first conception the time and space *en route* is perceived as an **exhausting obstacle**. Physical mobility is a chore that involves planning, concentration, physical

Type	Evaluation of being on the move	Use of the time *en route*	Function of ICT use	Perception of the space *en route*	Motivation for choice of transport mode
Description of the categories	**Statements about:** **- students' perceptions and evaluations of daily commuting.** **- the background of the evaluations.**	**Statements about:** **- the use of the time and space en route.** **- purposes of use.** **- criteria of use.**	**Statements about:** **- the use of ICT while commuting.** **- purposes of use.** **- criteria of use.**	**Statements about:** **- the subjectively perceived space en route.** **- the conditions of it**.	**Statements about:** **- reasons and backgrounds of the choice of transport mode.**
***en route* as an** exhausting obstacle	**Rejection & Reluctance** - A chore involving planning, concentration, physical or mental e**xhaustion**, often connected to the sentiment of unsafety. - If possible, commuting would be avoided – sometimes it prevents students from getting to campus.	- Fail to make use of the time because commuting requires their **full attention**, consuming mental capacities - Commuting feels like a **waste of time**	- At best, safety aspects only **passive use** of ICT, e.g. learning audios or music	- Daily **obstacle** and **burden** that **needs to be overcome** as quickly and safely as possible	- **Pragmatic**: Time (savings), safety, reliability
***en route* as a** monofunctional tunnel	**Indifference & Acceptance** - One goal: Getting from A to B - It is **not appreciated**, but **accepted as necessary part** of their study life, even though it can consume several hours a day	- The time *en route* is perceived as dead time. Often ICT is used to **"kill the time"** by listening to music, watching videos or browsing the internet	- The use of ICT further reinforces the **isolating effect** of the tunnel.	- The space *en route* is **hardly noticed**. These students are in their own world, while travelling physically from A to B without enjoying it.	- **Pragmatic**: saving time/money - **Habits**: use of familiar means of transport, even if unsatisfied with it. Instead of changing it, they retreat into their tunnel
***en route* as a** spare room	**Opportunism & Multifunction** - Appreciated opportunity to deliberately combine commuting with one or more function(s) or need(s): (daily exercise, „office" to organise the study day, …) - **Integral** but **rather (multi-) functional** part of their everyday study life	- As efficiently as possible: **deliberately** placing some of these activities into the space *en route*, opens up the **opportunity** to organise the time on and off campus more **freely**.	- ICT is usually an integral part or even a **requirement** for the space *en route* to **fulfil its function**, for example to serve as"office".	- V**arying**: If used as office, it is hardly noticed. If used as a gym, aspects of the environment gain relevance (traffic, topology, street condition…)	- **Needs-based**: If they need exercise, they choose active means of transport. If they need to organise something, they rather choose local transport
***en route* as a** public park	**Socialness & Sentiment** - The feeling of **being part** of the (social) world - **Interactions** (either active, by getting in touch with other people, or passive, by observing the surrounding landscape)	**- Interacting** with or **perceiving** the surroundings In doing so, students **relax** or **mentally recapitulate** the study day	The use of ICT (e.g. music) can further **enhance** the effect of spatial perception	- **Linked together**: The **perception** of the space *en route* often contributes to a **positive valuation** of being on the move	- **Health** aspects (fresh air, physical exercise) - **Social**: The option of interacting with the world
***en route* as a** mindful movement	**Selfcare & Motion** - A total**, overall experience**, a **routine** and a pleasant **ritual of mindfulness** - F**low state**. - Importtant act of **selfcare**	**- Mentally preparing** themselves for or **reflecting** the (study) day - Time for and with themselves with great importance for their **mental health**	ICT is used (e.g., listening to podcasts, music) if it **increases the flow state** and the moment of selfcare. - Some even **deliberately decide not to use** ICT in order to focus on themselves.	- **Setting of movement**: The space *en route* is perceived positively, although **no specific reason** is mentioned. Rather, it is an inseparable part of the overall experience.	- **(Mental) health** aspects - **Selfcare**: The wish to connect with oneself through movement

Table 1
Typology of spatial perception and practice *en route*

or mental activity and leads to exhaustion. These students try their best to make use of the time, often by using ICT, but usually they do not succeed. Hence, they feel that being on the move is a complete waste of time. Given the option, these students would avoid the commute at all. The commute to university becomes an obstacle that needs to be overcome in order to attend campus events – in some cases it even prevents them from getting to campus.

The second type sees the space *en route* as a **monofunctional tunnel**, serving only one purpose: Getting from A to B. The time and space *en route* is not appreciated, but unlike the previous example, they do not oppose being on the move. It is a necessity that they simply accept as part of their everyday life. Listening to music, watching videos or browsing the internet are some of the practices to "kill time". The use of ICT further reinforces the isolating effect of the tunnel.

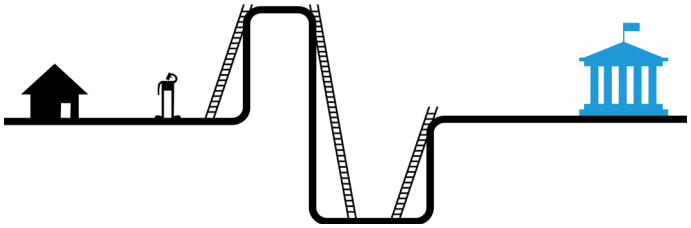
Similar to a **spare room** in a flat, the third type makes use of the space *en route* in different ways, serving at least one specific function: Some students use it as gym to get their daily exercise, some use it as office to organise their study day. Placing some of these activities deliberately into the space *en route*, it is an integral but rather functional part of their everyday study life. The demands on the space *en route* can vary from day to day, thus it has to be potentially multifunctional. The mode of transport is often chosen accordingly. ICT is usually an integral part or even a requirement for the space *en route* to fulfil its function, for example to serve as an "office".

The fourth type perceives the space *en route* as a **public park** where different practices can be performed. Being on the move is equated with being part of the social world. Interactions can be either active, by getting in touch with other people, or passive, by observing the surrounding landscape. Often the perception of the landscape contributes to a positive valuation of being on the move, while ICT (e.g. streaming music) can further enhance the effect of spatial perception.

The last conception, **mindful movement**, differs from the previous types: The space *en route* recedes into the background as a setting of movement. Being on the move is perceived as a total, overall experience, a routine and a pleasant ritual of mindfulness. The movement itself is routined and puts the student in a kind of flow state. Students use the space *en route* to mentally prepare themselves for or to reflect the (study) day. Some participants even reported the importance of the space *en route* for their mental health balance.

This typology shows that the space *en route* is perceived and used by students in many different ways. Today´s perceptions and practices while being on the move are not necessarily determined by the ability to pursue apparently "productive" activities such as studying or organising the day. Other activities are equally important and can positively contribute to students´everyday study experience.

Another finding was that, even if the external conditions are similar, the exact same route can be perceived very differently: For some students it served as their daily fitness routine, while for others it was an

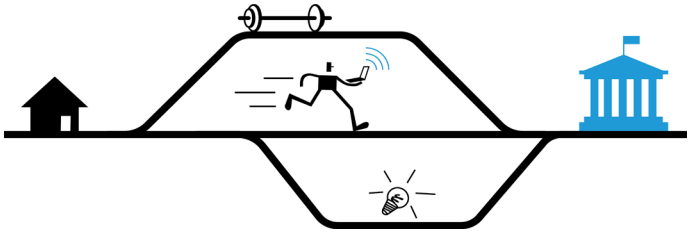


»It's a waste of time, because I try to use it as well as I can, but it's simply not possible for me to read any books or write text messages, [...] while I'm driving. And of course it also steals energy, which isn´t then available for the rest of the day.« TN10, 52 y.o.

Figure 1
The space *en route* as an exhausting obstacle

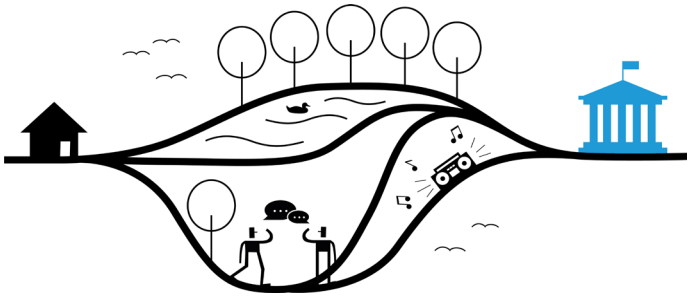
»[...] then I´ve already been four or five hours on the move, without being anywhere I wanted to be. Sometimes it's quite exhausting, but otherwise I've really got used to it. So that's nothing, that bothers me so much.« TN8, 22 y.o.

Figure 2
The space *en route* as a monofunctional tunnel



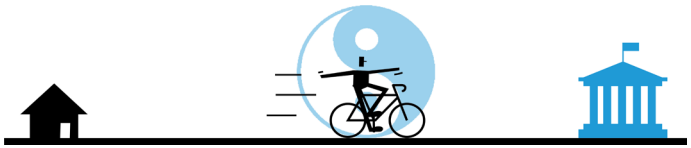
»I am actually super satisfied: I can combine my sport, my exercise, with my way to university. That´s awesome. These ten, eleven kilometres are simply a way for me to wake up, to be fit when I arrive in the morning. Even if it's -3 degrees and really disgusting outside, it's somehow nice.« TN3, 24 y.o.

Figure 3
The space *en route* as a spare room



»Movement is simply something I like. Also somehow perceiving a little bit of nature, breathing fresh air. Then also using the whole thing to spend time with friends. And also to cover a distance together.« TN7, 31 y.o.

Figure 4
The space *en route* as a public park



»The way to the university is just for myself: to think, to structure myself a bit, what am I going to do now. So for me moving also has a psychological aspect.« TN5, 20 y.o.

Figure 5
The space *en route* as mindful movement

unconquerable obstacle, keeping them off campus (Fig. 6).

This underlines that this typology is not only based on spatial features or means of transport, but on the use, perception and valuation of being *en route*. Therefore space, practice and perception cannot be considered separately – neither from each other, nor from the perceiving student. Rather, these factors interact and are closely interwoven. An adequate term for this situative, performative spatial interaction within the space *en route* is *Raumgeschehen* (Seggern 2019). *Geschehen* is an old German word that is still widely used for ‚something that is just happening'. The concept of space (German: Raum) as *Geschehen* allows to discover and comprehensively understand the space *en route* in its manifold, dynamic and performative – both physical and virtual – dimensions of spatial interaction (Seggern 2019; Seggern et al. 2015; 2009). Consequently the term *Raumgeschehen* is adequate to encompass the entanglement and the complexity of the use and perception of the space *en route*. What implications derive from this typology based on *Raumgeschehen* is discussed in the following.

Figure 6
Raumgeschehen *en route*

Discussion

The different types of spatial perception and practice *en route* show that students have different strategies of being *en route* that are not necessarily bound to ‚productive' activities but can still contribute to better learning and studying experiences. Therefore spaces and practices *en route* are an integral part of educational landscapes. From the results it can be concluded that routes to and from campuses need to be understood and designed as part of a whole system consisting of virtual and physical spaces. Here, it is important to find bold visions that show how people can flexibly use, experience and, in the best case, help to sustainably shape landscapes along the way. These visions must combine ideas for structural optimisation such as a system of cycle paths with those for communicative support of the transformation process towards sustainable travel.

Furthermore the typology shows how closely path use and landscape perception are linked to personal mobility habits and preferences in the flexible use of infrastructure. It helps to understand that the provision of suitable transport infrastructure is not sufficient to promote sustainable travel. Rather, it is about understanding the *Raumgeschehen en route* (Seggern 2019) and designing a multifunctional commuter landscape that enables different types to travel according to their needs.

With this in mind, the development of sustainable educational landscapes should also address spaces and practices *en route*. Furthermore, this perspective can provide new approaches in landscape architecture and spatial planning. What are these new approaches for landscape architecture and spatial planning?

Recognising spaces en route as a design task for landscape architecture
Transit spaces have so far been discussed in planning mainly as problematic non-places (Auge 2009). In times of linking virtual and physical travel and differentiating *en route* practices, the routes between places can come to the forefront of planning attention. They are an occasion to review linkages and reweave places. Landscape architecture can provide ideas on how to make these routes more resilient, for example by considering links with landscape elements and designing multifunctional interchanges.

Identifying the design scope of landscape architecture
In this transdisciplinary field of action, it is important for landscape architecture to contribute its competences and also to recognise the limits of its design scope. It must work closely with other planning disciplines, especially transport planning. The great opportunity lies in introducing the holistic design of flexibly developing systems into processes that are otherwise often determined by sectoral and static ways of thinking. The way landscape architecture creatively integrates physical space, the use of space and the individual understanding of space can play a special role.

Using en route typology as an analysis, design and testing tool
Working with the typology in a case study (Hagemann 2022) shows that it can inform and inspire design processes. The types were translated into personas, which allowed to anticipate how these prototypes would behave in, perceive, use and even shape the space *en route* within a developed vision for a more sustainable educational landscape. The typology showed the wide spectrum of different commuter interests and needs as well as the anticipated spatial interaction. In addition to the function of verifying the developed vision, the typology was used as a storytelling tool to communicate the vision to different stakeholders.

Conclusion
Asking "How can the spaces and practices *en route* be understood and described and what are implications for landscape design?" this paper could identify five different types of spatial perception and practices *en route* among HSOS students. The research shows that for the sustainable development of educational landscapes, it is necessary to deal with the spatial perception and practice *en route* and that this can also inform and inspire landscape architecture. The findings suggest that campuses have to be understood and developed as hubs in a regional network of mobility and that the spaces and practices *en route* are agents linking both physical and virtual spaces as well as spatial design and individual appropriation. Even though the study only referred to the HSOS, it is assumed that similar patterns can be found in other educational landscapes. This would have to be verified within further research and,

if necessary, the identified types should be supplemented.

Acknowledgements
EN ROUTE is a transdisciplinary research project with an interdisciplinary research team. As such, we benefit from a wide variety of perspectives on being on the move. We would like to thank our colleagues Prof. Dr. Sandra Rosenberger and Prof. Dr. Karsten Morisse who enriched our discussions with valuable advice and critical questions. Furthermore, we thank Frederik Stähling (B.Eng.) who visualised the typology and brought it to life, which was an important step within the design research process.

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The Centre for Landscape Democracy and Transdisciplinarity: Transdisciplinary challenges, research and education in landscape democracy

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Abstract
Transdisciplinary approaches are being increasingly recognised as an important way to examine complex societal problems. This paper explores the transdisciplinary challenges in landscape research and education by taking the summer school 'Living with earthquakes' in Falerone (Italy, 2022) – co-organised by the Centre for Landscape Democracy, Norwegian University of Life Studies (CLaD) – as a case study. First, the study introduces the impact of the earthquakes in 2016 and 2017 that affected central Italy, including the local context of Falerone. Second, the paper provides an overview of the summer school (aims, main topics, transdisciplinary teaching and learning methods, expected learning outcomes, and participants' backgrounds). Third, the paper presents the achieved learning outcomes of the students and their proposals for revitalising Falerone. Some of the findings are discussed through the lens of landscape democracy. The summer school provided an inspiring transdisciplinary learning experience across several disciplines (such as landscape architecture, architecture, philosophy, civil engineering, urban planning and cultural heritage), involving local communities, universities, policymakers and others. Similar teaching and learning approaches can help to train future professionals beyond their own disciplinary silos. A similar method may be considered for investigating other contemporary landscape and societal issues.

Keywords
Transdisciplinarity, summer school, earthquake, landscape democracy, CLaD (Centre for Landscape Democracy)

Introduction

Today, there are calls for transdisciplinary research and learning activities to examine contemporary societal problems and uncertainties. Collaborations between scientists and several social actors – such as practitioners, policymakers, civil servants, companies, and citizens – are fundamental for preparing new generations of students (Opdam et al., 2015). The ambition of academics is to offer intertwined research and learning environments to students, in which several researchers and profes-

sionals from a variety of disciplines (e.g. landscape architecture, urban and regional planning, social sciences, urban ecology, geography, and architecture), as well as other actors, should establish dialogue and collaboration. However, it remains difficult to construct transdisciplinary platforms and arenas, considering existing disciplinary silos and the challenges of transferring learning and research outcomes between different disciplines and into practice (van der Knaap, 2022).

In this context, the core group members of CLaD (the Centre for Landscape Democracy) present this paper that aims to explore the transdisciplinary challenges in landscape research and education, and related fields. CLaD is a cross-departmental, interdisciplinary centre at the Faculty of Landscape and Society, Norwegian University of Life Sciences. The centre aims to create and disseminate scientific knowledge, creative interpretations, and innovative solutions within the themes of landscape, development, and democracy – both nationally and internationally. In addition, CLaD intends to explore and support the societal missions of universities and the education of future professionals, through transdisciplinary approaches. The centre's current topics embrace landscape in emergencies (such as within wars, climate crises and earthquakes), conflicts between nature and city (e.g., green infrastructure, ecosystem services and nature-based solutions), and welfare landscapes in the context of urban densification.

This study addresses the following questions: i) *How might we frame and develop the transdisciplinary research and learning approach*? ii) *How might we frame and respond to landscape/societal challenges?* To answer these questions, we use the case study of the summer school 'Living with the earthquakes' in Falerone (Marche, Italy, 16–25 July 2022), that was promoted by the Department of Civil and Construction Engineering and Architecture (DICEA), Università Politecnica delle Marche, and co-organised by CLaD and other universities (see Methods section). The outcomes from the summer school are discussed within the framework of landscape democracy (see Results section). CLaD embraces the ideal of landscape democracy in which the landscape is recognised as a common living space where health and protection are considered to be significant universal values embedded in human rights (Egoz et al., 2011). In Central Italy, the 2016–2017 earthquakes resulted in a landscape of urban resources deprivation. Communities lost their material assets, hope in the future, and their voice in public reconstruction debates. Moreover, the earthquakes disrupted the historical connection between locals and place, creating a decline in recognition of the cultural identity of the affected territories. The earthquakes initiated a process of de-territorialisation (García Canclini, 1990) that continues to characterise the contemporary rural landscape in Central Italy. In this context, the 'right to landscape' enfolds tangible resources and intangible values, thus supporting human existence and dignity (Egoz et al., 2011). Further, the 'right to landscape' embeds the ethical values of equality and shared social responsibility, allowing all to have a voice and access to natural, social and cultural resources. At the same time, democratic values are often threatened through various tangible spatial manifestations (Egoz et al., 2011). CLaD

is particularly concerned with landscapes in crisis. According to our knowledge of the literature, studies which have discussed the impacts of earthquakes through the lens of landscape democracy have not yet been conducted.

The earthquakes of 2016–2017 and the case of Falerone

The major geographical foci of the regular summer schools are the small and medium-sized hilltop municipalities in the province of Fermo, in the Marche Region. The 2022 summer school chose the municipality of Falerone as the site of study, which is 25 km from the city of Fermo and surrounded by the municipalities of Montappone, Monte Vidon Corrado and Varano. Falerone was chosen as a case study and venue for the summer school in the light of ongoing collaborations between the Department of Civil and Construction Engineering and Architecture (DICEA), the Università Politecnica delle Marche and the municipality of Falerone, as well as the willingness of the city council to revitalise the area. The earthquakes of 2016–2017 affected 140 municipalities (a total of 8,000 km^2) in four regions in Central Italy (Marche, Umbria, Lazio and Abruzzo). Of the total surface area of the four regions, 17,4 % was impacted, but half of the earthquakes' epicentre was in the Marche Region, covering 40% of the territory (Banca d'Italia, 2019). The sequence of earthquakes severely damaged dwellings, schools, hospitals, transport infrastructure and cultural heritage, as well as local production (manufacturing, agriculture, tourism, and craftsmanship, as well as the food industry) (Di Bucci et al., 2020). The landscape could be significantly affected in the long term, considering the temporary abandonment of the towns, and if prolonged over time, this would in turn cause several socio-spatial and environmental impacts (Di Bucci et al., 2020). Even before the 2016–2017

Figure 1
View of the historic hilltop municipality of Falerone (Photo by Mina Di)

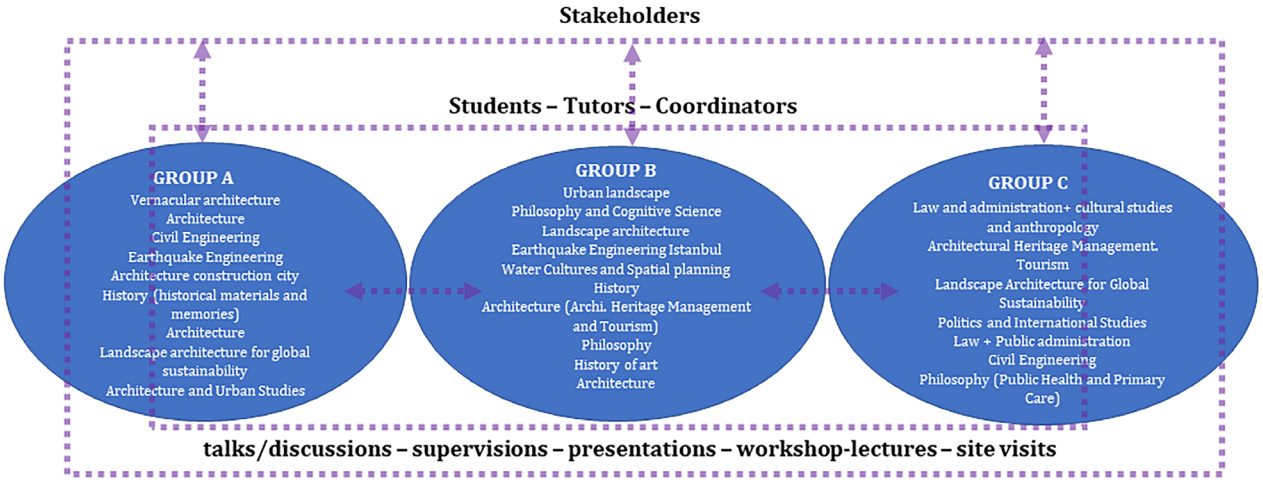
Figure 2
View to Piane di Falerone (Photo by Mina Di Marino)

Figure 3
View of the historic centre of Falerone

earthquakes, some of these areas were characterised by several issues such as population ageing and depopulation, and the low provision of public services (hospitals and schools). The earthquakes revealed on the one hand, the vulnerability of the local communities, and on the other hand, the resilience of citizens, authorities and industries that reacted to the disaster (Di Bucci et al. 2020; Di Marino, 2023). The municipality of Falerone is populated by 3,140 inhabitants (official number of residents according to Istat, 2021). Prior to the 2016–2017 earthquakes, the historic centre of Falerone was already partially abandoned, due to the lack of socio-economic and structural programmes specifically addressing livelihoods in rural areas in Italy. Elongated on the ridge of a low hill, the compact urban form of the historic centre of Falerone was heavily damaged by the earthquakes but is still standing (Figure 1). Although most of the buildings did not collapse (as happened in other municipalities), they are not safe and remain uninhabitable. Therefore, locals were forced to migrate to Piane di Falerone (a hamlet of Falerone, approximately 2.5 km from the town, located in the valley, and inhabited by 1,503 people) (Figure 2), or other coastal towns. Today only about 10 people live in the historic centre of Falerone.

Seven years after the earthquakes, most of the residential and public buildings in the historic centre (such as schools, the museum and the archives) cannot be used since they have not yet been refurbished – due to the lack of public financial resources, delays and the length of time required for structural interventions (Figure 3). In contrast, some workplaces and institutional buildings have been replaced with temporary structures.

Consequently, the town streets are not as vibrant as they used to be, due to the absence of facilities and services in the centre (such as a public library and cafés). The forced living in Piane di Falerone or other coastal towns has also affected the status and perception of this small townscape. Indeed, the historic centre is no longer attractive, since locals have changed their habits and travel behaviours (for example, due to the displacement of several public services such as schools), and above all, they continue to perceive that the town is an unsafe place in which to live.



The main stakeholders: i) Municipality of Falerone and its council members; ii) Region of Marche (the council member for the reconstruction); iii) State commissioner for reconstruction of Falerone; iv) Comunita' di Patrimonio di Falerone (non-profit association which promotes the local identity of Falerone); v) citizens of Falerone; vi) and the neighbouring municipality of Montappone.

Figure 4
The expertise of the three groups within the transdisciplinary learning environment

Methods

The summer school and its transdisciplinary learning environment

The summer school 'Living with earthquakes' held in Falerone, Marche, 16–25 July 2022, was promoted by the Department of Civil and Construction Engineering and Architecture (DICEA) and the Università Politecnica delle Marche, in collaboration with the University of Cambridge, University of Liverpool, Norwegian University of Life Sciences (CLaD), the Politecnico di Torino, the University of Macerata, the University of Las Palmas de Gran Canaria, the Silpakorn University Bangkok, and the British School at Rome, Ministro della Cultura as well as the municipality of Falerone. The complexity of the case study required a *transdisciplinary* approach.

The summer school aimed to generate i) a transdisciplinary dialogue (practice/research and learning environment); and ii) an innovative approach to post-earthquake reconstruction and regeneration. The approaches and methods that we experimented with in the municipality of Falerone have generated new knowledge (see Results section) that can be applied in other real-life cases. The transdisciplinarity of the summer school is based on the integration of knowledge from several disciplines and the engagement of a variety of stakeholders (Figure 4). Collaboration and mutual understanding among the participants were used to address highly complex problems (Lekies and Moore, 2020).

The summer school included large teams of faculty staff, masters and PhD students (in total 24) from different disciplines, who were grouped in a way that all groups were interdisciplinary (Figure 4). Two of the three co-authors of this paper were the coordinators for groups B and C. Among the learning outcomes,

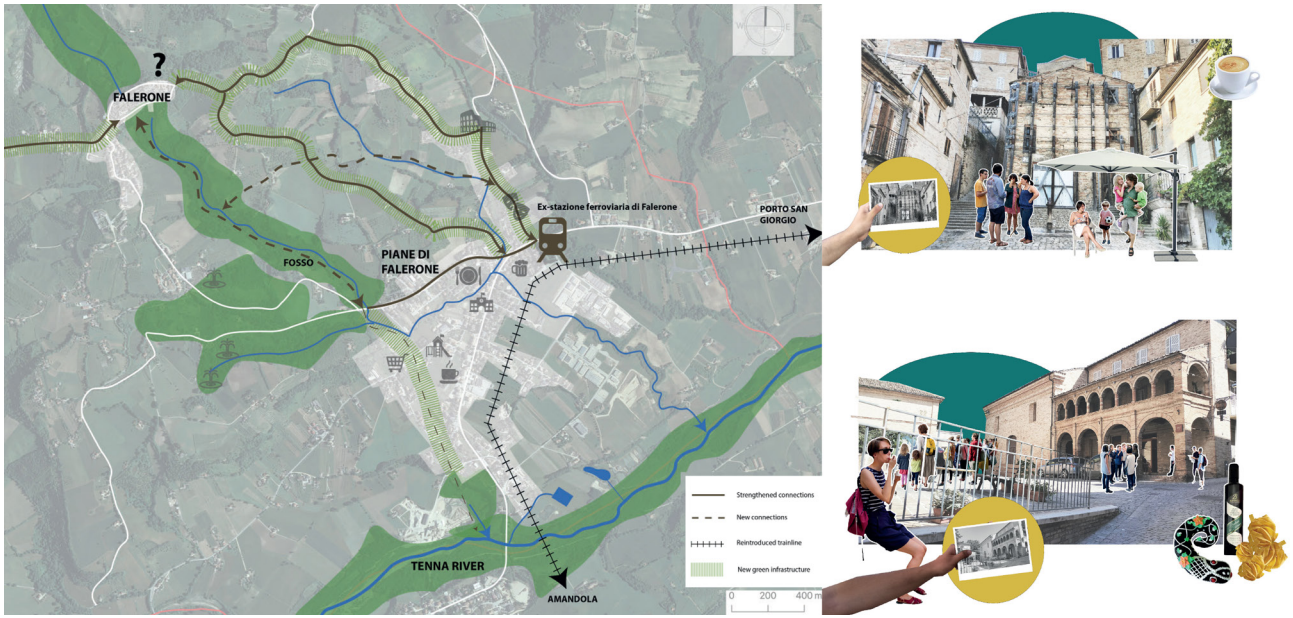
the students were required to identify the large spectrum of issues in Falerone, examining some of them in-depth through qualitative and quantitative analyses, and proposing solutions, possible scenarios and/or strategies for the recovery and reconstruction of the Falerone townscape. Some issues were preliminarily identified by the teaching staff, such as i) evaluating the level of seismic damage to public and private buildings; ii) re-functionalising the urban fabric and public spaces; iii) studying the tangible and intangible heritage and landscape; and iv) thinking of ways to retain people and attract new residents. This helped to identify the main objectives of each group. Group A, titled 'Urban and architectural rehabilitation', was coordinated by a professor with expertise in architecture. Group B, called 'Culture, landscape and memory', was supervised by two professors in philosophy and landscape architecture, respectively. Group C focused on 'Strategies and practices for promoting the future', and was coordinated by a professor with a background in urban and regional planning. Furthermore, students in the groups were supported by tutors and PhD candidates in architecture and cultural heritage.

Figure 4 shows how we framed the transdisciplinary research and learning approach. In the ten days of the summer school, several teaching and learning methods were adopted and mixed: such as work groups, lectures, workshops, group discussions, informal talks, and site visits (namely, hat factories in the neighbouring municipality of Montappone and an archaeological site in Falerone). Presentations were made to other groups, teachers, and stakeholders who provided several further inputs.

In addition, the students applied several qualitative and quantitative methods, such as observations (of buildings and the surrounding landscape), interviews (with citizens, local politicians, official practitioners and other stakeholders), visual documentation (pictures, sketches and videos), as well as landscape analyses and design approaches. They also used secondary data (e.g., official statistics and reports) and reviewed historical cartographies and planning documents (before and after the earthquake of 2016), as well as reports on housing damage (after the earthquake of 2016). Finally, they produced design proposals and developed strategies for revitalising Falerone.

Results

Through the on-site visits, interviews, observations, and secondary data, the students were able to identify the main landscape, socio-spatial and economic challenges in Falerone. There was a common understanding among the three groups that the most relevant issues are: i) depopulation and an ageing population, as a result of the youth moving to coastal towns; ii) a sense of uncertainty, depression and frustration, since most of the buildings have not yet been restructured and seismically improved (seven years after the earthquake); iii) a lack of services and infrastructure (e.g., WiFi and other forms of digitalisation); and iv) the impact of climate change, intensified by a lack of urban greening. As an example of climate change, during the summer school, Falerone was hit by an unexpected heat wave and recorded one of the highest



ever temperatures of 42 degrees. Group A focused on analysing the typologies and morphologies of existing public buildings and squares, as well as the provision and concentration of green areas. Among their proposals, the students proposed a physical network among the urban spaces of Falerone to attract people and enable them to enjoy a walk in the small town, with access to green spaces and views of the surrounding landscape. New urban functions and services such as cafés, restaurants, and schools, were also thought to reopen, in order to revitalise the historic centre and nearby streets. Group B used landscape analyses to understand the character of the overall municipality and its relation to the neighbouring territories. In particular, using the historic town of Falerone as base, students recognised the visual and perceptual relationships between the hilly part and the valley part of the municipality. Their proposed scenarios focus on a network of the entire municipality with its surroundings, through linear green parks encompassing the river system and supported by a system of paths, and infrastructural and recreational networks (Figure 5). A connection between the historic centre and the overall municipality was proposed through the revitalisation of old paths and historical viewpoints. To this end, the use of the streets and public spaces in Falerone was rethought, considering new multi-functional spaces and people's habits. The students illustrated the transformation of the town through videos and postcards which show the past and future of Falerone (Figure 5).

The main objective of Group C was how to attract young and highly specialised people with digital skills to re-invent the art of making hats, along with offering public spaces and new services for visitors and locals. The students were able to compare

Figure 5
Proposal Group B. (Source report by Tamia Guevara Pettersen and Lovisa Emilia Mokrosinski-Hoel -special syllabus "LIVING with EARTHQUAKES A strategic plan for earthquakes prone region" NMBU, August, 2022; copyright group B)

Falerone with other international rural contexts (e.g., in Switzerland and Norway) and were inspired by similar strategies adopted for revitalising small towns. Group C emphasised the relevance and need for digitalisation and IT infrastructure, which they shared with the local authorities and state commissioners for the reconstruction of the town. The students in Group C developed three strategies for revitalising Falerone as follows: i) *strategy 1*: Creating an artisan hotspot – a vocational school for hat makers since Falerone is part of the hat making trade, along with Montappone and other municipalities; ii) *strategy 2:* Providing an innovation centre for Falerone; and iii) *strategy 3:* Strengthening tourism in the town and the region as a whole.

Discussion and conclusion

The outcomes of the students' analyses and personal interactions with the coordinators, stakeholders and citizens reveal several challenges related to the democratic values and perceptions of Falerone as a common living space. Due to the prolonged abandonment of the urban landscape and dwellings, there are tangible spatial manifestations of threats to the landscape and people's right to live in Falerone (Egoz et al., 2011). The municipality of Falerone (and other state authorities) are focusing on the physical effects of the earthquakes, which are still visible after seven years – such as inhabitable houses due to structural damage, economic impacts, and displacement of the population. Thus, people do not yet have the right to return and access their own houses. At the same time, the municipality is aware of the important role of the cultural landscape and local heritage. Several projects and initiatives are being planned in the near future (such as transforming Falerone into a university campus and restoring public buildings to support future activities of the summer school). These suggestions were embedded within the strategies of Group C. In addition, de-territorialization and the resulting progressive loss of place attachment and sense of place define the feelings of the few residents who still dwell in Falerone. These feelings were also experienced by the participants of the ten-day summer school during their observations and interviews with locals. The transdisciplinary summer school 'Living with the earthquakes' in Falerone provided an inspiring transdisciplinary learning experience for both students and teachers. On the one hand, it established bridges between academics and students from multiple disciplines (including landscape architecture, architecture, philosophy, civil engineering, urban planning and cultural heritage), local communities, policymakers, and other stakeholders (Figure 4). On the other hand, the transdisciplinary summer school helped to explore several landscape and societal challenges in the local context (see Results section). Design scenarios offered by the three groups clearly reflected the contributions of navigating between disciplines and the culturally diverse expertise of the partners participating. Concurrently, one of the obstacles was the inherent value of cross-disciplinary work. Both educators and students had to negotiate and accommodate divergent perspectives on the town's sociocultural character and the nature of the difficulties they faced there. More investigation into methods of training future professionals and researchers that go beyond narrow specialisations is warranted. Moreover, in transdisciplinary learning environment, it

is important to invest in capacity building for effective stakeholder engagement (e.g. through discussions, interviews, fieldtrips as experimented in the summer school). The stakeholders' inputs helped to reason with relevant factors that were acknowledged within the group proposals (see Results section). Nonetheless, a more active participation of citizens in all workshops and presentations would have further supported the development of the groups' proposals. This aspect should be considered in the next editions of the summer school by arranging feedback sessions with local communities. A similar methodology and format could be used to investigate other contemporary landscape and societal issues, having in mind that cultural participation and civic engagement can vary from place to place.

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The question of scale is not new to landscape architects but is one that does not have a definite answer; it needs to be asked again and again. The issue addresses the very identity of the profession and the nature of the context in which landscape architects operate and teach. The theme of the 2022 conference in Ljubljana was inspired by the 50th anniversary of the landscape architecture program at the University of Ljubljana as well as the fact that 50 years have passed from the pioneering conference on landscape planning held in Ljubljana which was organized by professor emeritus Dušan Ogrin, one of the founders of landscape architecture and the first recipient of the ECLAS Lifetime achievement award.

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