Ellen Fetzer, M. Beatrice Andreucci,
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Editors

Landscape Economy

A Handbook for Educators

Funded by the European Union

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Ellen Fetzer (lead), Maria Beatrice Andreucci, Karolina A. Krośnicka, Veli Ortacesme, Didier Vancutsem, Jeroen de Vries

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Preamble

This book brings the learnings and experiences of the three-years TELOS ERASMUS project journey together. TELOS, the Greek work for *goal*, stands here also as the acronym for ***T**owards a **E**uropean **L**andscape Econ**o**my for **S**ustainably Urban Development.* This project journey started in November 2021, when the world was still coping with the impact of the COVID-19 pandemic. Learning from this experience, we all became more aware that everything on this planet is interconnected and operating in systems.

Our goal was to build 'knowledge and action bridges' between the seemingly competing ecological, social and economic systems as they appear to us our daily environments. We have tried to explore these systems in our everyday landscapes, where the values of both systems become evident: either as opportunities or threats. Our project brought five European metropolitan areas together: we linked Rome, Stuttgart, Brussels, Gdańsk and Antalya.

Our crucial questions are:

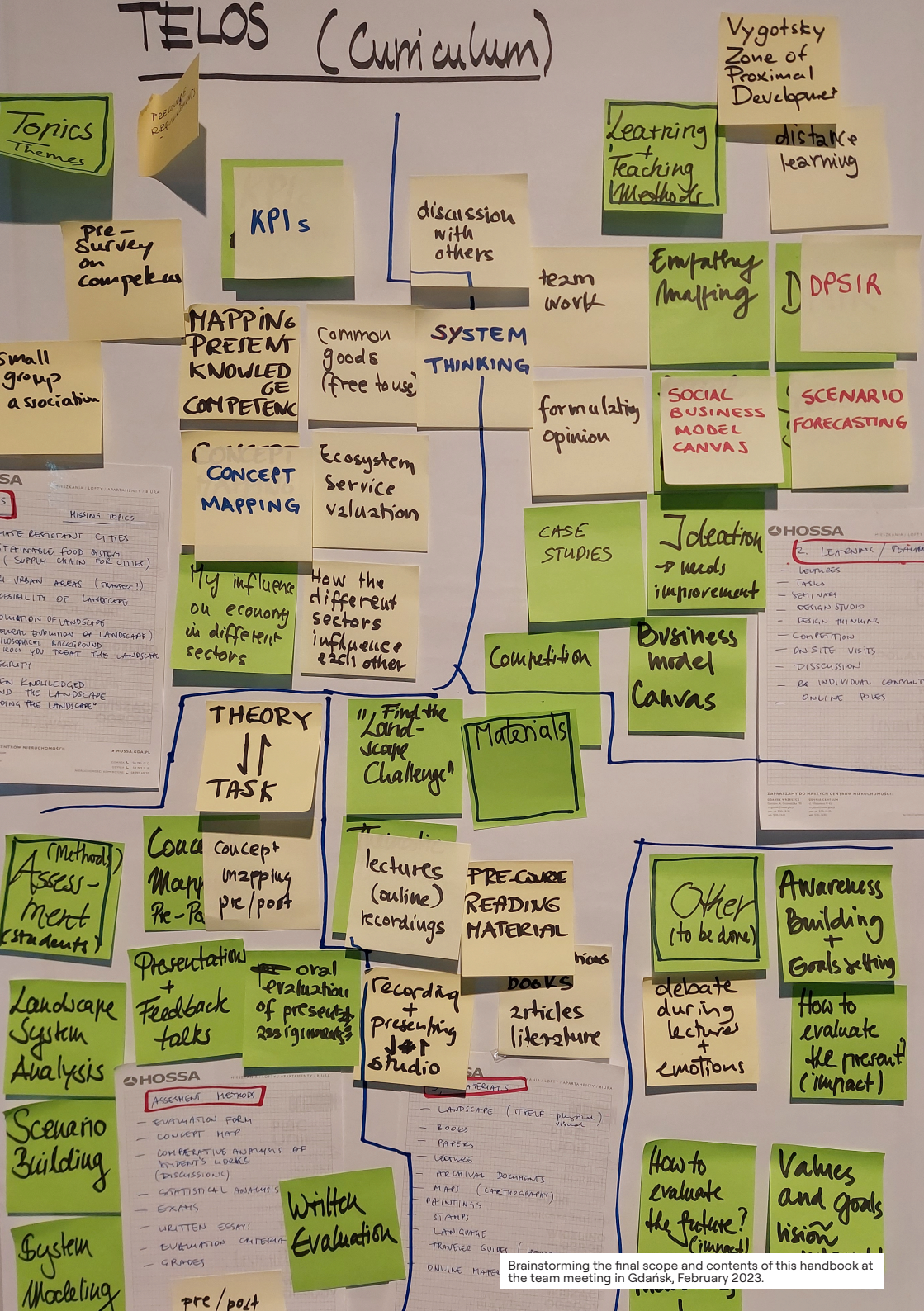
- How can we use economic principles to combine dynamic social and ecological goals?
- What are the trade-offs and opportunities at the interface of these complex systems?
- How can we effectively generate multiple values?
- Which new system models are needed for generating and sustaining these multiple values?
- How can we educate landscape economy systems thinking and systems design?

In light of these overall goals, TELOS has set the following specific objectives. First, to build capacity by developing critical teaching and learning skills in planning, design and business-related disciplines, that is, to develop and launch a European Landscape Economy Curriculum. This curriculum aims to strengthen core sustainability competences: systems thinking, critical thinking, anticipation, values thinking, strategic competence, creativity and collaboration. Second, to establish multidisciplinary teaching and learning labs in which the landscape economy curriculum is considered as a flexible canvas, able to adapt to country-specific priorities, while providing common ground and opportunities for alignment to all partners and future users of this curriculum.

Last but not least, we want to disseminate our results in transnational multidisciplinary higher education and this publication is an important element of this outreach. With this book we invite educators and students from all disciplines to explore sustainability through the conceptual lens of landscape economy. We hope that you find this pathway inspiring and inspirational for your own practice and research.

TELOS
Towards a European Landscape EconOmy for a Sustainable urban development

Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen
LE:NOTRE Institute
Linking landscape education, research and innovative practice
ULB Faculté d'Architecture La Cambre Horta
SAPIENZA Università di Roma
Gdańsk University of Technology



Brainstorming the final scope and contents of this handbook at the team meeting in Gdańsk, February 2023.

Contents

Abbreviations

BM	Business Model
CAP	Common Agriculture Policy
CC	Creative Commons
CRFS	City Region Food System
EEA	European Environmental Agency
ELC	Council of Europe Landscape Convention
ES	Ecosystem Services
EU	European Union
F2F	Farm to Fork
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Green House Gasses
GI	Green Infrastructure
IPES-Food	International Panel of Experts on Sustainable Food Systems
KPI	Key Performance Indicator
LCZ	Local Climate Zones
LDP	Local Development Plan
MaaS	Mobility as a Service
MUFPP	Milan Urban Food Policy Pact
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PB	Planetary Boundaries
RES	Regenerative Economic System
RUAF	Resources Centers on Urban Agriculture and Food Security
SBMC	Social Business Model Canvas
SDG	Sustainable Development Goals
SUMI	Sustainable Mobility Indicators
TELOS	Towards a European Landscape Economy for Sustainable Urban Development
TOD	Transit-Oriented Development

Introducing the Landscape Economy Handbook for Educators

This book presents an approach to integrating a landscape economy dimension into higher education. It is addressed in particular to teachers motivated to develop knowledge and competences for sustainable development and social-economic transformation. Landscape economy is not restricted to any specific discipline. We all live and work in and with landscapes and we do that through an economic system. However, we think that this book is of particular interest for educators in the fields of spatial planning, urban planning, architecture, landscape architecture, economics, business administration, real estate, mobility, agriculture, geography and regional development. Broader keywords are: integrated planning, transformative science, systems thinking, social innovation and social entrepreneurship.

Landscape economy forces teachers and learners into deep systems thinking across scales and spaces, sectors and interests, communities and institutions. The concept is, first of all, confusing and disorienting. Before diving deeper into this challenge, it seems important to clarify that there is no such thing as a landscape economy method which we could easily adopt and apply to any given context. Instead, landscape economy needs to be understood as a way of framing system boundaries, system elements and system dynamics within a specific territorial context. Within these frameworks, transition and innovation pathways are always unique and context-specific. Therefore, what we are trying to explain in this book, is a way of taking systemic perspectives on the landscape, guided by the normative dimensions of regeneration, sustainability, fairness and diversity.

The book is divided into four parts.

The first part is titled 'Mapping the Terrain' and starts with a broader argumentation of why a landscape economy approach is necessary. For example, the theory of the planetary boundaries explains the urgency for global regeneration of natural resources and the need for a deep transformation of how humans work with nature. This is followed by definitions of our key concepts which are 'landscape' and 'economy'. We use here the example of the global-value added chain to exemplify the relationship of economy and territory, leading to the three main characteristics of a sustainable economy system, namely efficiency, consistency and sufficiency. The chapter also includes a reflection on systems thinking, which is a key dimension of knowledge creation and a guiding principle of the landscape economy curriculum design. We also suggest here our definition of landscape economy, knowing that it is rather a state of mind than a tangible method.

The second part presents what we call 'Landscape Economy Stories'. It brings in the broad cultural and disciplinary perspectives of the five countries present in the landscape economy ERASMUS team. The idea is to create a better understanding of what is driving the different land use sectors that are typically competing for the same territory. The book contains

nine stories: The Commons, Health, Mobility, Dwelling, Energy Landscapes, Positive Energy Districts, Tourism, Agriculture and Urban Forestry. There are always more stories to tell of course. Each story follows more or less the same pattern. We start by setting the scene: What is driving this sector? Which sustainability conflicts is this sector not only facing but also creating? Which major tradeoffs with other landscape values are prevalent? On that basis, each chapter tries to show at least one example of a positive transition pathway and to tell a story of positive change. We learn about new models with innovative governance structures and value propositions. The authors further discuss which indicators of success are relevant: What is the specific contribution of this sector to an overall landscape economy? We learn that indicators, or so-called key performance indicators (KPIs), are different for every sector, and yet, they all come together in one landscape. Each chapter closes with a suggestion of research and analysis questions for landscape economy learners and provides references for further reading.

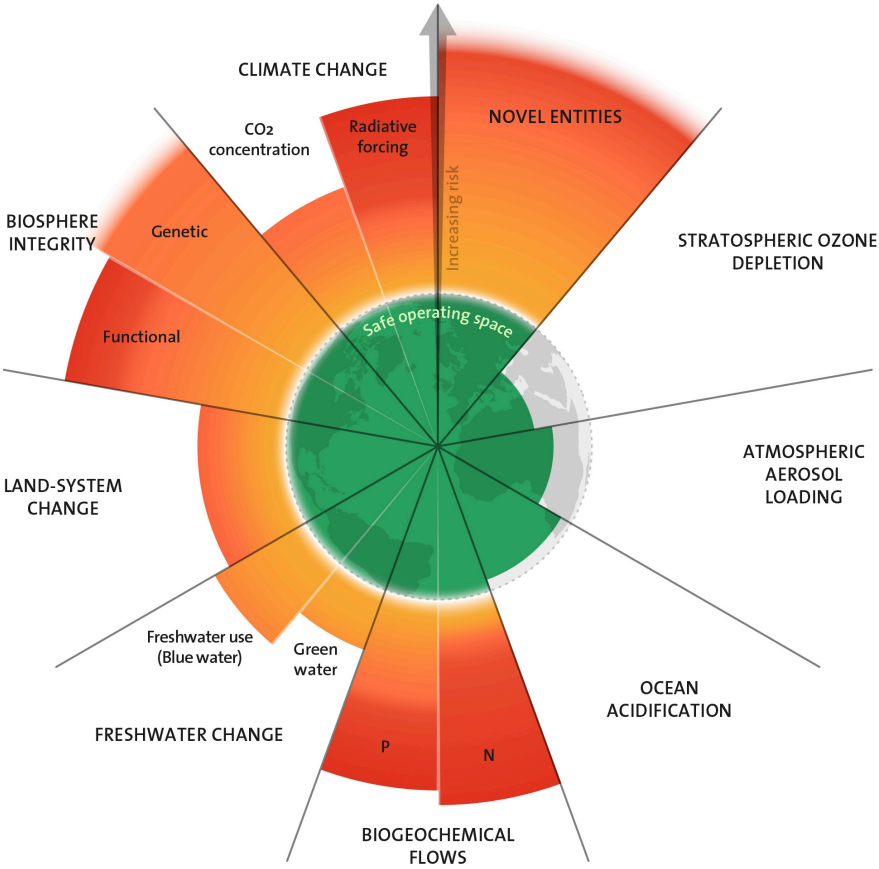
The third part explains in great detail how the landscape economy curriculum has been developed and what are the elements of the instructional design. We also introduce the various open access elements which are available to other educators and the learners. At the beginning, we elaborate broadly on the learning objectives of the landscape economy curriculum taking both the cognitive process and the knowledge dimensions into account. We then explain how we have tested the curriculum as part of our educational action research cycle by which we have been able to generate continuous evidence and greatly learn through and from the process. Educators interested in a landscape economy approach find access to all learning materials and recordings, detailed explanations of the assignment descriptions, evaluation forms and all conceptual considerations we have made.

Part four, Reflection in Action, finishes with a detailed presentation of our evaluation findings highlighting the key learnings of everyone involved, and reflecting on the development needs that still remain. The book finishes with a glossary of some key landscape economy terms.

We hope you find this approach inspiring for your own educational activities.

Mapping the Terrain

Why a landscape economy approach?
How do we understand landscape?
How do we understand economy?
Which are their conceptual connections?
What is the role of systems thinking?



The 2023 update to the Planetary boundaries
Credit: Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023 licensed under CC BY-NC-ND 3.0.

Why do we need a landscape economy approach in higher education?

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Planetary boundaries
Planetary boundaries (PB) define the boundaries of the "planetary playing field" for humanity if major human-induced environmental damage on a global scale is to be avoided. Trespassing one or more planetary boundaries may be highly damaging or even catastrophic, due to the risk of crossing thresholds that trigger non-linear, abrupt environmental damage, from regional- to planetary-scale systems. This concept is featured prominently in the development of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (United Nations, 2015).

In September 2023, a team of scientists quantified, for the first time, all nine processes that regulate the stability and resilience of the Earth system, namely:

1. Climate change
2. Change in biosphere integrity (biodiversity loss and species extinction)
3. Stratospheric ozone depletion
4. Ocean acidification
5. Biogeochemical flows (phosphorus and nitrogen cycles)
6. Land-system change (for example deforestation)
7. Freshwater use (alterations across the entire water cycle over land)
8. Atmospheric aerosol loading (microscopic particles in the atmosphere that affect climate and living organisms)
9. Introduction of novel entities (i.e., microplastics, endocrine disruptors, and organic pollutants)

These nine planetary boundaries were first proposed by former centre director, Johan Rockström, and a group of 28 internationally renowned scientists, in 2009. Since then, their framework has been revised several times. Now, the latest update (2023) not only quantified all boundaries, it also concluded that six of the nine boundaries have been transgressed (Richardson et al., 2023).

Placing the PB concept in a political and policy context helps to integrate the global perspective across and within policy systems. Identifying the relevant PB can thus lead to establishing new evaluation frameworks, based on a better understanding of the whole safe spectrum for urbanisation. It is thus valuable to investigate PB in relation to the evaluation of sustainable development, underpinned by the concept of Landscape Economy.

New agendas: Growth versus Degrowth
The OECD has promised to "strengthen their efforts to pursue green growth strategies […], acknowledging that green and growth can go hand-in-hand", while the World Bank has called for "inclusive green growth" where "greening growth is necessary, efficient, and affordable". Meanwhile, the EU has framed "green growth" as "a basis to sustain employment levels and secure the resources needed to increase public welfare […] transforming production and consumption in ways that reconcile increasing GDP with environmental limits" (EEA, 2021).

However, a recent survey (King et al., 2023) of nearly 800 worldwide climate policy researchers reveals widespread skepticism toward the concept in high-income countries, amid mounting literature arguing that the principle may neither be viable nor desirable. Instead, alternative post-growth paradigms including *degrowth* and *agrowth* are gaining traction. The *degrowth* school of thought (Kallis, 2011) proposes a planned reduction in material consumption in affluent nations to achieve more sustainable and equitable societies. Meanwhile, supporters of *agrowth* (Van den Berg, 2011) adopt a neutral view of economic growth, focusing on achieving sustainability irrespective of GDP fluctuations. Both positions represent skepticism toward the predominant *green growth* paradigm with *degrowth* representing a more critical view.

Desirable growth

Much of the current debate centers around the concept of decoupling. Meaning: Can the economy grow without corresponding increases in environmental degradation or greenhouse gas emissions? Essentially, it signifies a separation of the historical linkage between GDP growth and its adverse environmental effects. Importantly, absolute decoupling rather than relative decoupling is necessary for green growth to succeed. In other words, emissions should decrease during economic growth, and not just grow more slowly.

The relevance of deep systems thinking

Systems thinking is vital for the landscape economy because it recognizes the multiple interconnections between ecological, social, and economic factors in the landscape. Landscapes are complex systems where decisions in one area - such as agriculture, forestry, or urban development - impact water cycles, biodiversity, and local communities. By adopting a systems perspective, prospective landscape economists can identify synergies, minimize trade-offs, and anticipate unintended consequences. This approach promotes holistic solutions, such as balancing food production with ecosystem services, enhancing resilience to climate change, and supporting livelihoods. Within the TELOS programme, we consider systems thinking as a cross-cutting learning objective and an emerging cognitive skill.

Competences for sustainable development

This project is also an attempt to operationalise sustainability competences in higher education, taking the European Union's recently published GreenComp framework as a reference (Bianchi et al., 2022). This framework defines key competences for sustainability, which are crucial for the landscape economy. These competences—such as systems thinking, critical thinking, and fostering a sustainable mindset—help professionals address complex challenges in the landscape. They enable informed decision-making that balances economic growth, environmental health, and social well-being. By fostering collaboration, innovation, and long-term planning, GreenComp skills drive sustainable practices in land use, enhance ecosystem services, and support the transition to a greener, more resilient economy.

We therefore need a landscape economy curriculum to effectively combine systems thinking, systems innovation, global perspectives and local landscape contexts.

References

- Bianchi, G., Pisiotis, U. and Cabrera Giraldez, M., (2022): GreenComp: The European sustainability competence framework, Punie, Y. and Bacigalupo, Publications Office of the European Union, Luxembourg, https://dx.doi.org/10.2760/13286
- Jeroen C.J.M. van den Bergh (2011): Environment versus growth – A criticism of "degrowth" and a plea for "a-growth", Ecological Economics, Volume 70, Issue 5, 2011, Pages 881–890, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2010.09.035.
- European Environment Agency (2011): EEA Report No 11/2021, Creating a resilient economy within environmental limits, https://www.eea.europa.eu/publications/reflecting-on-green-growth (accessed 22.08.2024)
- King, L.C., Savin, I. & Drews, S. Shades of green growth scepticism among climate policy researchers. Nat Sustain 6, 1316–1320 (2023). https://doi.org/10.1038/s41893-023-01198-2
- Giorgos Kallis (2011): In defence of degrowth, Ecological Economics, Volume 70, Issue 5, 2011. Pages 873–880, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2010.12.007
- Richardson, Katherine; Steffen, Will; Lucht, Wolfgang (2023). "Earth beyond six of nine planetary boundaries". Science Advances. 9 (37): eadh2458.
- UN General Assembly (2015): Transforming our world: The 2030 Agenda for Sustainable Development, Resolution adopted by the General Assembly on 25 September 2015, 42809, 1-13. https://doi.org/10.1007/s13398-014-0173-7.2

The Concept of Landscape

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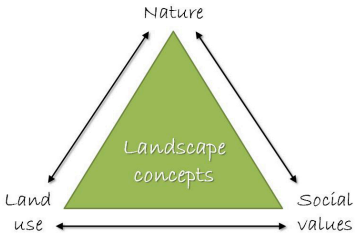
The term landscape is used in many different contexts and can therefore be understood in various directions. TELOS follows the definition of the Council of Europe Landscape Convention. „*Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*" (ELC 2000, Article 1). These areas consist of natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas. It concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes (ELC 2000, Article 2). Public spaces, recreation areas, parks, roads, streets, brownfield areas, forests, rivers, sea shores and agricultural land are all considered as parts of the landscape.

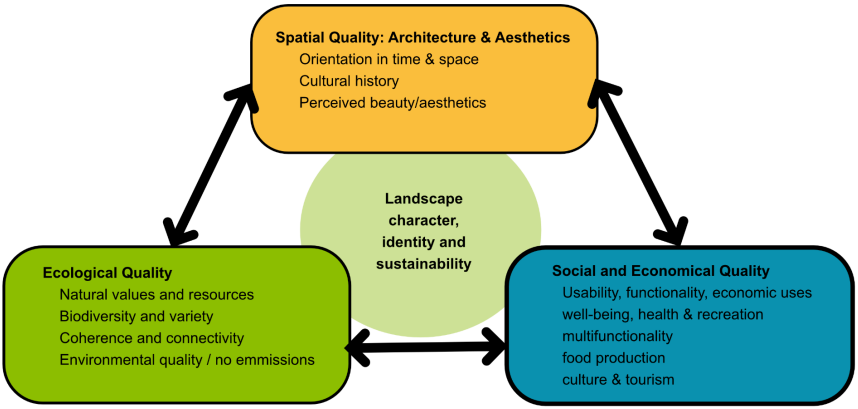
The concept therefore includes the city as a whole. In fact, a city is only a special type of landscape. It is important to recognize that landscape implies an understanding of how elements are interconnected. Landscape is a system in which natural and human elements are constantly present and systemically interacting. So landscape is both: the concrete natural and human elements of which it is composed. And the interpretation of it, both individually and collectively. Or, as described by Ipsen (2006), landscape concepts evolve at the interface of nature, human land use and the social - and cultural - values of society.

People judge objects, such as landscapes, by a specific and interrelated set of values: a value system. The value system is the basis for preferences and judgements, and thus determines the individual understanding of landscape quality. The system of quality criteria should in fact reflect the collective value system of the groups in society for whom the quality of the landscape has to be optimized. Only then it is possible to guide the development of a landscape in a way that serves the needs of society.



Landscape concepts evolve at the interface of nature, human land use and the social - and cultural - values of society (Ipsen 2006)

The systemic context of landscape quality. Graphic developed by Jeroen de Vries based on the Dutch landscape law.



In order to ensure healthy and generative development, the human use of natural systems in which the tourist industry, local businesses, farmers, multinationals and other stakeholders operate needs to become fully sustainable while stopping exploitation. Competing claims from a large variety of stakeholders converge on a landscape level. When addressed only individually, the approaches taken to reach these goals often have negative trade-offs and conflicts of interest. The idea of the landscape approache is to find cross-sectoral solutions. Thes might lead to synergies that are better than the sum of each sector-specific solution (Horn, van der & Meijer 2015)
The landscape approach aims to contribute to sustainability by supporting economic and social development that goes together with local biodiversity conservation. Landscape resilience and the continuous regeneration of natural capital are regarded as a foundation for sustainable development. A key element of present-day landscape approaches is the involvement of local communities and all relevant interest groups in the decision-making on how we use our landscapes. In addition to involving participants from all concerned interest groups, the concept also requires approaches on how to include those who may not be represented or organised as groups. On that basis, changes can be started that promote common benefits. A multi-level governance approach can integrate the objectives of different participants and help arriving together at a set of shared landscape quality objective. This way, innovative solutions for competing claims and interests might be found.

Since local situations are varied and there are social and cultural differences, there is not a one single landscape approach that fits all. There is a need to adapt the approach to the specific local landscape context at the interface of human and non-human needs.

References

1. Council of Europe (2000): Council of Europe Landscape Convention, https://www.coe.int/en/web/landscape
2. Ipsen, Detlev (2006), Ort und Landschaft, Springer, https://doi.org/10.1007/978-3-531-90396-5
3. Sarah van der Horn and Johan Meijer (2015). The Landscape Approach, The Hague: PBL Netherlands Environmental Assessment Agency, https://www.pbl.nl/uploads/default/downloads/PBL_2015_The_Landscape_Approach_1555.pdf (accessed 22.08.2024)

Deepen your landscape approach with the community of the Open Landscape Academy (OLA)

OLA is a transnational community of people who work to make landscapes more resilient and inclusive for all. OLA does this through academic and non-academic methods involving education, research, practice, and community participation, all related to landscapes.

OLA partners with communities of diverse ages, backgrounds, abilities, and life experiences. We invite you to be a part of our work today, committing at a level that suits your needs and capabilities:

https://www.openlandscapeacademy.org

The Neckar valley landscape in Plochingen, Stuttgart Greater Region, Germany: A natural river designed to serve production, energy and, transport

Hidden Landscapes – Exploring the conceptual connections of landscape and economy

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Hidden landscapes and the global value added chain

Most landscapes of the Global North are not fully reflecting the impact of the societies that are living in and with them. If we honestly explore the prevalent consumption patterns of the so-called developed world, it becomes clear that the dominant lifestyle is impacting many landscapes all over the planet.

Within the framework of the TELOS project and the landscape economy approach, we call them *the hidden landscapes of the global value-added chains*. These are all the remote places of raw material extraction, cheap labor or food production upon which much of the western economy relies.

In this chapter, we look at the value chain as a system in order to tell the story of these hidden landscapes. After clarifying the key terminology, we will use the example of the textile value chain to illustrate the undesirable developments from a sustainability perspective. Building on this, the approaches and strategies for a system change will be shown from the perspective of behavioral science. Behavioral science explores how people think, act, and make decisions in various environments.

This also requires a discussion of overarching issues relating to economic systems, especially capitalism and social market economy. Emerging solutions, such as the circular economy, are highlighted. Finally, we want to discuss possible scenarios and related design challenges.

Understanding *Hidden Landscapes*

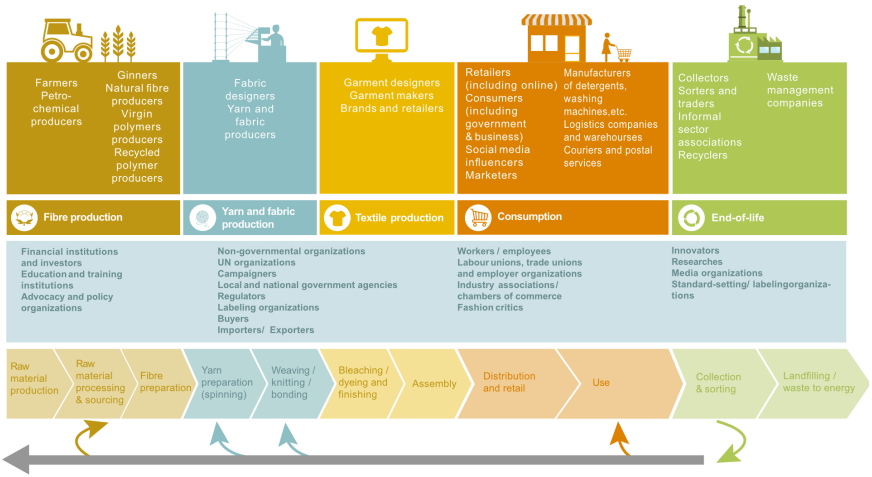
Value chains and the concept of *hidden landscapes:* illustrated by the textile industry

The value chain comprises all activities in the life cycle of a product or service. This includes the conception, the extraction of raw materials, the various phases of pre-production, intermediate and final production, wholesale, and retail as well as final consumption and disposal. Between these individual stages, connecting logistical activities (storage, sorting, repackaging, order picking, transportation) are required (Kaplinsky and Morris, 2001).

A distinction is made between four types of industries involved in value chains (Britannica money, online)

Primary industry: A distinction must be made between the genetic industry, which comprises the production of raw materials (agriculture, forestry, fishing), and the extractive industry, which comprises the extraction of exhaustible raw materials (mining, quarrying, and mineral extraction). Primary industries in the textile value chain are, for example, cotton cultivation or sheep farming.

Secondary industry: Commercial processing or further processing of raw materials into intermediate products and consumer goods (e.g., fiber production, textile production). Secondary industry also includes energy-generating industries (e.g. hydroelectric power plants) and the construction industry.



Textile value chain and associated Stakeholders *(Source: UNEP, 2023, p.13.)*

Tertiary industry: Includes services that are not directly involved in the production of goods but are essential for a functioning value chain in an economy based on the division of labor. For example, this includes banking, financial and insurance services, wholesale, and retail trade - with great importance for the textile industry - as well as freelance, consulting, and personal services.

Quaternary industry: This includes all information or knowledge-based products and services such as information systems and information technology (IT), research and development, but also research and consulting, as well as media and communication technologies and education.

The figure above shows such a value chain using the example of the textile industry, whereby the current (slow) development towards a circular economy has not yet been considered. This will happen at a later stage of this chapter when the system change towards more sustainability is discussed. UNEP proposes five main stages for the textile value chain: fiber, yarn and fabric production, textile production, consumption, and end-of-life. Each stage can be divided into different sub-stages. Different industries and stakeholders involved throughout the entire process are also illustrated (UNEP, 2023, p. 12-14).

Until well into the 19th century, textile production in Europe was largely carried out in local value chains. The raw materials were sheep wool, flax, and hemp. Linen spinning and weaving were mainly located in low mountain ranges such as the Swabian Alb in Germany. Sewing work was done almost exclusively by women in homework, sewing rooms, or larger

textile workshops. Before the sewing machine conquered the market in the 19th century as part of industrialization, people sewed exclusively by hand. With industrialization came spinning machines and mechanical looms, and factories emerged in which publishers and investors invested. As a result, many spinners and weavers were forced out of the trade and lost their livelihoods.

Today, the textile value chain spans the entire globe. A case study showed that a T-shirt travels 15,000 km and more before it is bought. The cotton is harvested in China, the yarn is made in India, the shirt is produced in Bangladesh, it is processed (e.g. printed) in Sri Lanka, and finally, sold in the UK (Goldberg, 2018). This illustrates the concept of *hidden landscapes*. By choosing a certain form of economic activity and consumption, we influence the design, development, and aesthetics of landscapes in different countries and places around the world. In doing so, we also shape the living and working conditions of local people.

There is a considerable negative impact of the textile value chain in key areas of sustainable development. The Sustainable Development Goals *Climate Action* (13), *Clean Water* (6), *Life below Water* (14), *Responsible Consumption* (12), and also the social goals like *No Poverty* (1) and *Equality* (5) are affected. According to the relevant studies (Stamm, 2020; EEA, 2022; Filo et al., 2022; EP, 2023, UNEP 2023), the textile value chain is globally responsible for:

- up to 8% of global greenhouse gas emissions
- 17 to 20% of the world's industrial wastewater
- about 10% of microplastic pollution to our oceans
- approx. 4.5 million tn. clothes in landfills (in Europe)
- approx. 200 million predominantly women who are working often under undignified conditions, without union protection, and for wages that do not guarantee their livelihoods

Or the other way round: consuming 1 kg of textiles means consuming 26 kg of raw material, 600l of water, 27 sqm of land and emitting 18 kg of CO_2 equivalent.

The case of LPP-GDAŃSK in Poland

Let us consider a T-shirt as an example of the flow of goods in the textile supply chain. We can ask: What has to happen before my T-shirt appears in my wardrobe? What is the value chain that accompanies this T-shirt? And finally, which landscapes are hidden behind this value chain?

In order for us to be able to buy a T-shirt in the nearest shopping mall or on the Internet, the process has to be carefully designed much earlier than we even think of ordering it. First, the clothing company has to design the T-shirt. Then it has to buy a suitable textile, usually cotton, from another company that makes cotton textiles. To ensure the quality of the cotton canvas and fibers, the textile company should monitor or even sometimes manage the agricultural

production of the cotton. Thus, in order to deliver a T-shirt to the store, the apparel company must consider, plan, and very often manage all four types of industries involved in value chains:

1. primary, with the production of natural fibers in the agricultural process;
2. secondary, related to the production of yarn and fabric, as well as textile production;
3. tertiary, including garment design, marketing, sales and distribution, and increasingly also garment maintenance and product recycling;
4. quaternary, such as research and development of new fibers or IT technologies for garment logistics (UNEP, 2023, p.13).

We take the example of a European garment company. LPP is a large global clothing company based in Gdańsk, Poland. It was established in 1998. At present, LPP owns 5 brands (Reserved, Cropp, House, Mohito, Sinsay) dedicated to different target groups. Currently, it sells almost 430 mln of pieces of clothing annually. The company employs 29,930 people all over the world, including 16,686 in Poland (57% of all employees according to LLP website).

Let us consider the LPP logistics chain with a breakdown of the different industries:

First: LPP, as a member of the *Cotton made in Africa* (CmiA) partner group, one of the leading international initiatives to promote sustainable cotton production and transparency in the textile supply chain, has some influence on the agricultural landscape in Africa. In 2020 CmiA worked with around 1 million African farmers, who produced around 630,000 tons of cotton. LPP has purchased enough CMiA-labeled cotton to ensure that 20 percent of LPP's branded collections from 2022 will be made from sustainably grown cotton. (LLP website). However, it is important to underline that the impact of many other clothing companies on agricultural landscapes, mainly in Asia and Africa, is still not as positive, as they rely mostly on the efficiency factor in the cotton production process, which leads to intensive monoculture farming, massive water consumption and an insufficiently diversified economic base of the region.

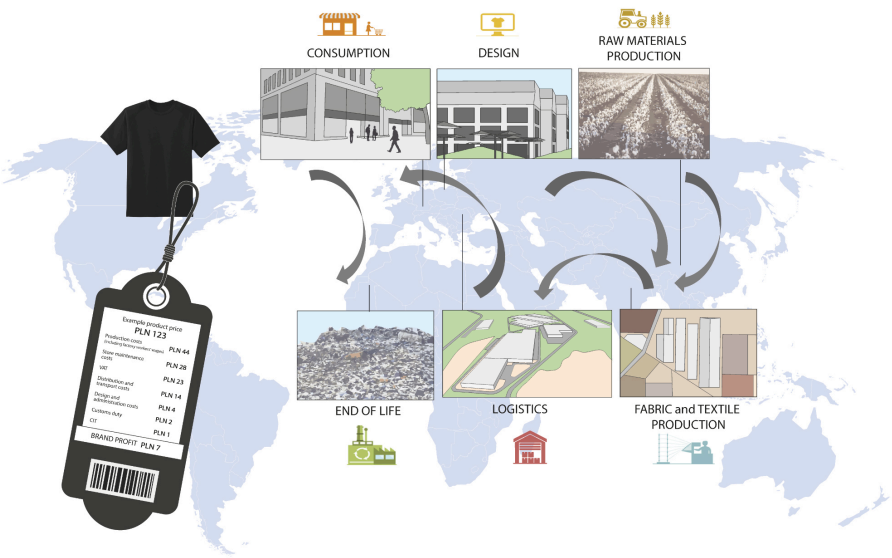
Second: LPP does not own any textile production facilities. It buys textiles from 1238 suppliers in Asia and Europe. Therefore, the factories where textiles and clothing are produced are industrial landscapes in Asia or Poland, Italy, Portugal, Romania, Bulgaria and Turkey. (Chatham, 2020). *"Fashion giant LPP makes contingency plans for coronavirus"* (thefirstnews.com, 2023). *"Polish fashion retailer LPP flags supply chain woes, rising costs"* (reuters.com, 2023). In addition to cotton, LPP uses other fibers, including organic fibers, certified recycled materials, but also licensed cellulose fibers made from wood pulp (LPP website). In this way, although the company does not own textile factories itself, it is an indirect co-creator of the industrial landscape in many different countries, including the factories that produce innovative recycled materials.

Third: The most important services provided by LPP are: clothing design and marketing, sales, distribution and, more recently, also clothing recycling.
Both the head office of LPP and part of the design and marketing offices are located in Gdańsk. 338 of all employees are designers working in the four design offices in Poland (Gdańsk, Krakow, Warsaw) and Spain (Barcelona). Since 1997 the company has had an office in China (Shanghai) and since 2015 also in the capital city of Dhaka (Bangladesh). (LPP website). Offices are a company's shop window in a city. As such, they are usually representative and a significant architectural element of the urban landscape, situated in prestigious locations.
LPP currently operates 1962 offline stores in 27 countries and 34 online stores on 3 continents. In total, the collection is available in 39 countries. The total area of the stores is 1.673 thousand square meters. The area of LPP stores is constantly growing from 434 thousand m^2 in 2012 to 1673 thousand m^2 in 2022, together with the number of stores (from 1077 in 2012 to 1962 in 2022). These shops are part of the urban landscape, either integrated into street facades, or as part of large shopping galleries that are social meeting places for residents.

The company, which has a vast network of stores, needs an efficient distribution and logistics system. That is why it has its own logistics operator - LPP Logistics. There is a network of 4 LPP Distribution Centers and 4 Fulfillment Centers across Europe with a total storage area of 413 thousand m^2. LPP's logistics facilities in the Gdańsk region, together with the proximity of the Gdańsk Port and its container terminal, enable the company to distribute and import goods overseas. The landscape of logistics facilities usually occupies large open and flat areas on the outskirts of the city, close to transport hubs (motorway and/or railway). Massive warehouses can now reach heights of around 25 meters, and their cubature dominates the agricultural background or the urban structure of the suburbs. Some of them are equipped with a state-of-the-art automatic sorting system, which optimizes the picking and dispatch process (LPP website).

In order to reduce textile waste, the company also offers, among other services, the used clothing collection system in 100% of LPP stores worldwide. The collection of used clothing also includes clothing from third parties. In this way, the company seeks to reduce the negative impact on the landscape of landfills for textile waste, sometimes in very distant countries (LPP ESG fact sheet 2022/2023).

Fourth: The LPP company has also some elements of the quaternary industry - based on data science, machine learning, and mathematical algorithms, the LPP IT experts are able to forecast the level of demand for a particular collection and match production levels to the supply generated by the customers (LPP website). The IT employees usually work at the company offices in the city, but they could also work online from home.



Landscapes hidden behind the added value chain of the LPP garment company.
Source: own based on https://www.lpp.com/en/sustainable-development/sustainability-report, access: March 2024

In most cases, our decision as customers to buy a particular T-shirt is primarily driven by the price of the product. To a much lesser extent, our choice is (or can be) dictated by our awareness of the environmental and social impacts associated with the production of that T-shirt. To understand the impact of this product on particular landscapes around the world, we need to look at the value chain from the moment of 'birth' to the moment of 'death' of the T-shirt's life. Let us look at the value chain of the T-shirt produced by LPP.

To trace the added value chain (so, an increase in the value of a piece of clothing in the process of its production cycle), we need to consider what share of the price is connected with which phase of the logistic chain. The LPP Sustainability Report for the year 2022 (LPP, 2023) provides that the total cost of the piece contains the following elements:

- production costs, incl. the factory workers: 35,8%
- store maintenance costs: 22,7%
- VAT: 18,7%
- distribution and transport costs: 11,4%
- design and administration costs: 3,2%
- customs duty: 1,6%
- CIT: 0,8%
- brand profit: 5,8%

This means that in the case of LPP, the highest costs are associated with production and retailing, and the company's profit is relatively low. Such a share of costs is possible if there is a kind of balance between

mass production and basing the value chain on the system of socio-environmental values. Unfortunately, this is not the case for many apparel companies, whose value chain is still primarily based on economies of scale.

The example of LPP demonstrates that production, logistics, retailing, and consumption are globally interconnected human activities, closely linked by technologies and supply interdependencies that create a value chain. As landscapes always reflect the human activity and technology used, each stage of the value chain is associated with a different landscape. It is easy to imagine that any potential change in one of these stages could also lead to a change in the landscape behind that activity. This means, as the historical example of German flax production in the nineteenth century shows that changing or eliminating one of the "links" in the value chain (e.g., changing the type of textile used for production) could lead to a dramatic change in another "link", even in a very distant area (e.g. closing the factory on another continent or changing the crops in a given area). Thus, when considering landscapes associated with activities such as agriculture, extraction, production, transport and logistics, wholesale, retail, or even landfills, it is clear that they should be understood as a complex system hidden behind the value chain.

Transition pathways: A behavioral science approach
In the previous section, we have shown how the textile value chain is structured today. This shows the negative impact on hidden landscapes worldwide. Against this background, we will first show possible strategies that could lead us to more sustainable value chains. This is followed by a future model for the textile industry. However, system change must be desired and implemented. In our view, this is where the real challenges lie. For this reason, we will conclude by discussing the existing hurdles to a more sustainable design of value chains from a behavioral science perspective. To this end, we look at the relevant decision-makers in the value chain. Finally, we show how the sustainable impact of a value chain can be measured.

Sustainability strategies: In principle, three principle sustainability strategies can be distinguished, which build on each other hierarchically (Siebenhüner, 2001, p. 78):

The **efficiency strategy** is about using resources as sparingly as possible at all stages of the value chain. Ecological and economic goals often go hand in hand here, as using fewer resources generally also means lower costs. Considerable efforts are being made globally along this strategic line and successes in implementation can already be observed.

The **consistency strategy** is much more demanding. It involves moving away from linear value chains

Sustainability strategies (*prepared by author in accordance with Siebenhüner, 2001, p.78)*

towards a circular economy, which in some cases means a disruptive system change. The transformation requires considerable investment, innovation, and time. The strategy is becoming increasingly important in the public debate but is still in its infancy in terms of implementation.

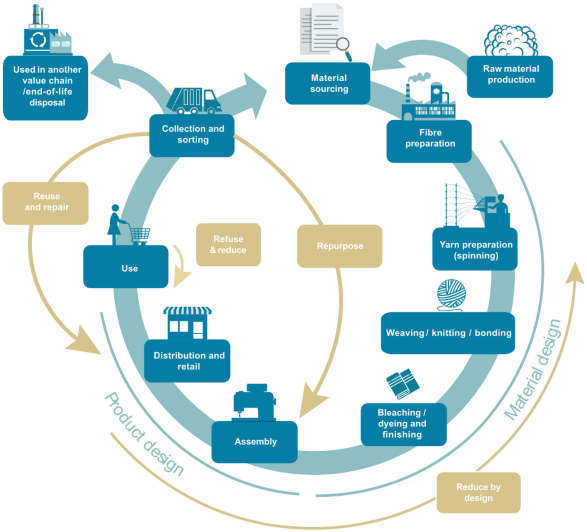
If we want to meet the increasingly recognizable limits to growth in a sustainable way, we ultimately need the **sufficiency strategy.** This is aimed at more conscious consumption and, in some cases, even the renunciation of consumption (less, slower, more regional). It is difficult to communicate this to people. In the (economically) less developed countries, people want to achieve the same level of consumption as in the industrialised countries of the Global North. And in the more economically developed countries, a clear majority of the population is not prepared to accept restrictions. Added to this is the fact that the world population is currently continuing to grow, which stands in the way of an absolute reduction in consumption.

In the following section, we use the example of the textile industry to show how the application of these strategies can lead to a model of a significantly more sustainable value chain.

Sustainable Textile Value Chain

In 2023, the United Nations Environment Program presented a comprehensive study on the design of a sustainable textile value chain. According to the study, the critical lever for system change lies in the concept of the circular economy (consistency). However, it also questions consumption patterns (sufficiency) and calls for careful use of resources (efficiency). The prerequisites for this are the improvement of production, design, and care practices in conjunction with considerable investment in infrastructure such as research & development, water treatment, and waste management (UNEP, 2023, p.6).

The following figure illustrates this new model for the textile value chain conceived as a cycle. Accordingly,



Sustainable circular textile value chain (Source: UNEP, 2023, p. 18)

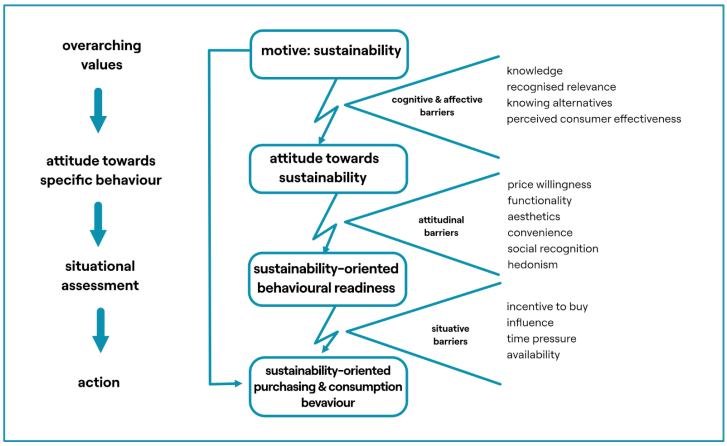
the change begins with the design of the products and the materials used (reduced by design). The corresponding raw materials are obtained or produced on this basis. A further challenge here is the question of how these new value chains can be organized regionally to reduce global transport routes. Finally, significant changes are required in the use and disposal phase. Less fashionable consumption (slow fashion instead of fast fashion), repairing instead of buying new, strengthening the second-hand market or clothes swaps, and, finally, consistent reuse or recycling in the textile or other value chains (UNEP, 2023, p.18-21). Other practices in the use phase of textiles, in particular, give rise to business models that are decoupled from production and resource consumption. These currently only have a global market share of 3.5%. This could be increased significantly (EMF, 2021).

Who decides?

The system change to new value chains can only succeed if the responsible decision-makers in their various roles play an active part in shaping it or at least allow it to happen. We see three perspectives: people, organisations, and policymakers. In this section, these are analysed in depth regarding their role in the necessary transformation.

People

People as individuals or groups influence the design of value chains in various roles. Firstly, they are the paying customers for a product or service. But they are also voters and citizens. Depending on age, level of education, gender, and culture, people show different levels of awareness of sustainability issues. Surveys have repeatedly shown that these issues are rated as important and that there is a need for action.



Barriers to sustainable consumption

However, research has identified an attitude-behavior-gap. This means that a high correlation between awareness of social and ecological problems and correspondingly adapted decisions and behavior is not to be expected due to other influencing variables (for example: Wiederhold & Martinez, 2018, Wintschnig, 2021).

The figure above shows the main obstacles that prevents people from consuming more sustainably. Based on the often-existing motive *„I want to act sustainably"*, there are several cognitive (e.g., knowledge) and affective influences (e.g., perceived effectiveness of one's own actions) that prevent consumers from gaining a sufficiently activating attitude. If this hurdle is overcome, there is often competition with other attitudes: for example, prices that are too high, the consumer's desire for pleasure, or possibly limited functionality. This means that the fundamentally positive attitude towards sustainable alternatives is not implemented. Once the consumer has overcome this hurdle, there may still be situational reasons that prevent sustainable purchasing or consumption behavior. These can be social influences in the purchasing process, time pressure, or the availability of a product or service.

We can derive the following design challenge:
What can we do to help consumers overcome the various barriers to more sustainable consumption?

This should not underestimate how central individuals - in their role as citizens and consumers - are to the transformation of value chains. In contrast to what the UNEP formulates in its study on the sustainable textile industry, we see people as the central actors of change (UNEP, 2023, p.15). Governments and companies must take initiatives to create more sustainable value chains. At the same time, however, consumers must support such change through their consumption and voting decisions.

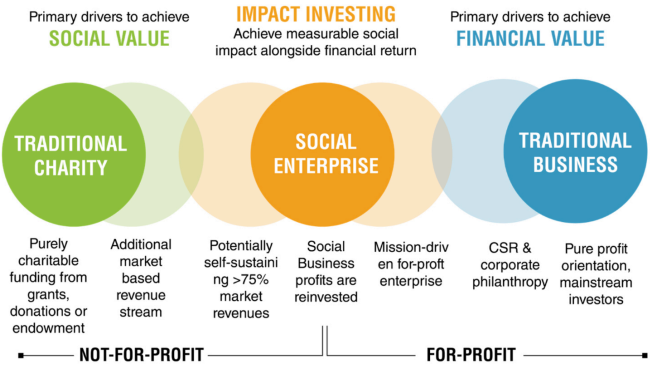
Organisations
The formative organisations in a value chain are companies. Depending on the country, these are framed by an economic system that, in most cases, moves along a continuum between a more social and a more capitalist market economy. China follows a particular path, with a system known as a socialist market economy. There are hardly any countries that explicitly include ecological considerations in the design of their economic system. This is most pronounced in Western/Northern Europe (Sweden, Norway, Denmark, the Netherlands, Germany, and Austria). These countries are at least on the way to an eco-social market economy.

The economic framework for international trade and thus, the activities in the global value chains is therefore characterized by market economy principles. This means private ownership of the means of production and the motive of making a profit as a central incentive for the players. Prices are primarily determined by the relationship between supply and demand on the market.

However, there is growing social pressure on companies and consumers to take social and increasingly also ecological aspects into account when making consumption and investment decisions. In a social and increasingly ecological market economy, greater attention is therefore being paid to ensuring that unchecked market forces and the individual pursuit of profit do not lead to social inequalities or undesirable ecological developments and that the system is not exploited by individuals.

At a microeconomic level, companies and other organizations can be classified according to the continuum shown in figure 6 between *Pure Profit* and *Pure Charity*. Most of the companies relevant to our analysis operate in the areas of *Pure Profit* and *CSR & Corporate Philanthropy*, which are characterized by shareholder interests. Social enterprises, which at least partly invest in mission-driven, are a growing segment, accounting for between 2% and 10% of gross domestic product in OECD member countries (OECD, 2023, p.3).

The following design challenge can be derived from this: **What can we do to help more investors recognize the importance and value of impact investing?**



Social enterprises - a hybrid spectrum (Funck et al, 2023, p.20; based on Ryder and Vogeley, 2017, p.2)

Policymakers
The framework for economic actors in value chains can be decisively influenced by those responsible in politics and parliaments at local, regional, national, and European levels. This is where the principles and interpretations of a given economic system described above are decided, and, if necessary, new guidelines and incentive systems are created. Which values are represented and enforced here is based on the corresponding election results in Western democracies and the EU. Three central fields of action can be distinguished in economic policy:

Regulatory policy: economic legislation that provides a long-term framework for economic agents (e.g., Supply Chain Act, Circular Economy Action Plan).

Process policy: direct, short- and medium-term interventions to influence prices, quantities, and costs (Incentives to act or not act like subsidies for e-cars, increase in mineral oil tax.

Structural policy: long-term regional or sectoral measures to enable economic/social change (e.g., subsidies for charging stations for e-cars, subsidies for the expansion of bicycle paths).

The following design challenge can be derived from this: **How can we succeed in ensuring that policymakers systematically and consistently consider the findings for a more sustainable orientation in their decisions?**

The principles of the capitalist market economy are under discussion. An eco-social market economy requires

- more focus on the common good than on individual benefit and profit
- more cooperation and international agreements
- a circular economy instead of a linear value chain

Due to its outstanding importance for the design of sustainable supply chains, the EU Supply Chain Act will be discussed in more detail here as an example for regulatory policy. The main objective of the EU Supply Chain Act is to ensure that companies within the EU take responsibility for the impact of their activities on human rights and the environment throughout their supply chains. This includes the identification, prevention, and mitigation of negative impacts as well as accountability and transparency in relation to these efforts. Agreement on the requirements of the law was reached on December 14, 2023. Implementation details have not yet been finalized, as the law still needs to be confirmed by Parliament and Council.

The central regulations (Krick, 2024, online):

- European companies with more than 500 employees and a turnover of more than 150 million euros as well as companies with more than 250 employees and a turnover of 40 million euros in specific high-risk sectors are affected. Non-EU companies that exceed certain turnover thresholds in the EU internal market are also

covered by the law.

- These companies must identify actual or potential negative impacts on human rights and the environment and take measures to prevent, mitigate, and remedy them.
- Companies must also submit a transformation plan on how they intend to contribute to the Paris Climate Agreement.
- Transparency is required through the publication of annual reports on the fulfillment of due diligence obligations. Complaints procedures are possible. The law also includes civil liability, which enables those affected to sue for damages in European courts.

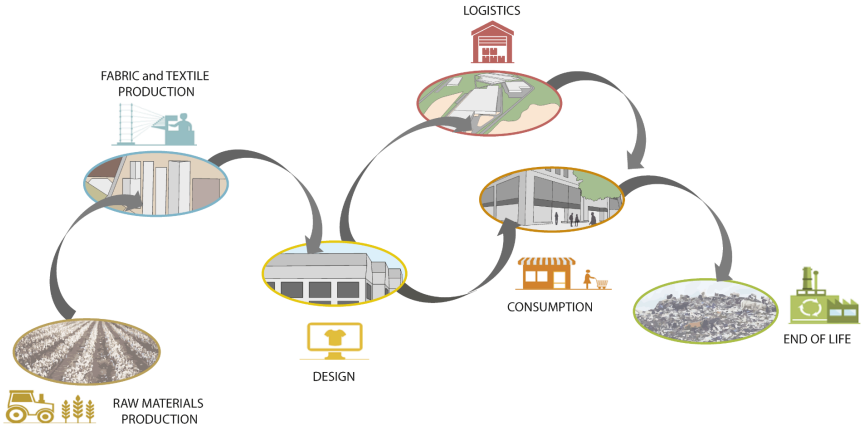
Impact evaluation

In the UNEP study from 2023, already cited above, three central goals are defined to achieve a more sustainable change in the textile value chain: (1) shifting consumption patterns, (2) improved practices, and (3) infrastructure investment. There are proposals for nine fields of action in which the system change should be implemented. These include, for example, avoiding overconsumption, better product care, or cooperation with less developed countries with groups that are still marginalized in the current situation (women, young people, Indigenous and tribal peoples, people with disabilities) along the economic chains to absorb social changes in the value chain and improve people's living and working conditions. (UNEP, 2023, p.39 to 40).

The following effects on the ecological and social impact of the textile value chain are considered possible (UNEP, 2023, p.72 and the literature cited there):

- Circular business models could enable the industry to eliminate approximately 143 million tons of GHG emissions in 2030.
- Reducing overproduction by even 10 per cent could reduce emissions by approximately 158 million tons in 2030, while eliminating all overproduction would result in a significantly greater benefit.
- Doubling the average uses of a garment could reduce GHG emissions by 44 per cent.
- Improving energy efficiency by 15 per cent per production unit in the processing phase of the value chain has a potential benefit of 64 Mt CO2e till 2030.
- Transitioning towards a circular economy across sectors could create a net total of 6 million new jobs by 2030, compared to a business-as-usual scenario.

These considerations can be used to derive an overarching structure for a system of indicators to measure the impact and progress of transformation, which must explicitly include economic goals and key performance indicators (KPI). Efficient economic structures are as crucial for providing the necessary investments as they are for ensuring decent working conditions and fair wages in the long run.



Current relations between phases in the textile industry. Source: author

Important economic targets that should be measured are productivity and investments in or market shares of technologies, business models, and products that promote the circular economy and fair trade. This should have a noticeable impact on the critical ecological targets: greenhouse gas emissions in tons and, in particular, the consumption of water, raw materials, and land along the value chain.

The value chain becomes more sustainable from a social perspective if working conditions improve (e.g., safety standards such as fire and health protection, weekly working hours), fair wages are paid (€/h, annual income), and people around the world are trained in the same way to become part of the transformation process (e.g. investment in training, number of people with relevant qualifications).

Landscape Transformation Scenarios

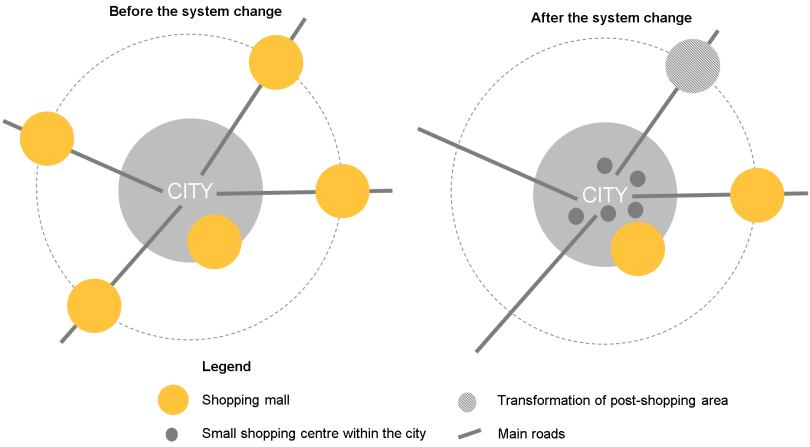
In order to consider possible improvements in the textile value chain and the reduction of its negative impact on landscapes at certain stages of the chain, let us consider a scenario of possible future. This scenario is speculative, based on a „What if?" approach, and should be treated as an intellectual exercise rather than an in-depth analysis of possible development paths.

Usually, when constructing scenarios, many different possible changes should be considered simultaneously because "things happen the way they do because many things happen at the same time" (Kolodko, 2011). For the purpose of this exercise, we will choose just one but very important change in a current textile value chain (figure above): let us

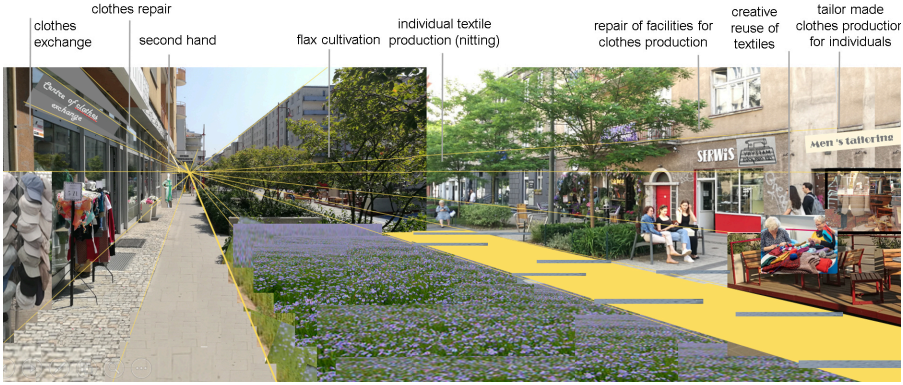
consider human behavior based on sufficiency and the consequences of this approach for landscapes from a perspective of the clothing retail transformation.

Due to the universality of sufficiency approaches, human shopping behavior is changing: people are buying less clothing but of higher quality and more expensive. Due to the price, they are buying less and start to care more about clothes and repair them. Some people buy used clothes in both offline and online shops circulating vintage clothes. Some begin to tailor clothes on their own. As a result, this behavior will lead to a decrease in the mass scale of clothes transportation and selling; thus it will reduce the need for the large-scale storage and shopping surface. The retail based on clothes will become more dispersed. Lots of people employed in the mass production garment industry will lose their job, while new jobs connected with clothes maintenance will occur - the repair, tailoring, and reuse approach will increase the individual time needed to manage "our wardrobe", which will open a niche for new types of jobs. The space required for traditional small-scale retail, as well as second-hand shops, and repair services will grow. The small shops with clothes, tailors, and repair shops, as more dispersed, will come back to city centers (figures below and next).

The large shopping malls will not be an effective retail system anymore. The landscapes connected with the large shopping malls located at the city borders will be replaced with new functions, such as housing, farming, or parks (figure below). But also the distant agricultural landscapes producing raw materials for textile production for a mass scale will be changed.



Retail landscapes transformation scenario. change in the distribution of the shopping malls within the city borders. *Source: author*



Retail landscapes transformation scenario - within the city center. *Source: author*

Their scale and/or number will be reduced, and the cultivation system will change - some of the agricultural land aerial producing for textiles will change the production profile, for example, it will switch to the production of food. A similar process will affect the factories producing fibers - the production will be reduced. Due to this limitation, some factories will be closed, and a large number of people will have to change industries.

Summing up, these changes in human behavior will therefore lead to a reduction in the scale of clothing processing and retailing, and at the same time, transform landscapes in many different places around the globe. Locally, close to the end user, it could transform the city center by making it more vibrant and walkable through the return of small, dispersed shops and services to the city center (figure above). At the same time, it will lead to the disappearance of large shopping mall landscapes on the outskirts of the city, which will be replaced by new housing estates, new factories, new types of agriculture, or possibly even by some environmentally active spaces such as parks or meadows. Also, the local structure of farming, forestry and textile production might change, as the need for local and regional production will occur. In this case, some new areas for flax and other plants allowing textile production will be needed, and perhaps also for new factories producing textiles from recycled or new materials. The distant landscapes hidden behind the textile retail trade will also be transformed towards different agricultural production (possibly food) or, depending on the local economic and social level, towards new types of industry, places serving tourism, forests, or other functions. Between the local and distant landscapes, some changes will also be introduced in the logistics areas, but in this case, it seems that this process will be a modification rather than a complete transformation, as logistics serves all sectors of industry (figure next page).

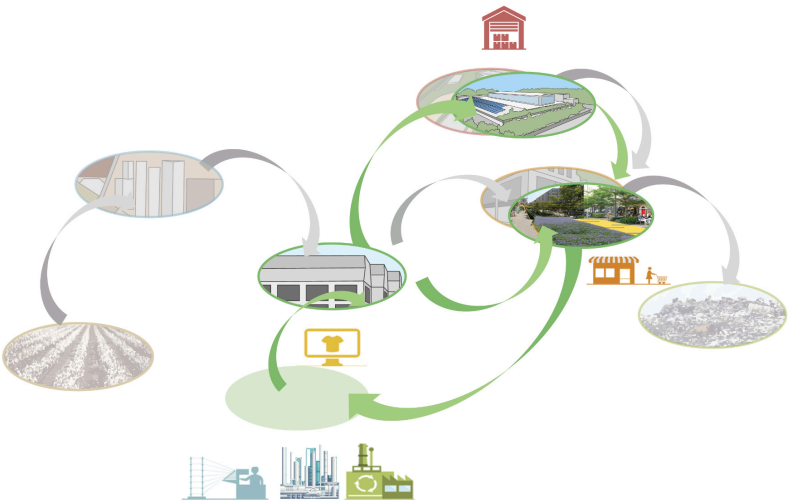
Analysis of the above scenario shows that most human activities expressed spatially in the form of landscapes are interconnected, like a system of interconnected vessels. A change in one landscape leads to changes in subsequent, seemingly independent landscapes in distant parts of the world. Therefore, when considering a change of a local nature, its far-reaching effects must also be taken

into account and incorporated into a manageable calculus.

It is important to remember that a textile value chain is only used here as an example. In general, all human activities leading to the delivery of any good to the customer, starting from the order of this good through the acquisition of the necessary raw materials, the processing of raw materials, the production of this good, and the organization of the process of waste management, are linked in value chains, which are the frameworks within which any landscape system transformation should be considered during the planning process.

Research and analysis tasks for learners

- Develop suggestions on how to help consumers overcome the affective and cognitive barriers to more sustainable textile consumption.
- Choose a hidden landscape along the textile value chain. What would have to change to noticeably reduce or even completely prevent the identified negative impacts on the landscape and the people living there? What would this hidden landscape look like in the future?
- Choose a type of landscape. What type of landscape do you think existed in this area before, and how did it change in the past? How do you perceive and evaluate the impact of this change on the transformation of the landscape?
- Consider how this contemporary landscape is connected to the others. Can you see a value chain linked to it? What is needed to bring about system change within this process?
- What are the main barriers to overcome? Do you think it is possible to make this process more sustainable?
- Can you imagine alternative scenarios of connections between hidden landscapes?



Transformation scenario of the value chain and landscapes hidden behind them. *Source: author*

References

- Britannica Money (no date), industries, online: https://www.britannica.com/money/industry; retrieved: 22.02.2024
- EEA - European Environment Agency (Ed., 2022): Figure-EU-27 apparent consumption of clothing, footwear and household textiles (excluding fur and leather clothing), 2010-2020, million tonnes and kilograms per person, online: https://www.eea.europa.eu/data-and-maps/figures/eu27-apparent-consumption-of-clothing/
- EMF - Ellen MacArthur Foundation (Ed., 2021): Circular Business Models: Redefining Growth for a Thriving Fashion Industry. Available at: https://ellenmacarthurfoundation.org/news/circular-business-models-in-the-fashion-industry
- EP - European Parliament (Ed., 2023): The impact of textile production and waste on the environment, online: https://www.europarl.europa.eu/pdfs/news/expert/2020/12/story/20201208STO93327/20201208STO93327_en.pdf
- Filho W., Perry P., Heim H., Dinis M., Moda H., Ebhuoma E.r, Paço A. (2022): An overview of the contribution of the textiles sector to climate change, in Frontiers in Environmental Science Vol. 10. https://www.frontiersin.org/articles/10.3389/fenvs.2022.973102/full
- Funck, D., Dreksler, B., Fetzer, E. (2023): People, Landscape, Sustainability - Handbook for Community Innovation Promoters, Nuertingen and Beirut. https://creativecommons.org/licenses/by-sa/4.0/deed.en
- Goldberg, Z. (2018): Your Product's Supply Chain Hits More Countries Than You Realize online: https://smallbizclub.com/run-and-grow/operations/products-supply-chain-hits-countries-realize/; retrieved: 23.02.2024
- Kaplinsky, R. and M. Morris (2001): A Handbook for value chain, online: https://www.researchgate.net/publication/42791981_A_Handbook_for_Value_Chain_Research
- Kolodko G. W. (2011): Acta Oeconomica, Vol. 62 (1) pp. 3–13. DOI:10.1556/AOecon.62.2012.1.2 https://www.tiger.edu.pl/kolodko/artykuly/Kolodko_Acta_Economica_no_1_2012.pdf
- Krick, T. (2024): EU-Lieferkettengesetz verpflichtet Unternehmen zu fairer und nachhaltiger Wirtschaft, Online: https://www.eqs.com/de/compliance-wissen/blog/eu-lieferkettengesetz/, last update 02.01.2024; retrieved: 27.02.2024.
- OECD (Ed., 2023): Recommendation of the Council on OECD Legal Instruments the Social and Solidarity Economy and Social Innovation OECD/LEGAL/0472.
- Ryder, P., Vogeley, J. (2017). Telling the impact investment story through digital media: an Indonesian case study. Communication Research and Practice 4, 1–21. https://doi.org/10.1080/22041451.2017.1387956
- Siebenhüner, B. (2001): Homo sustinens - Auf dem Weg zu einem Menschenbild der Nachhaltigkeit, Marburg.
- Stamm, A., Altenburg, T., Müngersdorff, M., Stoffel, T., Vrolijk, K. (2020): Soziale und ökologische Herausforderungen der globalen Textilwirtschaft - Lösungsbeiträge der deutschen Entwicklungszusammenarbeit, Bonn.
- UNEP (Ed., 2023): Sustainability and Circularity in the Textile Value Chain – A global Road Map, Paris (https://www.oneplanetnetwork.org/knowledge-centre/resources/sustainability-and-circularity-textile-value-chain-global-roadmap)
- Wiederhold, Marie & Martinez, Luis. (2018): Ethical consumer behavior in Germany - The attitude-behavior gap in the green apparel industry. International Journal of Consumer Studies. 42. 419-429. (https://onlinelibrary.wiley.com/doi/10.1111/ijcs.12435)
- Wintschnig, B. A. (2021): The Attitude-Behavior Gap – Drivers and Barriers of Sustainable Consumption in Junior Management Science 6(2), p. 324-346, (https://jums.ub.uni-muenchen.de/JMS/article/view/5108).

Weblinks Case Study

- https://www.lpp.com/en/sustainable-development/sustainability-report/ , access: March 2024
- https://www.lpp.com/en/press-releases/lpp-as-a-partner-of-cotton-made-in-africa/, access: March 2024
- https://www.warehouses.pl/en/news/lpp-one-of-the-largest-transactions-on-the-polish-warehouse-market-173 , access: March 2024
- https://www.lpp.com/en/about-us/headquarters-offices-and-logistics/logistics/, access: March 2024
- https://wwwlpp62711ea95a.blob.core.windows.net/blobwwwlpp62711ea95a/wp-content/uploads/2023/07/LPP-ESG-FACTSHEET-2022-2023-PL.pdf , access: March 2024
- https://www.lpp.com/en/sustainable-development/environment/production/ , access: March 2024
- https://www.lpp.com/en/sustainable-development/sustainability-report/ , access: March 2024

Systems Thinking in Landscape Economy

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So far, we have explained how we understand landscape in the context of the landscape economy approach. Landscape is a container for various natural and human systems. We have explored the conceptual connections of landscape and economy on the example of the hidden landscapes of the global value-added chain. Landscape provides context and territoriality to these systems. They become observable, not only with regard to their physical and structural impact, but also in terms of responsibility and accountability. This helps us navigating the complexities of sustainable development. In that sense, landscape is not just a theoretical concept but also a very practical and applicable method. Landscapes can be understood as dynamic assemblages shaped by diverse actors, both human and non-human.

From actor-networks to wicked problems

This brings us already close to one important theoretical direction of systems thinking: the actor-network theory (ANT), developed by sociology scientists like Michel Callon, Madeleine Akrich, Bruno Latour and John Law (1992). ANT encourages viewing landscapes not just as physical spaces but as networks of interacting entities, including environmental elements like soil, water, flora and fauna, and social elements like communities, organisations, industries and policies. Recognizing these as interconnected allows planners, designers and other actors to include a broader range of perspectives and dependencies, enhancing the likelihood of achieving holistic, sustainable outcomes and innovation towards regenerative systems.
A systemic approach seems necessary in particular when addressing the so-called 'wicked problems' of our times. Designing and leading the transition from the present state to a future regenerative landscape economy embraces multiple wicked problems. Rittel & Webber have described the characteristics of wicked problems already 50 years ago in their fundamental article on the *Dilemmas in a General Theory of Planning* (Rittel & Webber, 1974). Refering to this crucial article, we understand wicked problems according to the following ten main characteristics:

1. There is no definite problem definition for a wicked problem
2. Wicked problems have not stopping rule. There is only a constant process of understanding
3. Solutions to wicked problems are not true-or-false, but good-or-bad
4. There is no immediate and no ultimate test of a solution to a wicked problem
5. Every solution to a wicked problem is a 'one shot operation', because there is no opportunity to learn by trial-and-error, every attempt accounts significantly
6. Wicked problems do not have an enumerable set of solutions, nor is there a well-described set of possible operations that may be incorporated into a plan
7. Every wicked problem is essentially unique
8. Every wicked problem can be considered a symptom of another problem
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution
10. The planner has no right to be wrong. Because the aim is not to find the truth, but to improve some characteristics of the world where people live.

We may conclude here that every wicked problem is a system on its own right, which is why systems thinking is needed to address them.

Systems Thinking in the Green Comp Framework

We have already referred to GreenComp, the European sustainability competence framework, published in 2022 as a general orientation for curriculum design in Europe. Systems thinking is a part of this framework and included in the competence area 'Embracing complexity and sustainability'. GreenComp describes the competences of systems thinking as follows:

"*Descriptor (2.1): To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.*

Equipping learners with systems thinking is necessary to understand complex sustainability problems and their evolution. Systems thinking allows us to understand reality in relation to other contexts (lo- cal, nation, global) and fields (environment, social, economic, cultural). It is critical for advancing sus- tainability. Thinking in systems enables learners to identify feedback mechanisms, intervention points and interactive trajectories. Systems thinking can be understood as a tool for evaluating options, decision- making and taking action. It is based on the assumption that parts of a system act differently when taken apart from the system. In fact, contrary to this, fragmentary thinking, i.e. analysing parts in isolation, instead of the whole interconnected system, increases short-termism and could lead to an oversimplification of sustainability problems which may not correspond to reality." (GreenComp 2022, p. 23)

Operationalising systems thinking competence in higher education

Since this book is a handbook for educators it is relevant to discuss in more depth what systems thinking generally implies. On that basis, we can better understand which competences and learning activities are needed in order to enhance systems thinking as a cross-cutting learning objective and, eventually, as a cognitive skill. Considering systems thinking as a cognitive skill rather than a set of disciplinary frameworks and methods is increasingly supported by scholars in the field (Chowdhury, 2023) and known as the so-called 'fourth wave' of systems thinking. This conceptual shift is expected to help opening and democratising the field. Along this line of thinking, Cabrera and Cabrera (2019, 2022) introduced the DSRP approach. From these scholars' perspective, systems thinking is about how one can make **D**istinctions, organise **S**ystems, recognize **R**elationships, and arrive at **P**erspectives. Here we need to note that understanding perspectives greatly relies on advancements in neuroscience and expanding our knowledge about how the human brain works. A lot of what we or others know, or think

to know, is dependent on our - and their – emotional relationship to the same.

In 2015, Arnold and Wade applied a systems approach to arrive at a definition of systems thinking for use in a wide variety of disciplines. The approach is based on a comparative review of existing definitions, eventually leading to the following integrated definition:

„Systems thinking is a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviors, and devising modifications to them in order to produce desired effects. These skills work together as a system." (Arnold and Wade, 2025, p 675).

On that basis, the authors further suggest the following eight main elements of a systems thinking process:

(1) Recognising Interconnections
This obviously implies that the elements of a system have been identified and named. Recognising interconnections further includes the idea of setting a system boundary. The boundary can be both conceptual and territorial. The latter being relevant in particular for landscape economy.

It is relevant to be specific and explicit when describing the nature of the interconnections between the elements of the system.

(2) Identifying and Understanding Feedback
Some -but not all- of these connections can also be described by means of cause-effect relationships. Feedback loops need to be identified and further, their effects on other elements of the system have to be described. For example: Exaggerated use of nitrate fertilizers in agriculture (food production system) leads to groundwater pollution (water system). Because both systems are part of the same landscape system. The ability to identify and correctly describe cause-effect relationships requires subject-specific knowledge from various scientific fields, in particular natural, environmental and social sciences, and good observation. It is therefore important that landscape economy courses include diverse disciplines so that the systems operating within a landscape can be understood both correctly and holistically.

(3) Understanding System Structure
Elements 1 (system elements and interconnections) and 2 (cause-effect and feedback loops) are essential for understanding the system structure.

(4) Differentiating types of stocks, flows and variables
This dimension refers to the resources within a system, or the stocks. These resources are part of the elements in the system. Basically, elements have the capacity to pool resources. These can be, for example, the water or the microbes in the soil providing soil fertility. Flows are possible changes with regard to the availability of the resource. Variables describe a

dimension of change with regard to the availability of the resource. In our example this could be: Change of water levels because of drought or reduction of microbe activity because of artificial soil densification.

(5) Identifying and understanding non-linear relationships

This category is very similar to the previous one as it also refers to the relation of stocks, flows and variables. What makes this dimension specific is the idea of non-linear flows within a system. Non-linear flows lead to tipping points in the system and accelerated system behaviour. For example: The tipping point when a flood event exceeds the flood protection boundaries and floods a wide territory.

(6) Understanding dynamic behaviour

Systems are constantly evolving due to the ongoing interactions between their parts, being it linear or non-linear flows. Dynamic behavior refers to how the components of a system interact over time to produce changes and complex patterns in the system's overall behavior. A key skill for landscape economy thinkers is to imagine how me might reinforce positive feedback loops within the systems' behaviour, and how negative feedback loops can be reduced or mitigated. Dynamic behavior in systems often leads to emergent properties, where the system exhibits behaviors or outcomes that are not predictable by simply looking at individual components. This is seen in landscapes in particular, where interactions among human needs and natural resources have created complex dynamics like biodiversity decline. Moreover, systems thinking recognizes that some systems can adapt to changing conditions. For instance, ecosystems and social systems often self-organise, adjusting to disturbances or changes in resources (resilience capacity).

(7) Conceptual models: Reducing complexity by modeling systems conceptually

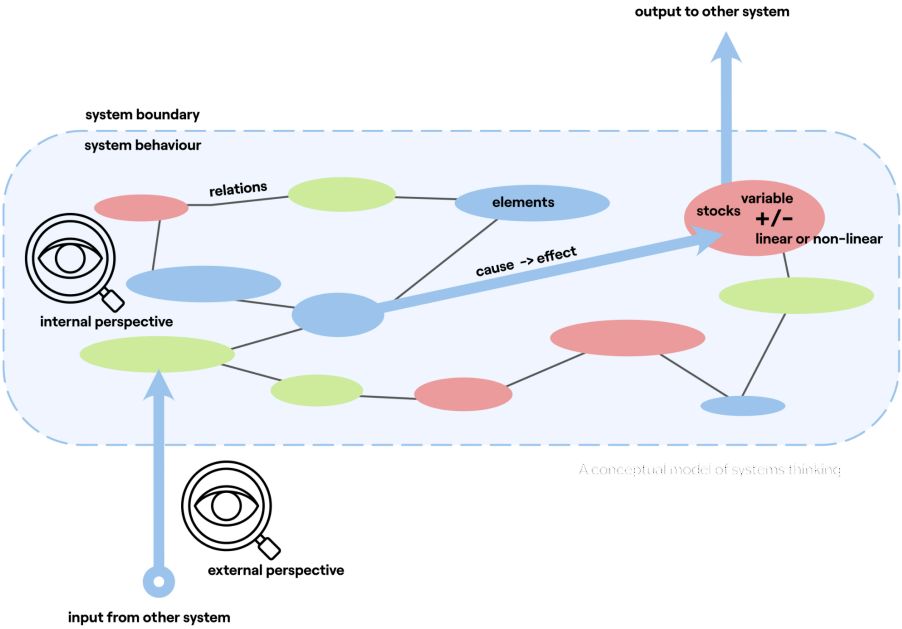
This element is the ability to conceptually model different parts of a system and to view a system in a different way. This ability is very relevant if we want to communicate about systems (and landscapes) across disciplinary and sectoral divides, and to local communities. This includes intuitive simplification, such as reduction, transformation, abstraction and homogenization. System models have the power to enhance the ability to embrace complexity, rather than getting overwhelmed by all details of the environment. Systems thinkers often use system archetypes to understand common patterns in dynamic behavior, such as growth limits, resource depletion, or oscillations. These archetypes help describe the behaviour over time and provide insights into potential leverage points for system innovation.

(8) Understanding systems at different scales

This skill involves the ability to recognize different

scales of a system, and systems of systems. Thinking in and with landscapes can greatly enhance this multi-scale approach. The landscape economy curriculum presented in this book supports this with the final assignment that combines a spatial translation (territorial scale) with the business model canvas (local community scale)

In the following chapter, comprising eight landscape economy stories, we show our approach to addressing in particular the systems thinking dimensions one and two, aiming at understanding system structures. The assignments and exercises described in the third part of this book illustrate our approach to supporting also the other dimensions of systems thinking. There is not a single exercise that can encompass all eight levels. It is rather the overall process of taking a landscape economy point of view that supports the stepwise development of systems thinking as a cognitive skill.



A conceptual model of systems thinking

References

- Arnold, D. Ross and Wade, Jon P. (2015): A Definition of Systems Thinking: A Systems Approach, Procedia Computer Science 44 (2015), 669-678
- Bianchi, G., Pisiotis, U. and Cabrera Giraldez, M., (2022): GreenComp, The European sustainability competence framework, Punie, Y. and Bacigalupo, M. editor(s), Publications Office of the European Union, Luxembourg, ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040.
- Cabrera, Derek, and Laura Cabrera (2019). What Is Systems Thinking? In: Spector, M., Lockee, B., Childress, M. (eds) Learning, Design, and Technology. Springer, Cham. https://doi.org/10.1007/978-3-319-17727-4_100-1
- Cabrera, Derek, and Laura Cabrera (2022). "DSRP Theory: A Primer" Systems 10, no. 2: 26. https://doi.org/10.3390/systems10020026
- Chowdhury, Rajneesh (2023): Holistic Flexibility for Deploying Systems Thinking as a Cognitive Skill, in: Systemic Practice and Action Research (2023) 36:803–825 https://doi.org/10.1007/s11213-022-09626-8
- Law, John (1992): Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity
- Rittel, Horst W. J. and Webber, Melvin M. (1973): Dilemmas in a General Theory of Planning, Policy Sciences, Vol. 4, No. 2 (Jun., 1973), pp. 155-169

Why is Landscape an Economic Framework?

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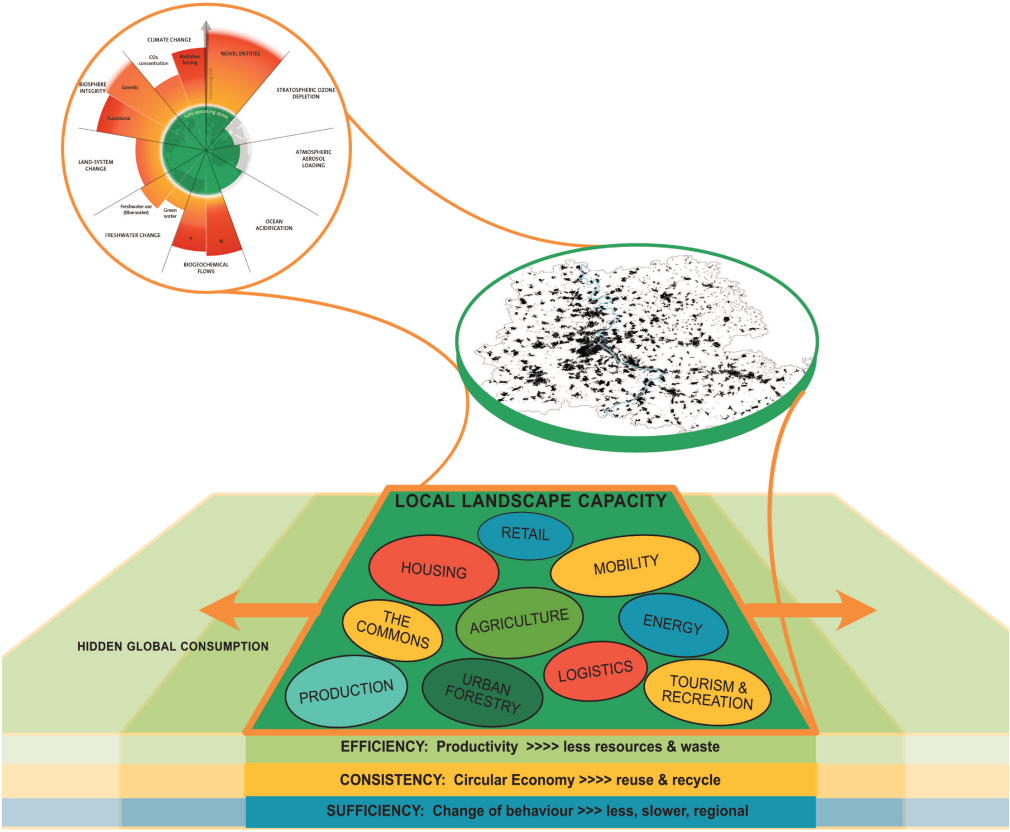
Landscape carrying capacity is the key reference of a regenerative economy

The transgression of the planetary boundaries at global scale is the sum of all local and regional landscape capacity transgressions. Anywhere. The map here shows Stuttgart Greater Region, one of the case study areas of our ERASMUS team. This is only one of many landscapes that are transgressing their capacity. What we do not see here is the constant hidden landscape consumption of Stuttgart Greater Region happening elsewhere in the world. These are the places where our food, energy, raw materials, water and other consumables come from and much of our waste goes to. If we consider this in an abstract way, we can conclude that any landscape has only a limited carrying capacity. Human-centred functions are operating within this capacity. Future landscape capacity will be further reduced by the effects of global driving forces such as climate change, biodiversity decline, and pollution. As presented in the previous chapter, consistency, efficienty and sufficiency are relevant dimensions of evaluation.

In this book, we explore how we might translate these principles into a regenerative landscape economy.



From planetary boundaries to the local landscape capacity. We are out of the save operating space
Overall graphic by author with use of the planetary boundaries graphic by Richardson et al: Earth beyond six of nine planetary boundaries, 2023

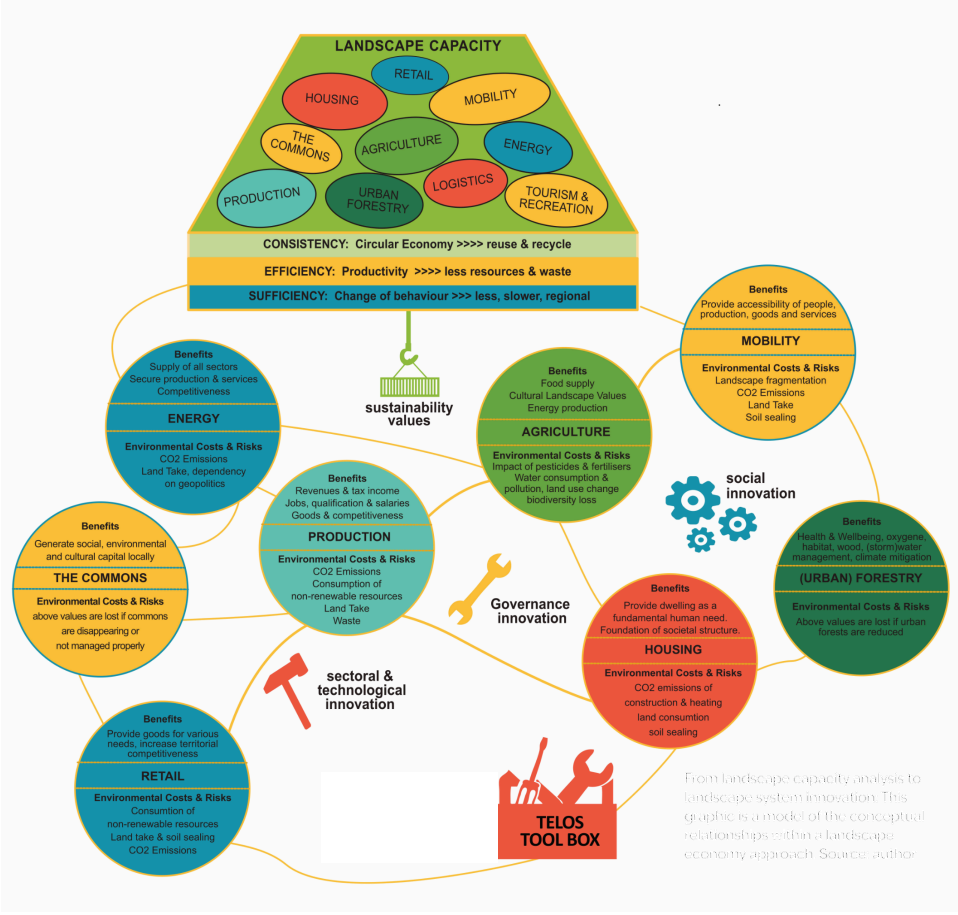
The approach used in the TELOS project is based on three complementary dimensions:

1. **Understanding the inherent system logic of individual land use sectors:** Learners are introduced to each sector, gaining insights into its benefits and risks.
2. **Analysing the systemic interrelationships between sectors within a specific territorial context: the landscape**. This involves identifying tradeoffs and risks while also recognizing opportunities and potential synergies.
3. Engaging in **an ideation and innovation process** to develop alternative system relationships that minimize risks and (re)generate values.

Sustainability values serve as the foundation for identifying goal conflicts, unsustainable practices, and systemic challenges. We hypothesize that recognizing and addressing these issues is essential for fostering innovation and creativity.

Potential transition pathways may align with one or more of the following three main innovation dimensions, all of which adhere to an integrative, landscape-based design thinking process:

1. Social Innovation
2. Governance Innovation
3. Sectoral and Technological Innovation



From landscape capacity analysis to landscape system innovation. This graphic is a model of the conceptual relationships within a landscape economy approach. Source: author

Landscape Economy Stories

Nine stories from nine perspectives.

Setting the scene: What is driving the sector?
What are the tradeoffs?
Which are possible transition pathways?
How do we measure success?

The Commons

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This chapter serves as an essential guide for educators, aimed at empowering learners to appreciate and engage with the concept of the commons.

The commons, encompassing everything from natural resources to cultural and digital assets, serve as a unifying theme that interlinks different areas of study. They represent critically important, yet often overlooked, shared resources, which communities manage and benefit from collectively. In this chapter we emphasize the central role that the commons might have in promoting landscape sustainability and the importance of integrating resilience, economic empathy, and collective stewardship into landscape economy education.

An introduction to the commons

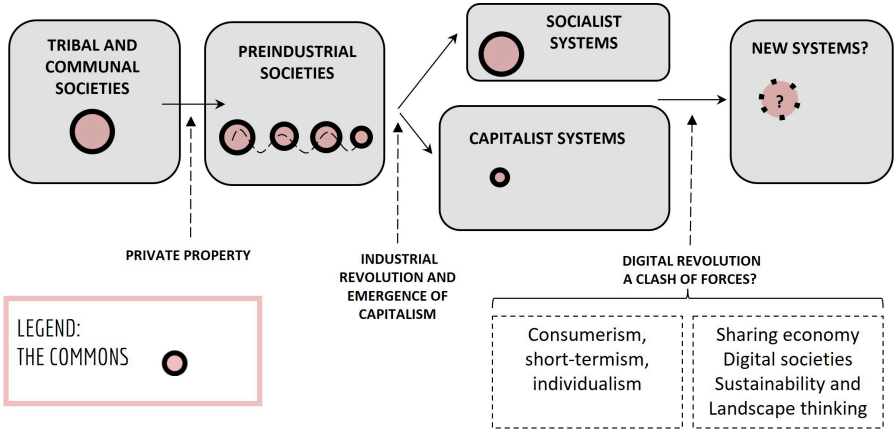
The history of commons management reflects a rich tapestry of social, economic, and environmental interactions. Starting from ancient civilisations, commons were integral to communal living, providing shared resources like water, grazing lands, and forests. Medieval Europe saw the formalisation of commons rights, but the Industrial Revolution brought a paradigm shift. Enclosure Acts in England, for instance, privatised common lands, fundamentally altering rural life and contributing to urban migration. In the 20th century, the *Tragedy of the Commons Theory* emerged (Hardin, 1968), prompting debates on their sustainability and feasible management. Recently, global challenges like climate change and digitalisation have opened new possibilities for the commons, emphasising their importance on both local and global scales, and leading to innovative models of shared resource governance. This historical evolution highlights the adaptability and continuing relevance of the commons, as claimed by J.M. Neeson (1993) and Elinor Ostrom (1990).

Over time, the understanding of the commons evolved from traditional communal usage to a modern perspective of integrated landscape management. This change highlights the interplay of ecological, social, and economic factors and emphasises collective stewardship for sustainable and resilient landscapes.

Key historical events that significantly influenced commons management include:

1. **Medieval Europe's Commons Systems**: Established shared use of land and resources, crucial for agrarian societies.
2. **Enclosure Acts in England (18th-19th Century)**: Privatisation of common lands, leading to significant social and economic changes, including urban migration.
3. **Industrial Revolution**: Altered traditional commons usage, as people moved to cities for factory work, reducing dependence on communal land.
4. **Rise of Environmentalism (20th Century)**: Sparked a renewed interest in sustainable resource management, influencing modern commons governance.

A conceptual and historical evolution of the Commons and current questions (Source: authors)



Types of commons and new commons

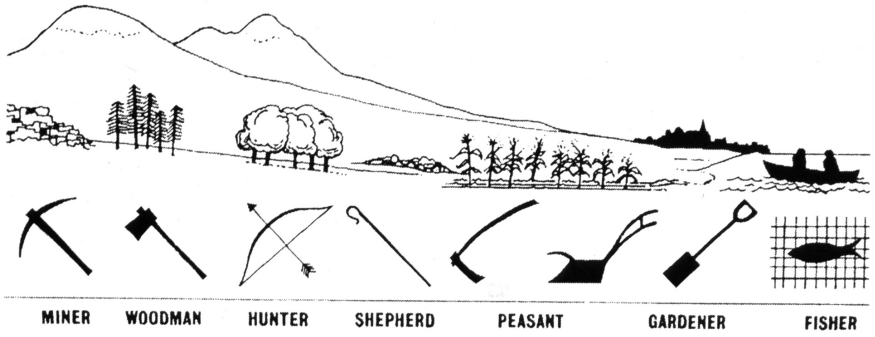
The historical development of Western Europe has witnessed the evolution of small settlements with common central areas. Over time, these lands have undergone changes in ownership, use, and management, leading to shifts in the landscape and community dynamics.

The landscape of common land is characterised by ongoing struggles between preservation, community welfare, and economic interests. This includes challenges like regulations impacting forest harvesting, loss of agricultural land to urban expansion, illegal occupation, sale of agricultural land, restricted public accessibility, and privatisation of public land. However, there are also gains, such as the reclamation of illegally taken plots, enhanced access for leisure, allocation of land for urban agriculture, and promoting community ownership for common production.

The advent of digital technology and increased urbanisation has expanded the definition of commons to include digital information and new shared urban spaces. This shift recognizes the importance of knowledge-sharing and collective action in managing the complexities of modern landscapes. Urban commons serve as vital spaces for community engagement and environmental stewardship (Bollier, 2012).

This evolution implies a renewed commitment to collaborative governance and community well-being. It aligns with broader goals like sustainable development and circular economies and is evident in various sectors, from rural resource management to urban communal spaces and the digital world.

The valley section from hill to sea by Patrick Geddes (1923)



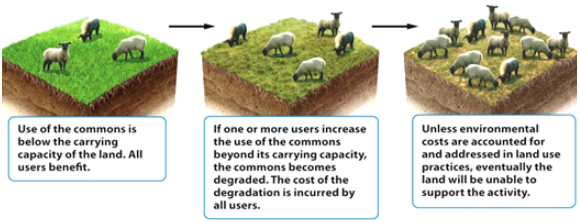
Rural Commons: They include shared resources and land use practices prevalent in rural settings that are crucial for the sustenance and well-being of local communities. Rural commons are often managed collectively by the community or local governing bodies.

The Valley Section by Patrick Geddes (see figure above) emphasizes the logics and harmonious distribution of land uses in rural settings.

Urban Commons: The emergence of urban commons represents a significant shift in the way cities are developed and managed. It advocates for a model of urban development that is sustainable, inclusive, and equitable, grounded in the principles of active community engagement and shared responsibility.

Urban Commons are not just about physical spaces but encompass diverse themes crucial for sustainable urban development. They support non-capitalist economies, emphasize ecological care and resilience, and utilize shared infrastructures to build resilient communities. Governance in urban commons transcends mere management, representing a political process embracing self-governance to transform society. They are seen as a way to promote collective care, regeneration, and resilience.

Creative Commons and Intellectual Property: The digital revolution, coupled with the rise of the sharing economy, is facilitating the exchange and sharing of goods, resources, and knowledge. This shift aligns well with emerging priorities like sustainability but is in contradiction with other contemporary trends like



The tragedy of the commons, source: Houtman, A. H (2012) *Environmental Science for a* changing *world*. W. H.. Freeman and Company

increased consumerism, short-term focus, and a rise in individualistic values.

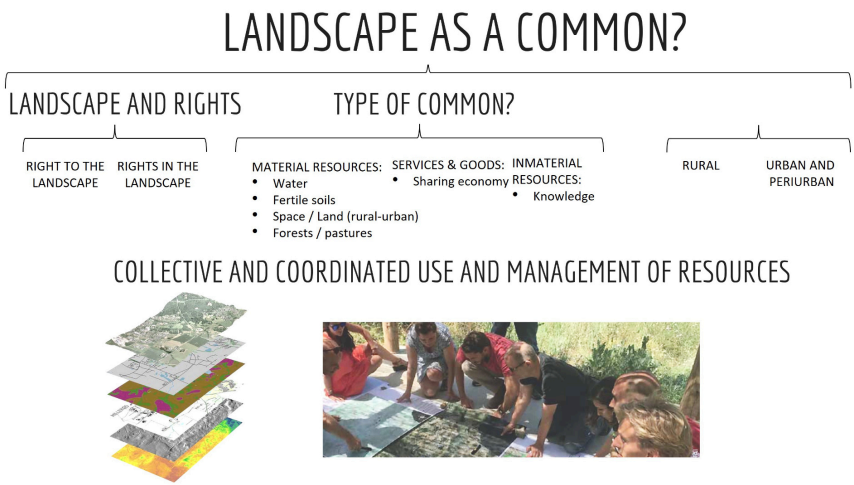
Just to give one example, the concept of *creative commons* has revolutionised access to educational resources, balancing free access with the protection of authors' intellectual property rights. This approach contrasts with traditional copyright, offering a flexible framework for using works without direct permission from the creators.

Rights and duties in commons management

Managing commons involves setting and agreeing upon a set of rules by all those involved. This underscores the collective responsibility and shared benefits in using commons. Governance of the commons involves not just rules but also the dynamic relationships within communities and, in many cases, between humans and nature. This concept is vital for sustaining and revitalising community life, especially in times of uncertainty.

Critical theory on the commons: challenges and new possibilities

The Tragedy of the Commons: In 1968, Garrett Hardin published a seminal paper that shaped the discourse on commons management for decades. Hardin argued that shared resources, when left unregulated, are subject to overuse and eventual destruction due to individual self-interest. This theory, known as the *Tragedy of the Commons*, posits that individuals, prioritising their personal gain, would inevitably deplete common resources, leading to a collective loss. This perspective led to the widespread belief that privatisation and individual ownership could provide a solution to the effective management of these resources.



Synopsis: Conceptual model of the landscape as a common, *source: authors*

Challenging the tragedy: Elinor Ostrom's work challenges Hardin's view. The work of Elinor Ostrom, a Nobel Prize laureate, introduced a transformative perspective on the management of the commons. Ostrom's extensive research demonstrated that communities could, contrary to Hardin's predictions, successfully manage their resources through cooperative practices and mutual agreements. Her studies revealed that with appropriate communal strategies, shared resource management could be sustainable, debunking the notion that privatisation was the only viable solution.

Ostrom emphasized the significance of intergenerational and collective thinking, aligning her findings with modern sustainability and resilience paradigms. Her work showcased that communal resource management, when done effectively, can be an integral part of addressing contemporary environmental and societal challenges.

Requirements for effective commons management: Ostrom's principles for successful commons management are highlighted:

- Defining a group of people with rights to the common.
- Establishing rules to prevent overuse and abuse.
- Ensuring the capacity to modify rules as needed.
- Gaining recognition and legal status for the rules.
- Developing a system to monitor usage and enforce rules.
- Implementing sanctions and procedures for solving disputes.
- Operating at multiple levels, from local to broader scales.

Landscape as a shared resource and as a common Landscape, as a shared resource, pertains to the collective benefit derived from both natural and built environments. This view promotes the integration of ecological health, cultural values, and community well-being into landscape management practices. It also highlights the need for inclusive governance systems that allow for the participation of diverse stakeholders in decision-making processes.

The drivers of the commons sector are multifaceted, involving ecological sustainability, social justice, and economic viability. The sustainability conflicts often stem from competing interests such as conservation versus development. Major tradeoffs can include the choice between preserving traditional ways of life and embracing modernisation, or the conflict between individual benefits and collective well-being. Systems thinking in this context requires acknowledging the complexity of landscapes as networks of interrelated ecological, social, and economic systems. It involves understanding how changes in one aspect of the system affect others and considering long-term impacts. Policymaking based on systems thinking would involve adaptive management practices that are responsive to environmental feedback and inclusive community inputs.

Major challenges in managing commons today:

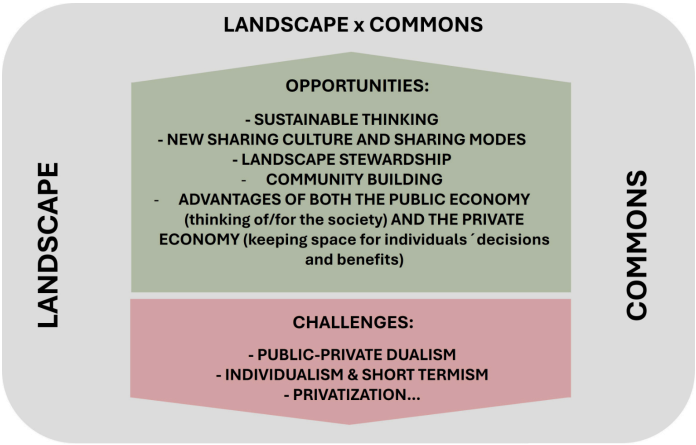
- **Environmental degradation**: Addressing the impact of climate change and pollution on natural resources.
- **Resource overuse:** Managing the demand on resources due to population growth and overconsumption.
- **Technological impact:** Adapting to the digital transformation and its effects on traditional commons management.
- **Socio-political issues:** Navigating complex political dynamics and ensuring equitable access and distribution of resources.
- **Economic pressures:** Balancing economic development with sustainable resource management.

These challenges require innovative, adaptable, and inclusive approaches to ensure sustainable and equitable commons management.

The role of commons for landscape economy

Commons play a pivotal role for the landscape economy, serving as a cornerstone for achieving economic, social, and environmental goals. In the following we present some important arguments of how commons contribute:

1. **Resource stewardship:** Commons promote responsible resource management, ensuring that ecosystems are conserved and maintained for future generations, aligning with environmental sustainability.
2. **Equity and inclusivity:** Commons uphold principles of equity and inclusivity, providing access to resources for all, regardless of socioeconomic status, thereby addressing social sustainability.
3. **Community empowerment**: Commons empower communities to actively participate in resource governance, fostering social cohesion, trust, and self-reliance, contributing to both social and economic sustainability.
4. **Innovation and adaptability**: Commons often serve as laboratories for innovative governance models and practices. Their adaptability to changing needs and challenges contributes to economic sustainability through innovation.
5. **Local and global impact:** Commons management has both local and global relevance, addressing regional issues while contributing to global challenges such as climate adaptation and biodiversity conservation.
6. **Resilience:** Commons enhance the resilience of communities and ecosystems in the face of environmental and societal shocks, a key aspect of sustainable development.
7. **Interconnectedness:** Commons management recognizes the interconnectedness of ecological, social, and economic factors, aligning with a holistic approach to sustainable development.



Some opportunities (green) and challenges (red) affecting the commons in the landscape (source: authors)

Dependencies of commons and landscape economy

The interdependence of commons and landscape economy has deep historical roots and contemporary relevance, necessitating an integrated management approach that encompasses both material and immaterial resources.

Commons in social and community development

This section explores the critical role of commons in the social and economic landscapes of communities. Here, the term *commons* is understood as shared resources that are integral to community life, extending beyond mere physical assets to encompass social and economic dimensions. The focus is on how commons intertwine with and bolster the social economy, thereby contributing to the economic development of communities.

Central to this exploration is an analysis of the rights associated with landscapes, such as access and perception, and their influence on how communities interact with their environment. This inquiry into landscape rights is vital for understanding the complex ways in which communal spaces shape and are shaped by the people who use them.

Connection to social economy and community economic development

Commons, as shared resources and spaces, play a crucial role in fostering social economies where the focus is on community benefit rather than individual profit. This approach aligns with principles of sustainability, equity, and collective well-being. In community economic development, commons-based initiatives can lead to more inclusive, participatory, and resilient communities. Such initiatives often emphasise democratic governance, ensuring that all members have a voice in managing and benefiting from common resources. This connection underlines the potential of commons to transform local economies and social structures, prioritising communal needs and values.

Rights related to the landscape, perception of landscape, and access to land

These rights are central to the concept of commons. They encompass the idea that landscapes are not just physical spaces, but also hold cultural, ecological, and social significance for communities. The perception of landscape is integral to understanding how communities interact with and value their surroundings. Access to land, including the right of way and the use of natural resources, is crucial for sustaining community practices and traditions. These rights highlight the need for inclusive and equitable management of landscapes, ensuring that they serve the broader interests of the community rather than just private or commercial entities.

Right to landscape and access to land

The European Landscape Convention highlights the collective right to enjoy urban, rural and wild nature's beauty, emphasizing the importance of landscape perception. This extends to the right of way for walking, underlining the importance of access to land, ownership rights, and benefits associated with it.

The '**Right to the City**' as defined by Doina Petrescu in *The Handbook of Commons* is a concept that encompasses the entitlement of all urban inhabitants to shape and influence the development, spaces, and governance of their cities, ensuring equitable access and democratic participation in the urban environment.

Economic perspectives of the commons

Private, public, and common goods: In the context of commons, economic perspectives imply the differentiation between private, public, and common goods. Private goods are characterised by their exclusivity and rivalry in consumption. Public goods, in contrast, are non-excludable and non-rivalrous, making them accessible to all members of society. Common goods or common pool resources, however, are resources shared within a community or group, often necessitating collective management and sustainable practices to prevent overuse. The governance of these commons highlights the need for balancing individual and collective benefits, fostering community engagement, and promoting sustainable economic models. Understanding these distinctions is crucial for effective management and policymaking in landscape and environmental economics.

The balance between private, public, and common goods is a complex and dynamic challenge that plays a crucial role in shaping societies and economies. Each category of goods has distinct characteristics and implications:

Private Goods
Characteristics: Excludable and rivalrous, meaning individuals can be excluded from access, and one person's use diminishes availability for others.
Implications: Private goods incentivise individual

ownership, leading to market-driven production, consumption, and investment. They can foster innovation and efficiency due to competition.

Challenges: Over-reliance on private goods can lead to inequalities and exclusion, as those who can afford access benefit the most. Monopolies and over-exploitation of resources are potential downsides.

Public Goods
Characteristics: Non-excludable and non-rivalrous, meaning everyone has access, and use by one person does not diminish availability for others.

Implications: Public goods provide essential services like national defence, clean air, and public parks. They are typically funded through taxes and government provision, contributing to the common welfare.

Challenges**:** Can face the *free-rider problem*, where individuals benefit without contributing, potentially leading to underfunding or overuse.

Common Goods (or Common-Pool Resources):
Characteristics: Non-excludable but rivalrous, meaning access is open, but excessive use can deplete the resource.

Implications: Common goods are often managed by communities, combining individual and collective interests. Effective management ensures sustainability and equitable access.

Challenges: Common goods can suffer from overuse, degradation, and the *Tragedy of the Common*s if not managed properly. Balancing individual and collective needs is essential.

Social economy and economic community development principles

While there is an inherent connection between commons and the broader framework of social economy and community economic development, it is essential to delineate specific principles that directly influence commons management. These principles not only prioritize people and social goals over capital but also imbue the management of commons with unique characteristics.

Key aspects include:

Voluntary Participation and Democratic Governance: Encouraging open membership and ensuring that decisions are made democratically, reflecting the collective will and best interest of all stakeholders.

Balancing Individual and General Interests: Striking a balance between serving the needs of individual members or users and addressing broader community concerns.

Solidarity and Responsibility: Emphasising mutual support and accountability within the community, fostering a sense of shared responsibility for the welfare of the commons.

Autonomy and Independence: Operating independently from external control, particularly from public authorities, to ensure that community needs drive decision-making processes.

Sustainable reinvestment: Channeling profits or surplus back into the community or towards sustainablity actvities, rather than individual gain.

The balance between private, public, and common goods has a profound impact on both communities and economies.

Communities:

Private Goods: Offer individuals ownership and exclusive access, leading to individual incentives for resource conservation and investment. However, this can result in exclusion and inequalities within communities.

Public Goods: Ensure universal access, benefiting entire communities. However, they may suffer from the *free rider problem*, where individuals benefit without contributing.

Common Goods: Promote collective resource use, fostering cooperation and community cohesion. However, without proper management, common goods can be susceptible to overuse and degradation.

Economies:

Private Goods: Drive market-based economies, incentivizing production and consumption. However, excessive privatization can lead to monopolies and inequities.

*Public Goods***:** Provide essential services and infrastructure, contributing to economic development. However, funding and provision challenges can arise.

Common Goods: Encourage collaborative and sustainable resource use, supporting local economies. However, mismanagement can result in resource depletion and economic decline.

Challenges and opportunities in managing rural and urban commons

Managing rural and urban commons presents distinct challenges and opportunities. In rural areas, challenges include maintaining ecological balance, protecting traditional practices, and dealing with issues like land encroachment and privatisation. Opportunities lie in leveraging rural commons for sustainable agriculture and community-led initiatives.

In urban settings, challenges involve managing space scarcity, addressing gentrification, and ensuring equitable access to common resources. However, urban commons offer opportunities for fostering community engagement, creating green spaces, and promoting sustainable urban development. Balancing

these challenges and opportunities is crucial for effective commons management in both rural and urban landscapes.

In the landscape economy, key sustainability conflicts and tradeoffs often revolve around the balance between environmental conservation and economic development. Conflicts may arise between preserving natural landscapes and exploiting them for agricultural, industrial, or urban development. Tradeoffs can involve decisions between short-term economic gains and long-term ecological health. Additionally, there's a challenge in ensuring equitable access to resources while managing them sustainably. Balancing these conflicting interests and tradeoffs is crucial for achieving a sustainable landscape economy.

Material and immaterial resources in the landscape economy

Material resources, such as water, forests, and pastures, have been traditionally managed for communal benefit, while immaterial resources include cultural practices, knowledge systems, and digital spaces (Ostrom, 1990). The value they add to the landscape economy, especially in terms of tourism, social cohesion, and sustainable development, cannot be overstated (Bollier, 2012).

In this section, we delve into the multifaceted nature of landscapes as common goods, categorising them into material aspects, services, and goods, and examining their embedded social, economic, and democratic values. This exploration is enriched with practical examples to illustrate these concepts.

Categorization of Landscape Resources: Material, Services, and Goods in Landscapes:

Material resources: For instance, the Amazon rainforest serves as a crucial material resource, providing timber and medicinal plants, while also being a key ecological asset.

Services provided by the landscape: The Great Barrier Reef in Australia exemplifies services, offering biodiversity conservation and acting as a barrier against storms.

*Goods derived from the landscape***:** The vineyards of Bordeaux, France, demonstrate how landscapes can produce valuable goods like wine, contributing significantly to the region's economy.

Social, economic, and democratic values of landscape commons:

Social Values: The Central Park in New York City illustrates social values, acting as a communal space for recreation and cultural events, thereby fostering community cohesion and urban well-being.

*Economic Values***:** The Dutch tulip fields show economic value, attracting tourists worldwide and boosting local economies through agro-tourism

Democratic Values: The community-managed urban gardens in Detroit, Michigan, highlight democratic values, where local residents collectively decide on the use and management of these green spaces, promoting community empowerment and participatory governance.

Economic implications of landscape commons
The utilization of common resources for economic development must be balanced against their preservation for future generations. This dichotomy has been discussed extensively in the literature, exploring the consequences of both exploitation and conservation (Hardin, 1968). The economic implications are vast, ranging from the maintenance of biodiversity to the promotion of eco-tourism and local economies (Harvey, 2012.).

Value creation within the commons
Value creation within the commons framework involves generating tangible and intangible benefits for the community through shared resources and collaborative efforts. This includes fostering environmental sustainability, enhancing social cohesion, and supporting economic development through communal activities and projects. By prioritising community needs and interests, the commons approach leads to the creation of shared value that benefits all participants, contributing to overall well-being and resilience. This value creation is often driven by principles of equity, sustainability, and collective governance, ensuring that the benefits of common resources are accessible and distributed fairly among all members of the community.

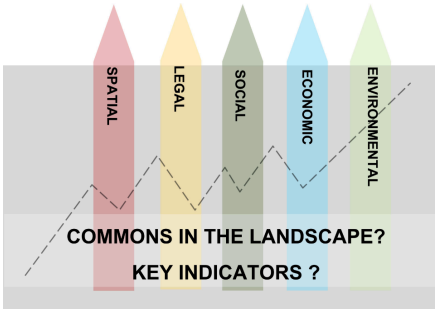
KPIs for the Commons
Identifying Key Performance Indicators (KPIs) is a crucial step in measuring the success of commons-based initiatives for the landscape economy. KPIs should be tailored to reflect the unique objectives and outcomes desired in commons projects and be comprehensive, measuring not only immediate outcomes but also long-term impacts on the landscape and community.

In the context of the landscape economy curriculum, a set of dimensions and indicators have been proposed to assess and monitor the evolution of commons in the landscape. Through these multidimensional KPIs, we can gain a comprehensive understanding of the efficacy and impact of commons in the landscape, ensuring their continued relevance and effectiveness in promoting sustainable and equitable community development. These include:

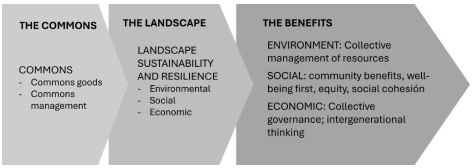
1. **Spatial:** % and connectivity of the land affected by communal regulations and use Measuring the percentage and connectivity of land impacted by communal regulations and usage. This indicator assesses the extent and coherence of areas under commons management.
2. **Legal**: Evaluating the recognition of different types of commons within the legal system and

the number of legal texts regulating their use. This highlights the legal framework supporting or hindering commons initiatives.

3. **Economic**: Calculating the percentage of economic activity developed within communal structures (such as social economy entities and cooperatives) and the value of products regulated and managed communally. This KPI reflects the economic impact and viability of commons-based economic models.
4. **Social**: % of people benefiting or participating - estimating the percentage of people benefiting from or participating in any form of communal structure, including those working in the social economy sector and those sharing resources like cars or flats. This indicator gauges community engagement and the social reach of commons initiatives.
5. **Environmental**: Assessing the contribution of commons and commoners to the preservation and enhancement of environmental values and assets, including ecological connectivity and biodiversity. This KPI underscores the environmental benefits and sustainability of commons management practices.



Some possible dimensions to assess and monitor the evolution of the commons in the landscape. *Source: authors*



Conceptual model of a commons value chain in the landscape *Source: authors*

Urban Pastoralism Bulgaria 2013. Source N. Triboi

Learning from Commons Stories

While exploring *commons stories*, it remains crucial to understand the drivers of this sector. These include environmental sustainability, community empowerment, and economic resilience. The sector is marked by sustainability conflicts, such as balancing resource conservation with economic needs, and tradeoffs between traditional practices and modern development. A systems thinking approach is essential in the landscape economy, where the interconnections between ecological, social, and economic factors are considered to create holistic solutions that address these challenges and opportunities in a sustainable way.

Urban pastoralism: Transforming abandoned land into commons

Urban pastoralism is a unique and compelling case study within the broader context of commons research. This practice, which involves the management of livestock and green spaces within urban areas, has gained increasing attention due to its multifaceted benefits for both the environment and society. In this section, we explore the concept of urban pastoralism as a study case for commons, highlighting its relevance, challenges, and contributions to sustainable urban development.

Relevance to commons research:

1. *Resource management*: Urban pastoralism exemplifies the shared management of common resources, as urban green spaces are utilized collectively by pastoralists and the community.
2. *Community engagement***:** It fosters community engagement and cooperation as urban residents often participate in or benefit from pastoral activities.
3. *Biodiversity conservation:* Grazing and browsing by urban livestock contribute to biodiversity conservation by maintaining open habitats and preventing overgrowth.

Challenges and solutions:

1. *Land use conflicts:* Urban pastoralism faces challenges related to competing land uses. Solutions involve collaborative land-use planning and policy support.
2. *Environmental benefits:* The practice offers ecological benefits, such as reduced fire risk and improved soil health that require recognition and preservation.
3. *Livelihoods:* Supporting pastoralists' livelihoods in urban settings is crucial for the practice's continuity.

Contributions to sustainable development:

1. *Green infrastructure:* Urban pastoralism contributes to the creation of green infrastructure, enhancing urban resilience and mitigating climate change effects.
2. *Cultural heritage***:** It preserves cultural traditions and enhances the quality of life for urban residents.
3. *Biodiversity*: By maintaining open green spaces, urban pastoralism promotes biodiversity and ecological balance within cities.

R-Urban Project: A model of commons in action

The R-URBAN initiative, based in Colombes, France stands as a pioneering case study in the realm of urban commons. This community-driven strategy aims to enhance urban resilience and sustainability by empowering citizens to actively engage in shaping their environment. The project focuses on creating a self-sustaining ecosystem that integrates living producing, and consuming within a localized urban rural continuum.

Inauguration Agrocité 2013 Source: http://r-urban.net

Key components and implementation

R-URBAN consists of several innovative units in Colombes:

AgroCité: Combines urban agriculture with community spaces, renewable energy, composting, and water recycling.

RecyLab: An eco-construction unit recycling urban waste into building materials.

ECoHab: Offers cooperative and ecological housing with self-built community spaces.

AnimaLab: A domestic farm within AgroCité, contributing to the local distribution network with beehives and chicken coops.

Expansion and support: The R-URBAN strategy is being replicated in other Ile-de-France cities, adapting to local contexts. It has garnered support from the EU Life + Programme and has established partnerships across Europe, including Belgium, Spain, Romania, Germany, and beyond.

Community engagement and governance: The initiative operates under a developing charter, guiding collaboration among stakeholders and ensuring community-centric governance. Tools and resources are provided to facilitate citizen involvement, aligning the project with local needs.

Outcomes and impact: R-URBAN serves as a platform for local and regional emergent projects, sharing a vision of sustainability and resilience. It has proven to be both a showcase and a toolkit for those interested in starting their own projects or joining the network.

Valuable lessons:

Scalable model: It demonstrates a replicable and adaptable framework for urban resilience.

Community-centric: Highlights the crucial role of active citizen participation and cooperative governance.

Environmental innovation: Shows practical applications of ecological cycles in urban settings.

Economic Resilience: Underscores the potential of cooperative economic models to enhance local resilience.

Challenges and Adaptations: R-Urban faced challenges such as bureaucratic hurdles and the need for continuous funding. To overcome these, the project relied on community support, partnerships with local organizations, and innovative funding strategies like crowdfunding. The adaptability and resilience of the project in the face of challenges underscored the potential of commons-based approaches in urban settings.

Suggestions for Education

Based on the experience gained during our curriculum develpment project, this subchapter frames the concept of the commons within an educational context, aiming to equip learners with a deep understanding of commons management.

Learners in this field can engage in research and analysis tasks that delve into commons case studies, exploring the intricate relationships between community action, governance models, and sustainability outcomes within the commons framework. The study of commons is an exploration of how shared resources, governed equitably and sustainably, can lead to resilient and inclusive communities, contributing to a larger landscape economy that values both people and the planet.

To facilitate these learning outcomes, a variety of methods are suggested:

- Engaging in *case study analysis* allows learners to apply theoretical knowledge to real-world scenarios.
- *Participatory workshops* simulate commons management decisions, offering hands-on experience.
- *Fieldwork* involves direct engagement with local commons initiatives, providing invaluable observational insights.
- *Collaborative projects* encourage co-creation and shared knowledge development regarding commons.

Further research suggestions

We proposes several research trajectories for deeper exploration:

- Comparative studies of *governance models* across various commons worldwide.
- Research on the *impact* of urban commons on community resilience.
- *Policy analysis* to assess the effectiveness of legal frameworks in supporting commons maintenance.

Suggested research and analysis tasks for learners

To enhance practical engagement with commons management, several tasks are proposed:

- *Case study analysis:* Evaluate a successful commons project, assessing its multidimensional impacts.
- *Comparative study***:** Contrast commons-based landscape management with traditional management methods, focusing on sustainability outcomes.
- *Field Survey and interviews*: Conduct fieldwork in communities practicing commons management, focusing on participation, resource sharing, and conflict resolution.
- *Policy analysis:* Examine policies affecting commons management, identifying gaps, and proposing improvements.
- *Sustainability indicators development*: Create and apply sustainability indicators specific to commons management.

- *Literature review on ecological economics:* Explore economic theories supporting sustainable management within the context of the commons.
- *Design a commons-based project*: Develop a hypothetical project addressing local landscape issues using commons principles.

Through these pedagogical strategies and research directions, this chapter aims to cultivate a nuanced understanding of commons. It prepares learners and researchers to contribute meaningfully to this evolving and vital field, equipped with the knowledge, skills, and practical insights necessary for sustainable landscape management.

Future perspectives and potential developments

The field of commons management is poised for significant developments and future perspectives that will shape resource governance and sustainability in the coming years. Some key trends and potential developments include:

Digital Commons: The expansion of digital commons, including open-source software, creative commons, and online knowledge repositories, will continue to influence the way information and technology are shared and governed.

Urban commons: The revitalization of urban commons, such as public spaces, community gardens, and shared mobility systems, will play a crucial role in promoting sustainable and liveable cities.

Indigenous knowledge: Recognition of the value of indigenous knowledge in commons management will increase, with indigenous communities playing a central role in shaping resource governance practices.

Climate resilience: Commons will be at the forefront of climate resilience efforts, with communities adapting traditional resource management practices to address the impacts of climate change.

Policy innovation: Governments and organizations will continue to explore innovative policies and governance models for commons management, with a focus on inclusivity, equity, and sustainability.

Interdisciplinary Research: Interdisciplinary research will gain prominence, providing holistic insights into commons dynamics and informing policy and practice.

Ethical considerations: Ethical considerations, including cultural sensitivity and social justice, will become integral to commons management discussions and decision-making.

Global collaboration: Global collaboration and knowledge-sharing networks will facilitate the exchange of best practices and solutions in commons management. An example is the Open Landscape Academy (www.openlandscapeacademy.org).

Technological advancements: Technology, including blockchain and decentralized systems, will offer new

tools for transparent and decentralized commons governance.

Education and awareness: Increased education and awareness initiatives will empower communities and individuals to actively engage in commons management.

The future of commons management holds promises for addressing contemporary challenges while promoting sustainability, equity, and community well-being. As our understanding of shared resources evolves, the field will continue to adapt and innovate, offering solutions to complex societal and environmental issues.

References

- Bauwens, M., & Kostakis, V. (2014). "From the Communism of Capital to Capital for the Commons: Towards an Open Co-operativism." TripleC: Communication, Capitalism & Critique, 12(1), 356-361.
- Bollier, D., & Helfrich, S. (2012). The Wealth of the Commons: A World Beyond Market and State. Levellers Press.
- Foster, S. R., & Iaione, C. (2016). "The City as a Commons." Yale Law & Policy Review, 34(2).
- Geddes, Patrick (1923). The valley section from hills to sea, New York City
- Hardin, G. (1968). "The Tragedy of the Commons." Science, 162(3859), 1243-1248.
- Harvey, D. (2012). Rebel Cities: From the Right to the City to the Urban Revolution. Verso Books.
- Hess, C., & Ostrom, E. (2007). Understanding Knowledge as a Commons: From Theory to Practice. MIT Press.
- Neeson, J. M. (1993). Commoners: Common Right, Enclosure and Social Change in England, 1700–1820. Cambridge University Press.
- Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.
- United Nations. (2015). Paris Agreement.
- Urban Commons Research Collective. (2022). Urban Commons Handbook.

Health

Promoting health and well-being through multifunctional, designed landscapes

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Setting the Scene

Improved environmental and human health conditions have long been associated with the integration of nature into urban environments (Hadavi et al., 2015; Thompson et al., 2012). Pandemics such as Covid-19 have underscored the importance of access to nature and open spaces in cities for social, physical, and mental health. Studies have shown that individuals residing in neighbourhoods with poorer air quality and limited greenspace experience higher mortality rates (Wu et al., 2020).

Access to nature has also been found influential in reducing stress and fostering socialization, with urban parks gaining attention for their benefits as citizens seek comfortable, safe, and pleasant outdoor spaces for work, socialization, and recreation.
This renewed focus is supported by a trend in urban planning and landscape design aimed at providing opportunities to connect people with nature through community-based projects, regenerative and biophilic design interventions, all of which have been linked to enhanced well-being, concentration, socialization, and sense of place (Beatley, 2016).
Despite this evidence, there persists a disconnect between our inherent need for nature, our daily lived experiences, and human behaviour. Recent systematic research (Beute et al., 2020A; Beaute et al., 2020B) suggests that connectedness and relationship with nature, and particularly experiences of biophilic design, may be critical for improving quality of life and sustainability endeavours.

Globally, climate change has been described as "[…] the most serious threat to global economic, social, and environmental stability in recorded history […] with many prevalent human diseases linked to climate fluctuations" (Africa et al. 2019).

Addressing future global emergencies, such as climate change and pandemics, may hinge on our relationship with nature and the application of biophilic design principles. Moving beyond abstract notions of nature to encourage sustainable behaviour involves using design and policy at various scales—building, neighbourhood, and city—to integrate daily interactions with nature. This approach could foster connection, improve health and well-being, and make sustainable actions more meaningful, ultimately helping address climate and disease crises. The direct connection between climate change and health may drive more effective policy and practice changes.
From a health perspective, there is a need to shift from merely reducing risks and treating illnesses to embracing "salutogenic" approaches—those that focus on factors promoting health and well-being rather than solely mitigating illness (Antonovsky, 1987). Given the intrinsic link between human and planetary health, integrating biophilic and "salutogenic" design approaches can provide a holistic framework connecting ecosystem and human dimensions. At the building scale, where research often focuses on health threats, adopting a holistic approach can promote health-enhancing environments (Loder et al., 2020).

Engaging with nature requires developing systems capable of evolving towards states of health and thriving over time, rather than merely sustaining or restoring previous states by minimizing impacts. Understanding our role on the planet is crucial for fostering awareness and achieving regenerative sustainability.

On a larger scale, an emerging trend is *bio leadership*. A concept of an ecosystem comprising people and projects transforming leadership by working with nature. In the design and policy realms, this concept shifts from a mechanistic view, where the world operates like a machine, to a natural, fluid approach. This framework aims to reshape our relationship with the environment, nurturing a co-evolving mutuality and potentially leading to a more equitable and regenerative future. Integrating equitable access to nature with evidence supporting its benefits at multiple scales, the large-scale application of biophilic principles can contribute to restoring both human and ecological health (Mang & Haggard, 2016).

Making the case for a positive transition pathway

The link between access to nature and human health benefits has been supported by evidence accumulated over the last 40 years. This has been of interest to designers who include access to nature for its diverse benefits, such as in the workplace, and city planners who are interested in the socio-cultural benefits of green infrastructure for human health and well-being (MEA, 2005). Although the evidence points to clear benefits between access to nature and human health outcomes, there remains a lack of alignment between this large body of research and the type of evidence that convinces stakeholders that adding nature will reap tangible and trackable benefits for their unique project. This misalignment is partly due to the types of research—and the paradigms that support them—that brace up most findings that have captured the attention of policy makers and building owners.

Comparing research on nature is complicated by the wide variety of types and measures used, which can complicate the establishment of robust results between them. The most influential research programs in the last forty years have been based on adaptive or utility paradigms. The adaptive paradigm assumes that evolution, or biological survival, motivates physiological and psychological responses to the experienced environment, and that some environments are better suited to human health and well-being than others. Two research programs that have emerged from an adaptive paradigm have garnered significant attention and subsequent

research. The first focuses on restorative environments that help with the restoration of attention or improve cognition, notably Stephen and Rachel Kaplan's Attention Restoration Theory (ART) (Kaplan & Kaplan, 2005). The second focuses on the ability of restorative environments to support stress recovery and positive mood, notably Roger Ulrich's Psychophysiological Stress Reduction Theory (PSR) (Ulrich, 1993).

The original ART research argued that nature possesses four attributes necessary to hold our attention involuntarily and be experienced as restorative: fascination, mystery, coherence, and the feeling of being away, and this research has been heavily tested in subsequent studies (Kaplan & Kaplan, 2005; 1989) A key component of research testing ART has looked at aesthetic preferences for different types of nature. These studies argue that some types of nature are more favorable to restoration than other types of nature, and that nature overall is more restorative than urban environments (Frumkin et al, 2017; Kaplan & Kaplan, 2005). Research testing the PSR theory also uses an evolutionary biology theory but tends to focus on the affective or emotional aspects of this relationship. At its core, evolutionary biology argues that because we evolved in nature, we tend to feel connected with things that remind us of nature; this attitude is called biophilia (translated as a love of nature) (Kaplan & Kaplan, 1989). This love of nature has begun to be studied for its potential to link to our connectedness to nature, which has been shown to improve health and well-being outcomes as well as sustainability behaviors and belief in climate change. While the utility paradigm also draws on the idea that our natural environment is connected with our well-being, it focuses on the role that nature plays as a quality of an environment to satisfy current personal or interpersonal needs. These are often measured by known benefits of access to nature, such as increased levels of physical activity, restorative experiences, or social cohesion, interaction, and safety (Brambach et al., 2017).

The adaptive and utility theories underpin most of the research linking access to nature with improved physiological and mental health and well-being. Some researchers have continued to develop these theories and have proposed that these relationships can be viewed as a series of pathways that have formed the basis of multiple research streams: (1) stress reduction, (2) physical activity, (3) social cohesion, and (4) air quality (Hartig et al., 2014). Understanding the key types of research on the benefits of nature and the aim of these research streams can help designers and planners determine which research is relevant to their project goals. Stress reduction has traditionally received the most empirical and theoretical attention. Research looking at stress reduction has tended to follow the ART and PSR restoration theories outlined above. These two theories rely mostly on the visual and aesthetic qualities of nature, and they link to the assumed

characteristics of nature seen in evolutionary and related biophilia (or biophobia—fear of nature) theory (Ulrich, 1993; Kellert & Wilson, 1993). While the variety of contexts for this research supports the strength of the research, it has been harder to evaluate their application at a building scale given the high number of variables involved.

Physical activity has been gaining attention and follows the utility paradigm. As opposed to sedentary behavior, outdoor physical activity has been shown to have positive effects on mental health, showing, for example, better outcomes in green areas than indoor, or non-green urban areas. However, the results have been unclear in cross-sectional and / or epidemiological studies at the neighborhood scale, showing the difficulty of applying lab-based studies to real-world situations. Real-world situations have other explanatory variables that may influence health outcomes. Furthermore, lab-based studies do not always consider other factors such as green space characteristics, location, and other influences, or mediators, on behavior or preferences. Studies have found that multiple factors over and above the amount of greenspace—including quality and accessibility—determine urban greenspace use and physical activity.

The third pathway looks at how access to nature is linked to improvements in social interactions (at the individual level) and social cohesion (at the neighborhood level) and varies in its research paradigms—ranging from utilitarian, which focuses on characteristics of parks that influence desired uses, to the design of parks, which influences social cohesion. Although the link between social interaction and mental health has been firmly established, the link between social interactions, social cohesion, and green space has received less research attention than the first two pathways.
The research linking air pollution, nature, and health has equally received less attention. While the link between air pollution and negative effects on physical health and mortality has been long established, newer studies have also linked air pollution with negative impacts on mental health, and cognitive performance. Some researchers have gone further and proposed that air pollution, together with traffic-related sounds, can put a constraint on the restorative potential of an environment as a whole. This holistic approach is important for understanding negative environmental influences or ecosystem disservices. This last pathway can be one of the most easily integrated into regional-level planning and regenerative policies and can be a good way to

balance synergies and trade-offs at this scale. Lastly, the concept of Topophilia (Tuan, 1980) has received renewed interest recently among planners, designers, and academics in Europe, who see the focus on personal identity and meaningful attachment with place and landscapes as a powerful design tool for reconnecting urbanites with local nature and thus inspiring sustainable behavior. While in theory, place attachment can be used to inform a regenerative approach to urban and regional planning, it has not been used much in application to date due to its more theoretical and qualitative approach and the lack of alignment with design and planning practice.

While there has been some qualitative research conducted in the adaptive and utility paradigms, most of this research follows a psychometric research approach, which aims to generalize relationships through quantifiable measures. The psychometric approach aligns well with the kind of data promoted by urban planning and green building researchers and has created a vast amount of data on the benefits of access to nature (outlined below). It has also been very influential in public policy and has provided much of the support for adding nature into buildings, neighborhoods, and cities to date. However, the type of linear and somewhat mechanistic approach to nature and health in psychometric research does not always align well with the more holistic, design-thinking approach seen in biophilic design and green infrastructure work to support human health. There has also been some criticism from social scientists that research based in the adaptive paradigm tends to not address the larger context of place and that the underlying evolutionary paradigm—i.e., that love of nature is innate—can ignore cultural, socio-economic, and power differences that can influence the success of urban nature interventions and equitable access to nature. The utilitarian paradigm has also been criticized for its limited understanding of the socio-economic and socio-cultural factors influencing access to nature, the reduction of environmental values to utility, and the general lack of acknowledgment of the symbolic aspect of nature. In short, while research following the adaptive and utility paradigms has provided strong evidence to support the health goals of biophilic design, biophilia's focus on sense of place, lived experience, and holistic design-thinking may be more aligned with some of the relational and sense of place work on the human relationship to nature that rarely gets cited outside of academia.

Under the bottom line

Biophilia, popularized by E.O. Wilson, refers to humans' inherent connection to nature. It has inspired the modern biophilic design movement, which incorporates natural elements into built environments. Kellert defined it with two dimensions: organic/naturalistic and place-based/vernacular, breaking it down into six main elements and over 70 attributes, like water, sunlight, sensory variability, and

cultural connections. Juhani Pallasmaa also proposes a biological historicity approach, integrating historical and social layers with natural features to create meaningful spaces. This perspective enriches biophilic design by incorporating a sense of place and deeper connections to history and culture, potentially fostering better human-nature relationships and sustainable living.

Possible ways forward in research and practice

Despite over forty years of research on the benefits of access to nature for human and climate health, there is still ambiguity in the sustainability and design fields regarding the specific types of nature that lead to benefits, and for whom. This ambiguity arises partly from a failure to interpret and apply research on nature and health to various design and policy interventions at different scales (Frumkin et al., 2017). Specifically, issues stem from a disconnection between biophilic design principles, urban planning interventions, and specific health and well-being outcomes, as well as a lack of integration between different disciplines. This ambiguity has practical implications as buildings, cities, and regions attempt to align regenerative design goals with human health objectives but often lack the necessary tools and knowledge, resulting in insufficient evidence to support the effectiveness of these interventions. Humans' disconnection from nature has already negatively impacted mental and physical health. Our habitats are often designed, constructed, and operated separately from nature, rather than as part of it. Over the last thirty years (since Brundtlandt, 1987) (World Commission on Environment and Development, 1987), sustainability in design and construction has been a core element in the built environment, yet climate and biodiversity indicators have worsened. Meanwhile, the impact of building design and practice on health conditions is increasingly researched but remains unclear. Evidence from the last forty years indicates that contact with nature in general can improve human health, but gaps persist in application at different scales and in understanding which research applies to specific situations.

Conversely, biophilic design is growing in popularity but lacks specificity in research outcomes and variables. It tends to be dismissed in many design circles as "nice to have but dispensable" rather than an effective intervention to improve health and performance. The research on nature and health supports many biophilic design attributes; however, in practice, biophilic design often focuses on a few

variables, limiting its application in design practice. Additionally, much remains unknown about the potential benefits of biophilic design interventions, both individually and collectively. This gap has not been addressed by the confusion surrounding green design interventions in green buildings and green infrastructure over recent decades, which may or may not be linked to evidence-based or biophilic design. This complexity is further compounded by differing underlying paradigms in nature and health research and design: research examining nature as a linear input with an expected outcome does not align well with the more philosophical sense of place and lived experience goals of biophilic design. Drawing on experiences developed in experimental biophilic design may help bridge some gaps in traditional nature-health research and address the nuances and complexities of the holistic lived experience connected to nature or biophilic design projects. Connecting to a sense of place, historicity, and embodied experience in biophilic design may address some criticisms of adaptive and utilitarian approaches to nature-health research while creating design solutions that work for real people in real contexts (Andreucci et al., 2021).

Lastly, there is a need to synthesize available knowledge about the relationship between nature design and policy interventions, natural systems, and health. This need is confirmed by the growing demand from policymakers. For instance, in the "Urban green spaces: brief for action", recently published, the World Health Organization (WHO, 2017) emphasized the need for a change in urban health initiatives with a focus on the creation, promotion, and maintenance of green spaces, explicitly calling for expert advice. How this expertise is developed is a current gap in both education and practice.

The discussion above suggests that understanding the strengths and limitations of influential research on health and nature can support and align with biophilic design at multiple scales. This knowledge can result in a more effective and holistic understanding of how nature can be incorporated into our buildings, neighbourhoods, and cities. Combining research on health and nature with biophilic design principles may also provide a more comprehensive and equitable approach to connecting humans with nature and encouraging sustainable behaviour, further supporting regenerative policy and action. As we look beyond Covid-19, the future shape of the built environment remains uncertain, providing an opportunity for re-evaluation and new insights into our relationships with the human, natural, and built environments.

References

1. Africa, J.; Heerwagen, J.; Loftness, V.; Ryan Balagtas, C. Biophilic Design and Climate Change: Performance Parameters for Health Front. Built Environ. 2019, 5, 28.
2. Andreucci, M.B.; Loder, A.; Brown, M.; Brajković, J. Exploring Challenges and Opportunities of Biophilic Urban Design: Evidence from Research and Experimentation. Sustainability 2021, 13, 4323. https://doi.org/10.3390/su13084323
3. Antonovsky, A. Unravelling the Mystery of Health; Jossey-Bass Inc: San Francisco, CA, USA, 1987.
4. Beatley, T. Handbook of Biophilic City Planning and Design; Island Press: Washington, DC, USA, 2016.
5. Beute, F.; Andreucci, M.B.; Lammel, A.; Davies, Z.; Glanville, J.; Keune, H.; Marselle, M.; O'Brien, L.A.; Olszewska-Guizzo, A.; Remmen, R.; et al. Types and Characteristics of Urban and Peri-Urban Green Spaces Having an Impact on Human Mental Health and Wellbeing. Report prepared by an EKLIPSE Expert Working Group; Centre for Ecology & Hydrology: Wallingford, UK, 2020.
6. Beute, F.; Davies, Z.; de Vries, S.; Glanville, J.; Keune, H.; Lammel, A.; Marselle, M.; O'Brien, L.; Olszewska-Guizzo, A.; Remmen, R.; et al. Types and Characteristics of Urban and Peri-Urban Blue Spaces Having an Impact on Human Mental Health and Wellbeing. Report prepared by an EKLIPSE Expert Working Group; Centre for Ecology & Hydrology: Wallingford, UK, 2020.
7. Braubach, M.; Egorov, A.; Mudu, P.; Wolf, T.; Thompson, C.W.; Martuzzi, M. Effects of Urban Green Space on Environmental Health, Equity and Resilience. In Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice (pp. 187–205). Cham: Springer International Publishing; Springer International Publishing: Berlin/Heidelberg, Germany, 2017; pp. 187–205.
8. Brown, M. FutuREstorative: Working Towards a New Sustainability; RIBA Publishing: London, UK, 2016.
9. Frumkin, H.; Bratman, G.N.; Breslow, S.J.; Cochran, B.; Kahn Jr, P.H.; Lawler, J.J.; Wolf, K.L. Nature contact and human health: A research agenda. Environ. Health Perspect. 2017, 125, 075001.
10. Hadavi, S.; Kaplan, R.; Hunter, M.C.R. Environmental affordances: A practical approach for design of nearby outdoor settings in urban residential areas. Landsc. Urban Plan. 2015, 134, 19–32, doi:10.1016/j.landurbplan.2014.10.001.
11. Hartig, T.; Mitchell, R.; De Vries, S.; Frumkin, H. Nature and Health. Annu. Rev. Public Heal. 2014, 35, 207–228, doi:10.1146/annurev-publhealth-032013-182443.
12. Kaplan, R.; Kaplan, S. The Experience of Nature: A Psychological Perspective; Cambridge University Press: Cambridge, UK, 1989.
13. Kaplan, R.; Kaplan, S. Preference, Restoration, and Meaningful Action in the Context of Nearby Nature. In Urban Place: Reconnecting with the Natural World; Barlett, P., Ed.; MIT Press: Cambridge, UK, 2005; p. 330.
14. Kellert, S.R.; Wilson, E.O. The Biophilia Hypothesis; Island Press: Washington, DC, USA, 1993.
15. Loder, A.; Gray, W.A.; Timm, S. The international WELL Building Institute's Global Research Agenda. Available online
16. Mang, P.; Haggard, B. Regenerative Development and Design: A framework for Evolving Sustainability; Wiley: Hoboken, NJ, USA, 2016.
17. Millennium Ecosystem Assessment. Ecosystems and Human Well-being: Synthesis; Island Press: Washington, DC, USA, 2005.
18. Thompson, C.W.; Roe, J.; Aspinall, P.; Mitchell, R.; Clow, A.; Miller, D. More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. Landsc. Urban Plan. 2012, 105, 221–229,
19. Tuan, Y.F. Rootedness versus sense of place. Landscape 1980, 24, 3–8.
20. Ulrich, R.S. Biophilia, Biophobia, and Natural Landscapes. In The Biophilia Hypothesis; Kellert, S.E.O.W., Ed.; Island Press: Washington, DC, USA, 1993; pp. 74–137.
21. WHO Regional Office for Europe. Urban green space interventions and health: A review of impacts and effectiveness. Copenhagen: WHO Regional Office for Europe. Available online
22. World Commission on Environment and Development. Our Common Future; Oxford University Press: Oxford, UK, 1987.
23. Wu, X.; Nethery, R.C.; Sabath, B.M.; Braun, D.; Dominici, F. Exposure to air pollution and COVID-19 mortality in the United States, 2020. Available online.

More resources:

Accessibility & proximity

1. Andreucci MB, Russo A, Olszewska-Guizzo A (2019), Designing urban green blue infrastructure for mental health and elderly wellbeing", Sustainability, 11(22):6425. doi: 10.3390/su11226425.
2. Dallimer M, Tang Z, Bibby PR, Brindley P, Gaston KJ, Davies ZG (2011), "Temporal changes in greenspace in a highly urbanized region", Biol Lett, 7(5):763–66. doi: 10.1098/rsbl.2011.0025.
3. Dzhambov, A. M. et al. Does greenery experienced indoors and outdoors provide an escape and support mental health during the COVID-19 quarantine? Envi-ron. Res. 196, 110420 (2021).
4. Han, B.; Cohen, D.A.; Derose, K.P.; Marsh, T.; Williamson, S.; Raaen, L. How much neighborhood parks contribute to local residents' physical activity in the City of Los Angeles: A meta-analysis. Prev. Med. 2014, 69, S106–S110, doi:10.1016/j.ypmed.2014.08.033.

5. Labib, S.; Lindley, S.; Huck, J.J. Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review. Environ. Res. 2020, 180, 108869, doi:10.1016/j.envres.2019.108869.
6. Lachowycz, K.; Jones, A.P. Towards a better understanding of the relationship between greenspace and health: Develop-ment of a theoretical framework. Landsc. Urban Plan. 2013, 118, 62–69
7. Markevych I, Schoierer J, Hartig T, Chudnovsky A, Hystad P, Dzhambov AM et al. (2017), "Exploring pathways linking greenspace to health: theoretical and methodological guidance", Environ Res, 158:301–17.
8. Marselle MR, Hartig T, Cox DT, de Bell S, Knapp S, Lindley S et al. (2021), Pathways linking biodiversity to human health: a conceptual framework, Environ Int, 150:106420..
9. Pouso, S. et al. Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. Sci. Total Environ. 756, 143984 (2021).
10. WHO (2004), Promoting mental health: concepts, emerging evidence, practice. Summary report, World Health Organization, Geneva.
11. WHO (2005), Ecosystems and human well-being: health synthesis: a report of the Millennium Ecosystem Assessment, World Health Organization, Geneva.
12. WHO Regional Office for Europe (2016), Urban green spaces and health: a review of evidence, WHO Regional Office for Europe, Copenhagen, available online.

Health Assessment

1. Aerts R, Honnay O, van Nieuwenhuyse A (2018), "Biodiversity and human health: mechanisms and evidence of the positive health effects of diversity in nature and green spaces", BR Med Bull, 127(1):5–22. doi: 10.1093/bmb/ldy021.
2. Beute F, Andreucci MB, Lammel A, Davies Z, Glanville J, Keune H et al. (2020a), Types and characteristics of urban and peri-urban green spaces having an impact on human mental health and wellbeing. Centre for Ecology & Hydrology, Wallingford, UK, available online
3. Beute F, Davies Z, de Vries S, Glanville J, Keune H, Lammel A et al. (2020b). Types and characteristics of urban and peri-urban blue spaces having an impact on human mental health and wellbeing. Centre for Ecology & Hydrology, Wallingford, UK available online
4. Braubach, M.; Egorov, A.; Mudu, P.; Wolf, T.; Thompson, C.W.; Martuzzi, M.: Effects of Urban Green Space on Environmental Health, Equity and Resilience. In Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice (pp. 187–205). Cham: Springer International Publishing; Springer International Pub-lishing: Berlin/Heidelberg, Germany, 2017; pp. 187–205.
5. Brown DK, Barton JL, Gladwell VF (2013). Viewing nature scenes positively affects recovery of autonomic function following acutemental stress. Environ Sci Technol, 47(11):5562–69
6. Choudhry, K.Z.; Coles, R.; Qureshi, S.; Ashford, R.; Khan, S.; Mir, R.R. A review of methodologies used in studies investigating human behaviour as determinant of outcome for exposure to 'naturalistic and urban environments'. Urban For. Urban Green. 2015, 14, 527–537, doi:10.1016/j.ufug.2015.03.007.
7. Keniger, L.E.; Gaston, K.J.; Irvine, K.N.; Fuller, R.A.: What are the Benefits of Interacting with Nature? Int. J. Environ. Res. Public Heal. 2013, 10, 913–935, doi:10.3390/ijerph10030913.
8. Kondo MC, Fluehr JM, McKeon T, Branas CC: Urban green space and its impact on human health, Int J Environ Res. Public Health, 15(3), 2018,445. doi: 10.3390/ijerph15030445.
9. Korpela, K.M.; Ylén, M.; Tyrväinen, L.; Silvennoinen, H. Determinants of restorative experiences in everyday favorite places. Heal. Place, 2008, 14, 636–652
10. Perrin, J.L.; Benassi, V.A. The connectedness to nature scale: A measure of emotional connection to nature? J. Environ. Psychol. 2009, 29, 434–440, doi:10.1016/j.jenvp.2009.03.003.
11. von Lindern, E.; Hartig, T.; Lercher, P. Traffic-related exposures, constrained restoration, and health in the residential context. Health Place 2016, 39, 92–100.
12. WHO Regional Office for Europe: Green and blue spaces and mental health: new evidence and perspectives for action, 2021, WHO Regional Office for Europe, Copenhagen

Mobility

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Introduction

In this chapter, we will look at daily mobility. Daily mobility is a form of spatial mobility characterised by movements within a settlement area over short periods of time. It is therefore different from residential mobility (the movement within a residential area over a long period of time), migration (movement outside a residential area over a long period of time) and travel (movement outside a residential area over a short period of time).

The initial focus will be on changes in mobility practices and the impact of technological innovations on them. This will be achieved by setting the scene, which will involve identifying the drivers, conflicts and major tradeoffs prevalent in this field. It will be followed by an examination of the cultural and political dimensions of the deployment of the car and the road in the 20th century, with a particular emphasis on *the myth* of the structuring effects of transport.

These perspectives on the past allow us to address the need for change, underlined both in terms of the reinforcement of social inequalities by current transport systems and their impact on the environment. We present opportunities and challenges posed by electrification, shared and smart mobilities and the deployment of active mobilities. The chapter goes on to clarify a few key concepts and presents successful transformations in Barcelona and Brussels.

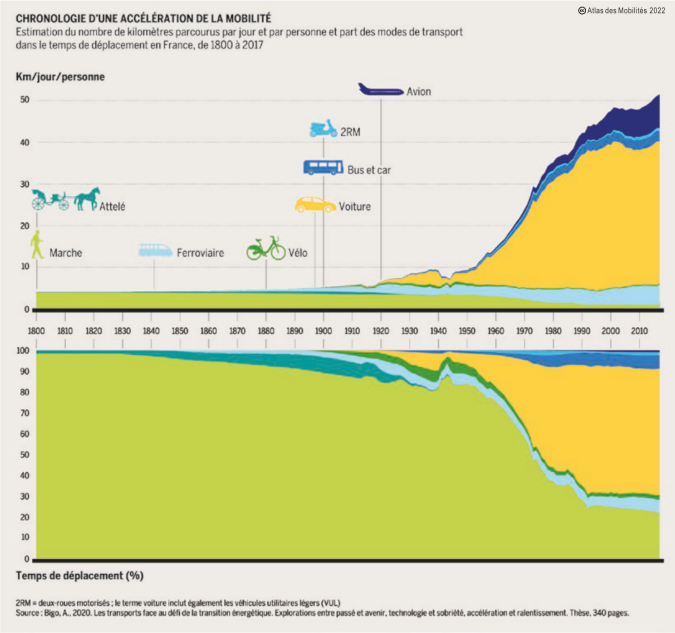
Transport evolution: Questioning the technological determinism

Daily mobility practices have changed significantly over the 20th century. We are often tempted to describe the historical development of mobility as a linear story dictated by technological innovations that successively revolutionised travel. For example, the invention of the steam engine (1769) and the appearance of the railway (1830s), which led to the first industrial revolution driven by the steam engine and coal, are regularly cited. The second industrial revolution at the end of the 19th century was driven by oil and electricity. This was the beginning of aviation and the deployment of internal combustion vehicles.

Admittedly, the development of means of transport, which lies at the heart of the disciplines of transport history and the history of technology, was marked by radical innovations such as steam and electricity, which marked a sharp break with pre-existing technical systems. At the same time, however, there have been a multitude of frequent improvements to existing products and manufacturing processes.

These changes must also be nuanced by highlighting the very slow evolution of everyday mobility, despite the development of transport technologies. For a long time, these innovations mainly concerned a minority, impacting on travel and the development of tourism as a practice for the upper classes. In the 19th

Illustration: A chronology of accelerating mobility. Estimates of the number of kilometres travelled per person per day (above), and the share of transport modes in travel time in France (below), from 1800 to 2017. From left to right: walking, horse-drawn transport, rail, cycling, car (including light commercial vehicles), bus and coach, motorised two-wheelers, airplane. Source: ***Herbet***, *Jules (dir.) (2002) Atlas des mobilités. Faits et chiffres sur les mobilités en France et en Europe, p. 15.*



century, these innovations also facilitated significant population movements e.g. from Europe to the Americas and a rural exodus (residential mobility).

It wasn't until the 1950s that we really saw a sharp increase in travelled km per day. This increase was driven by gradual upward social mobility and rising living standards, which led to the spread of the car among households and accumulation of and access to individual property in the urban periphery.

Finally, the idea of a linear transition from one transport system to another is being seriously challenged by the concomitant development of several modern modes of transport: the car and public transport, for example. Rather than a succession of transport systems, we are faced with a stack of transport systems that comple-ment and compete with each other, depending on the area under consideration.
This false evidence of a linear history dictated by technological innovations (Baldasseroni et al 2022) stems from a concept known as *technological determinism,* according to which society is influenced by technology and not the other way round. This view sees technological

development as an autonomous process, independent of society, whose evolution – the success of a technology – is determined solely by the intrinsic superiority of that technology, which develops in a linear fashion. The perspective of social constructivism in the study of science and technology, on the other hand, has clearly shown the intersections between society, technology and culture.

In the early 2000s, the mobility turn highlighted the centrality of mobility in the organisation of contemporary societies. It proposes placing mobility at the heart of the human and social sciences. Rather than concentrating on the technical aspects, this turn invites us to consider the functional, sensitive and social dimensions of mobility, thus renewing the historical and social approaches to mobility. The proponents of this movement place the development of mobility infrastructure and technologies within the culture of their time, the imaginaries of mobility and the values that underpin them.

Focusing on automobility and the important role it plays in contemporary society, Sheller and Urry (2000: 738–39) described automobility as the unique combination of "*six interlocking components. It is the unique combination of these components that generates the 'specific character of domination of automobility across the globe […]: the quintessential manufactured object produced by the leading industrial sectors and the iconic firms within 20th century capitalism […]; the major item of individual consumption […]; an extraordinarily powerful machinic complex constituted through the car's technical and social interlinkages with other industries […]; the predominant global form of 'quasi-private' mobility that subordinates other 'public' mobilities; the dominant culture that sustains major discourses on what constitutes the good life […]; the single most important cause of environmental resource-use […].*"

The development narrative around roadbuilding and motorisation

Even if, in Europe, the motorisation of households in the post-war period is linked to upward social mobility and peri-urbanisation, the car has not been enthusiastically embraced around the world since its invention. Adopting a postcolonial reading of motorisation phenomena, scholars were able to show that car development and roadbuilding were part of the 'development' narrative of the Western block to reaffirm its superiority in the context of the Cold War and the independence of former colonies. Modernisation through road construction became indeed prominent during the Cold War, with significant impacts on local spatial arrangements and landscapes. While road construction improved accessibility for local populations, it also enhanced control over remote areas, aligning with a broader project of rural modernization and anti-communism. International organizations incorporated roadbuilding

into said *development* agendas and practices for *Third World* countries through knowledge transfer and development aids, with the expectation of growing private car ownership and reasserting their own superiority (knowledge-power) in the newly independent colonies (Mom 2020).

Two contrasting case studies, the Pan-American Highway network and road construction in the Navajo Reservation in the United States, exemplify how relations between the centre and the periphery are redefined through the lens of road infrastructure development. The Pan-American Highway project illustrates American influence on road development across the Americas. Initially conceived as an imperial project to extend US influence, it was gradually transformed by Latin American partners to meet their national and local needs. Transnational negotiations reinforced the sovereignty and modernity of Latin American nations while highlighting regional interests. Despite significant American investment, the project also reflected the strength of local partners, demonstrating a complex dynamic between the centre and the periphery. In contrast, road construction in the Navajo Reservation in the United States had adverse effects on local populations. While Navajo residents hoped for modern roads to access healthcare and education services, federal planners aimed to integrate the reservation into the regional and national economy, primarily to exploit resources such as uranium. These roads profoundly transformed rural and indigenous communities, illustrating tensions between national development goals and local interests. Road construction in the Americas and the United States illustrates complex dynamics between the centre and the periphery, as well as conflicts of interest between national development goals and local needs. These examples highlight the importance of road infrastructure in redefining geopolitical and socio-economic relations at regional and global scales.

The emergence of the car was *"only one model of mobile modernisation, spectacular and very influential, but enjoyed by a global minority"* and was only a fragment of a much diverse mobility network beyond the West (Mom 2020, 385). The market dominance by the car was the political goal. Yet, even if modernization plans, in their diversity, often involved discarding 'outdated', 'traditional', 'informal' modes of transport such as rickshaws, minibuses, etc. to implement 'modern' and 'developed' transport systems, few were successful because of lack of funding to adequately respond to users' needs and practices and provide these modern transport systems for the majority. These resulted therefore in what Gijs Mom calls *layered mobilities* (2020): the copresence of informal/traditional/old mobility systems and the car system, acknowledging huge social inequalities around the globe.

Wellbeing and economic impacts of transport infrastructures: The myths of structuring effects

Even in Europe, road construction is promoted by specific stakeholder groups with economic and social development objectives and backgrounds. In the first part of the 20th century, the modern road and the car become n*ormal*, as observed by Pierre Lannoy (1999): in the context of modern society, the phenomenon of road traffic and its associated negative effects have become so pervasive that they have become normalised and are now regarded as part of everyday life. In a political sense, a specific body of legislation and regulations relating to the road and driving (responsibility, accessibility, priority, vehicle equipment, rules of the road, signs, etc.) was developed. Driving and its infrastructure become a standardised system, socially and legally standardised. In a technical sense, the 1920s and 1930s were the years of development of the science of traffic engineering. This is a set of scientific-technical tools and knowledge standardised within the engineering community, aimed at unifying and formalising the traffic phenomenon and improving its performance.

After the Second World War, the number of cars on the road and the number of accidents were constantly rocketing. Two concerns were therefore on the agenda: the question of the road network, its size and development, and the question of how to improve road safety. Considering the seemingly inevitable increase in traffic volume, the use of traffic modelling methods originally developed in the United States was proposed to facilitate the construction of major roadways across Europe. Alternative transport technologies and policies were excluded. For instance, the alternative modernisation model by rail transport as developed in the Soviet Union was underfunded in the US as in Europe. During this period, there was a transformation in the collective representations of the environment. The automobile lobby has been successful in colonising the imaginary and naturalising motoring.

Our perception of mobility has been quite narrow since the advent of the automobile. The focus has primarily been on efficiency, speed, and the economic and urban growth associated with road infrastructure. However, this perspective often overlooks critical side effects such as air pollution, environmental damages and social inequalities. Moreover, many stakeholders fail to consider other forms of mobility, including those adopted by different user groups, public services, and alternative economic ecosystems. In reality, there exists a multitude of actors and modes of mobility that must be considered within the broader context of mobility.

It is generally accepted that transport infrastructures –whether by road or rail– support and sustain economic and social activities by connecting spatially dispersed areas and facilitating the movement of key economic inputs. All types of infrastructures,

including physical infrastructures (e.g., roads, railways, ports, and bridges), social infrastructures (e.g., educational institutions and facilities supporting health and well-being), and digital infrastructures, play a significant role in creating economic opportunities and can be argued to promote economic prosperity. Therefore, infrastructure investments have been frequently employed as policy instruments to stimulate economic growth at both the national and subnational levels, as well as to enhance national, regional, and local economies. It is in this context that the discourse on the alleged "*structuring effects of transport*" is developing.

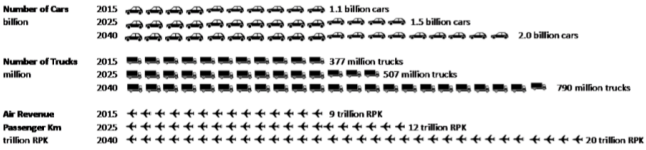
This discourse gives a positive role of transport infrastructure in solving urban problems. It makes the hypothesis of a *„mechanical consequences (i.e. repetitive and predictable) of the implementation of certain types of infrastructure on certain types of spaces"* (Offner 1993, 236). This hypothesis permits the comparison of pre- and post-deployment changes in the context of a transport infrastructure. It assumes that the infrastructure itself is the sole cause of all observed changes, including the isolation and decontextualisation of the infrastructure. It forgets the general context of urban change, in which the infrastructures are only part of: the wider structural dynamics and, more importantly, the strategies of actors who position themselves in relation to these projects. The myth of the structuring effects of transport overlooks the *"political, economic and social conditions which have made it possible to carry out the project and the phenomena of appropriation which it entails"* (Offner 1993, 238). However, what can be observed is that infrastructure development amplifies and accelerates pre-existing trends, whether or not they are favourable to the territories where they are located. Transport infrastructure impact on territorial economic development also depends on the considered scale of the territory. Moreover, the indirect and induced effects on social inequalities and the environment are often overlooked in those analyses.

Mobility tradeoffs

An economic model leading to a collapse
The number of vehicles on the road is increasing globally each year, and the problem of urban traffic congestion is a significant challenge for urban liveability and environmental sustainability. In addition, the cost of road deaths is a significant concern. As we had 1.1 billion of cars worldwide in 2015, we are expecting 1.5 billion of cars by 2025 and 2.0 billion cars by 2040, which makes a substantial growth of almost 40% every 10 years (World Economic Forum 2016). The car industry is one of the most important drivers of economic growth globally. Similar figures of growth are expected from the truck industry, while the fastest growth is expected to be in air travel, despite the different global crises.

Mobility and social equity
Mobilities are structured by social inequalities and reinforce them (Sheller 2018). Underprivileged urban populations, who make up most of the world's population and have no access to individual motorised vehicles, continue to suffer the most, particularly women (Sagaris 2019), from the development of motorised transport. In addition to air

Illustration: Amount of vehicles on the road and evolution between 2015 and 2040.
Source: *Business Insider, World Economic Forum, 2016*



pollution and traffic congestion, this prevents the development of adequate public transport solutions and infrastructure for active mobility (Cunha & Silva 2022; Sietchiping, et al. 2012). The sedentary modes of passenger transport have furthermore a deleterious effect on health (Böhm et al. 2006).

Impacts on landscape and territories

Transportation has become an indispensable aspect of modern life, facilitating the movement of individuals to and from work and educational institutions, the delivery of essential services and commodities to disparate communities, and the global connectivity of people and industries. However, the negative effects of transport extend beyond the aforementioned benefits: transport has a detrimental impact on human health and the environment. This is evidenced by the prevalence of road injuries and fatalities, air pollution, and CO_2 emissions, which contribute to climate change. Transportation accounts for approximately one-third of the total energy consumption in the member countries of the European Environment Agency and is responsible for approximately one-fifth of greenhouse gas emissions (EEA 2024). The greatest contributor to this phenomenon is road transport, followed by aviation and maritime transport. Furthermore, transport is a significant contributor to air and noise pollution in urban areas. The emission of pollutants such as nitrogen oxides (NOx) and fine particles has been demonstrated to have a detrimental impact on human health and the environment.

Landscape impacts of mobility infrastructure

Infrastructure is an integral component of the environment in which we live. It is the physical basis of modern societies, the foundation on which we travel, meet each other, make exchanges, and have new experiences. Most of us utilise multiple components of our extensive infrastructure network daily. However, many of us are unaware of the ownership of this infrastructure, the individuals responsible for its maintenance, the financial resources that fund it, the designers of the infrastructure, or the decision-makers who oversee its development. Nevertheless, infrastructure has been created by the human mind and has been constructed by people investing a significant amount of capital and effort in its development. Countries are investing billions every year for construction and maintenance of their national infrastructure.

However, the environmental impact of transportation infrastructure is strongly dependent on the correlated "hard" infrastructure, which are considerable trade-offs. The hard and "grey" infrastructures, which are mostly connected to hard surfaces and utilise concrete and cement, are carbon-intensive and have a significant impact on landscapes. They create new barriers, change natural territories into "transformed"

and "urbanised" territories, destroy habitats, and therefore result in more sealed surfaces. The consequences of sealed surfaces are manifold. Soil sealing results in the formation of heat islands, the non-infiltration of rainwater, floods and the destruction of ecosystems (EEA 2011).

The phenomenon of urban heat islands is largely attributable to the unregulated temperature within the urban fabric, which is primarily the result of soil sealing. Soil sealing is defined as the destruction or covering of the ground by an impermeable material such as asphalt or concrete, which has a detrimental impact on fertile agricultural land, endangers biodiversity, increases the risk of flooding and water scarcity, and contributes to global warming. Since the mid-1950s, the total surface area of cities in the EU, as reported by the European Environment Agency, has increased by 78%. This expansion has contributed significantly to the phenomenon of soil sealing and its associated negative consequences.

Furthermore, the production of grey infrastructure (sealed surfaces, tubes, bridges, and more) is mainly dominated by the use of concrete or asphalt, both of which are highly polluting materials. To illustrate, petroleum-based asphalt is a substance with a high volatile organic compound (VOC) content. The conversion of the product to asphalt results in the release of significant quantities of harmful gases into the atmosphere. Similarly, the production of cement for concrete necessitates the application of high levels of heat, resulting in the generation of considerable quantities of volatile organic compounds (VOCs). It has been calculated that the molecules released from asphalt could lead to higher GHG emissions than GHG emissions released by gasoline and diesel vehicles. Both sources pale in comparison to volatile chemical products, such as pesticides, coatings, adhesives, cleaning agents, and personal care products (Stokstad 2020). On average, the direct CO2 emissions of asphalt are approximately 25kg per tonne, which represents approximately 10% of the total GHG emissions worldwide. In addition to the realization of infrastructure, the extraction of raw materials, such as gravel, the transformation of underground materials, and the construction of earthworks using mechanical infrastructure, collectively contribute to a significant increase in GHG emissions.

Need for change

The 2030 Agenda of the United Nations with the 17 Sustainable Development Goals (SDGs) was adopted during the last 2016 Habitat conference in Quito: it is detailed in 169 Targets, covering the whole spectrum of human development — from the fight against poverty, to climate change, education and health, gender equality and decent work, to better institutions, justice and peace, and sustainable and liveable cities and territories. The aspects *mobility and transport* are crucial to the achievement of sustainable cities and communities and embedded in the dedicated SDG 11. Especially the SDG11.2 is

relevant to the topic of mobility: "*11.2 by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons*". However, according to the latest projections from the International Union of Public Transport, those figures are far from being achieved by 2030 (UITP 2019). There is therefore a real need for a mobility shift in our cities and landscapes.

Mobility shift and the emergence of *New Mobilities*

It is often assumed that electrification, automation and sharing economies are the three revolutionary trends that will transform the transport sector and the way we design streets and mobility infrastructure. We can date this understanding back to the mid-1980s with the emergence of a new technological problematisation which establishes technology (essentially telematics) as the main vector for the realisation of an acceptable, sustainable road order (Lannoy 1999). It is the promise of a new age of motoring in which optimised travel goes hand in hand with safety and user comfort (fluidity, safety, cleanliness) through the development of 'intelligent' roads and 'smart' vehicles.

However, reducing the number of kilometres travelled and developing alternatives to the car are still important as resources are limited for the electrification of vehicles as well. Switching from internal combustion engines to electric motors - the motor shift - is one of the five levers for reducing transport-related greenhouse gases emissions in Europe (Bigo 2020). However, their mass adoption poses challenges in terms of limited resources. The resources needed to produce batteries (materials such as e.g. lithium, cobalt or nickel) are limited on earth. The current search for more sustainable alternatives is therefore focusing on (1) innovations in materials to reduce dependence on rare materials: for example, cobalt-free batteries, and (2) saving resources using recycled materials and the modular design of batteries to make it easier to dismantle and recover components. Yet, battery recycling still requires a considerable improvement in recycling rates. Moreover, the motor shift solves almost none of the problems regarding local, regional and global resources.

Another alternative is to *share* vehicles and move away from the model of an ownership economy. While shared (electric) cars are becoming increasingly common in urban areas, the deployment of charging station networks for electric cars does not consider the strategic nature of this network to support a transformation of mobility system. The installation of the charging points answers the current need linked to electric car ownership, which vary across social classes, whereas they could be installed in a way that is consistent with the equal deployment of shared electric vehicles. Energy suppliers are working with local authorities to plan the development of electric

mobility based on current travel needs and spatial planning.

Over the last decades, digitalisation and the Internet of Things have profoundly reshaped the landscape of mobility and logistics in our environment. Some transport sectors are being interrupted and disrupted, with new markets emerging, while others are converging, and some are disappearing entirely. Good examples are start-ups connected to e-mobility, delivery services and more, or simply emerging services such as e-scooters, Bolt, Lime and UBER.

The benefits of these innovations lie in the replacement of our current vehicle-centric system with a more efficient, (data-enabled) ecosystem facilitating **multimodality** and the uses of more sustainable modes of transport. Mobility users will be able to switch between different types of transportation with dynamic information. The innovative concept of Mobility as a Service (MaaS) aims to provide intermodal, personalized, on-demand, and seamless transportation experiences through a single interface. Despite the growing number of shared mobility, electric mobility, and multimodal passenger transport users, the list of MaaS providers, focussing or not on electric mobility (eMaaS), remains relatively short. One reason for this scarcity lies in the difficult integration of all actors within the (e)MaaS ecosystem. Addressing integration challenges is crucial for their widespread adoption. Public actors, such as the Brussels administration in charge of mobility plans (see below the GoodMove Brussels plan), are also contributing to the effort.

However, we must not overlook the potential for deploying **active forms of mobility** (mainly cycling and walking) in dense urban areas. These forms of mobility have the advantage of combining a whole series of benefits in terms of public health, low spatial footprint and affordability, even if their experience is still strongly affected by social inequalities linked to gender, class and race.

Key concepts towards positive mobility transition

Alternative Mobilities and Technologies
The term **alternative mobilities** itself is problematic, as it implies that all other transportation systems are mere "alternatives" to the car—the latter still being considered the dominant system. This perspective overlooks the reality that a significant portion of the global population lacks access to individual motorised vehicles.

When we discuss alternative forms of transport, we refer to "soft" modes of mobility—those with minimal environmental impact. These include collective transport, and active modes such as walking and cycling. In recent decades, there has been substantial discourse promoting "active" mobility, where the human body is directly engaged (such as walking or cycling), in contrast to the more "passive" motorized modes of transportation.

The development of alternative forms of mobility draws on a proliferation of technological innovations in terms of equipment. The emergence of new equipment such as the electrically assisted bicycles now profoundly transform urban mobilities. In recent years, new terminologies have appeared to cover increasingly diverse technologies circulating on different infrastructures and corresponding to different regulations: mobility equipment (single-wheelers, scooters), micromobility (e-bike, e-scooters), also known as light electric vehicles, often presented in opposition to heavy electric vehicles such as electric cars.

Intermediate vehicles, also called light electric vehicles, is a category of vehicle between the traditional bicycle and the passenger car. This definition is still evolving as it covers an expanding technological field. Intermediate vehicles combine features from both worlds, offering an interesting alternative for urban and suburban travel (Bigo 2022; Barbier-Trauchesses et al. 2022). Although they are not yet widespread, they hold significant potential in the transition toward more sustainable mobility. Being lighter, they contribute to reducing greenhouse gas emissions compared to traditional cars, as they are more energy-efficient and integrate well with greener electric mobility. Additionally, they are resource-efficient (both in terms of materials and energy) during manufacturing and are often more affordable for households. Intermediate vehicles are part of a wider strategy to make cars greener by limiting their speed, acceleration and weight. They can accelerate the transition by providing a practical alternative for short trips, encouraging people to reduce their reliance on individual cars. However, broader adoption requires overcoming obstacles such as social perception and infrastructure adaptation.

Alternative infrastructure: Relocating lifestyle and transport-urbanism coordination by using TOD principles

In this context, the development of alternative forms of transport is also supported by better coordination between transport and urban planning, which reduces transport demand.

With the phenomenon of massive rural-urban migration occurring across numerous regions in Europe, cities and urban landscapes, as the focal points of socio-economic activities, are confronted with a considerable demand for a wide range of infrastructures, as well as commercial and residential buildings.

As regions become more interconnected, new socio-economic opportunities are created. Investment in new construction and improvements to existing buildings is needed to accommodate and support new and expanded socio-economic activities. This dynamic is particularly pronounced in urban and inner-city areas. Conversely, inner areas face depopulation and the reduction of basic services. In

such cases, infrastructure can play a key role in developing an intercommunal network and attracting new residents and tourist flows. However, there are major challenges associated with this, such as financing and the institutional framework. A key channel through which infrastructure can be financed is the real estate sector.

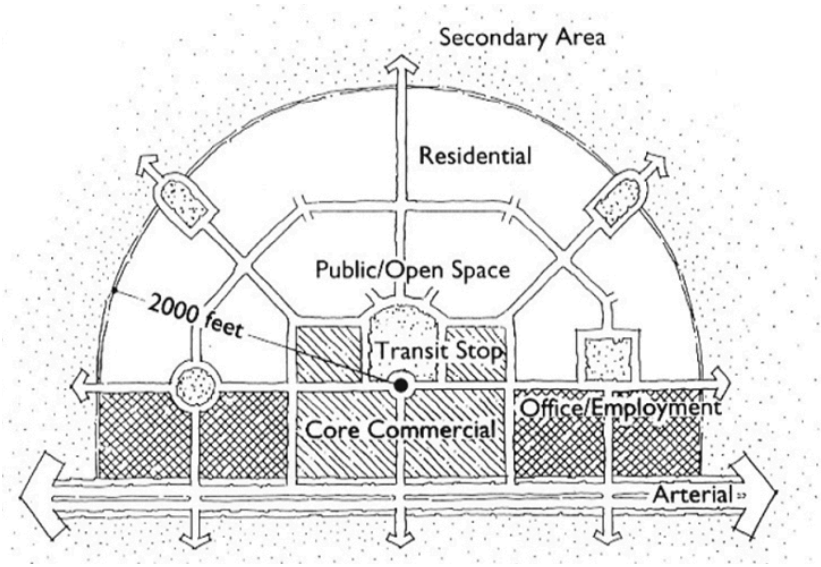
One recognised solution to this dilemma is known as **Transit-Oriented Development (TOD)** (Calthorpe 1993). Transit-Oriented Development is a concept that encompasses integrated urban areas designed to facilitate the convergence of people, activities, buildings and public spaces, with convenient pedestrian and bicycle connections between them and reliable transit service to the wider city. This strategy ensures equitable access to local and citywide opportunities and resources through the most efficient and healthiest combination of mobility modes, at the lowest financial and environmental cost, and with the highest resilience to disruptive events. Inclusive TOD is fundamental to the long-term sustainability, equity, shared prosperity and civil peace that are essential to the well-being of cities.

A global shift from sprawl to inclusive TOD is a matter of great urgency. However, despite its conceptual simplicity, it is easier to conceptualise than to implement. Achieving this shift requires the alignment and integration of many complex and interdependent elements, including infrastructure, street and building planning and design, codes, regulatory reform, and finance. The process involves a wide range of stakeholders with different worldviews and interests. These include decision-makers and policy-makers from different institutions, professional technicians from different disciplines, developers and investors, future tenants and residents, people attached to car-based suburban lifestyles, people living in communities to be transformed by redevelopment and densification, and grassroots and community organisations. In this context, a large-scale shift to TOD must begin with the development of a common understanding and conceptual framework for collaboration.

The concept of TOD is based on 8 principles, making inclusive cities and completing neighbourhoods around walking, cycling, and public transit: W*alk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift* is the core framework of the TOD Standard:

1. *Walk:* Develop neighbourhoods that promote walking.
2. *Cycle:* Prioritise non-motorised transport networks with safe spaces and facilities for cyclists, such as cycle lanes and parking.
3. *Connect:* Create dense networks of streets and paths.
4. *Transit:* Locate development near high-capacity, reliable public transit.
5. *Mix:* Plan for mixed income, uses and demographics.
6. *Density:* Optimise density, including by absorbing urban growth with taller buildings.
7. *Compact***:** Create areas or within-city regions with short transit commutes.
8. *Shift:* Increase mobility by regulating parking and road use.

Illustration: Calthorpe's Transit-Oriented Development Model
Source: Calthorpe, Peter (1993) The Next American Metropolis", New-York: Princeton.



Towards positive transformation: a current approach of the 15min city by the example of Paris

Another key concept to better coordinate transport and urban planning to reduce transport demand is the 15-minute city. The idea behind the 15-minute city is to make urban life better by creating places where everything residents need is within easy reach on foot or bike (Moreno et al. 2021). The 15-minute city means people can get around without having to travel far for housing, offices, hospitals, parks, restaurants or cultural venues. Each neighbourhood typically has six main social functions: living, working, supplying, caring, learning and enjoying. The 15-minute city concept is not new. Many experts and city planners have been chatting about it for the past hundred years. If we take the American urban planner Clarence Perry as an example: Perry came up with the idea of the *liveable neighbourhood unit* way back in the 1920s, before the mass influx of private cars and city zoning arrived in the 20th century. This made mobility in the US a concept based on cars. In the 1980s, a new urban design movement called *New Urbanism* emerged in the US. It was all about creating walkable cities. While this was a great

Rue de Rivoli, Paris Summer 2023. Source D. Vancutsem

Concept of the 15-minutes city, Carlos Moreno, being applied in Paris (illustration by Micaël, courtesy of Paris City Hall)

idea, cars were still the main way of getting around.

In Paris, its first female mayor Anne Hidalgo in charge since 2014, initiated the 15-minute city transformation. Hidalgo was re-elected into power in 2020, and Paris is undergoing today a significant shift towards a more environmentally conscious approach.

The transformation of Paris into a more bicycle-friendly city is evident in the construction of dedicated bike lanes on main streets like the renowned Rue de Rivoli, which is now reserved for buses and two-wheelers. Additionally, the greening of the cityscape is evident in the proliferation of plants and parks. These changes are a testament to the city's commitment to sustainability and a more liveable environment.

Two examples of best practices

Barcelona and its Superblocks: Barcelona is a Mediterranean city with a rich architectural heritage, a mile-long seafront, extensive cultural, gastronomic and entertainment offerings, and a reputation for being green and sustainable. However, there are concerns that the city's current environmental footprint is unsustainable, with limited green space per capita and high levels of traffic, density and air pollution. By comparison, London has 27, while Amsterdam has 87.5. However, Barcelona is pursuing a strategy of urban regeneration that includes the creation of so-called "superblocks".

The superblock concept was developed by the city government in 2016 as a means of promoting sustainable mobility and restructuring the poorly structured urban layout of the city in neighbourhoods

Illustration: The city authorities' plan for the Eixample district. Source: Ajuntament de Barcelona, 2021.

in which traffic calming policies are then put in place. The concept of the superblock, or "superilles" in Catalan, involves the combination of up to nine city blocks. In these superblocks, older approaches to traffic calming are combined in order for pedestrians and cyclists to have priority over other road users. On two-lane streets, one lane is reserved for pedestrians and cyclists, while cars are banned. This allows children to play and residents to enjoy a coffee and a chat on newly installed park benches. The monochrome palette of the street is replaced by a tapestry of planted beds, flowerpots and trees. Motor traffic is restricted to 10 to 20 km/h on the remaining one-way streets. The result is that the streets become an extended living room. Instead of the noise of cars, you can hear children laughing; instead of exhaust fumes, you can breathe fresh air; and instead of the hustle and bustle of city life, you can meet relaxed residents talking to each other. The first superblock was built in 2017 in the Poble Nou neighbourhood, where it initially met with resistance from shopkeepers and motorists, but then received overwhelming support from local residents. The superblocks that have been designed and built across the city so far have not led to the predicted decline in local

businesses. On the contrary, the number of local shops has increased by up to 30 per cent.

A total of 503 superblocks are expected to be built in Barcelona, representing a 60% reduction in the number of streets used by cars. A recent study by Barcelona's BCNecologia health institute suggests that the implementation of these superblocks would have a positive impact on the health of residents. The study found that life expectancy would increase by almost 200 days. The reduction in emissions would lead to a reduction in noise and heat islands and could prevent around 300 premature deaths per year. According to the study, private car use could be reduced from 1.19 million trips per week to 230,000. This would reduce nitrogen dioxide emissions from the current 47 micrograms per cubic metre to 36 micrograms, below the World Health Organisation's guideline of 40 micrograms.

Brussels and the Good Move plan

Good Move is the Regional Mobility Plan for the Brussels-Capital Region. It was approved in 2020 by the Brussels Government and defines the main policy guidelines in the field of mobility. The plan's objective is to improve the living environment of the people of Brussels while supporting the demographic and economic development of the Brussels-Capital Region. It was the result of a participatory process involving all Brussels stakeholders, including mobility and institutional partners, municipalities, the economic and associative world, as well as citizens. The participatory process spanned a period of four years.

The Good Move plan builds upon the foundations laid by the regional mobility plans Iris I (1998) and Iris II (2010), which did not produce the change one hoped for. However, they did lay the groundwork for a culture of sustainable mobility. Significant advances have been made, which should be built upon even if they still don't quite suffice. The Good Move plan places the user at the heart of all and any ideas and thoughts on daily travel. The Good Move plan employs a cross-cutting approach to mobility, a consequence of the co-construction process. Its objective is to enhance the quality of life of the inhabitants of the region and to encourage individuals to modify their travel patterns in accordance with their needs and constraints.

The plan is resolute in its objective of creating a pleasant and safe city, comprising peaceful neighbourhoods, connected by intermodal structural corridors and focused on efficient public transport and improved traffic flow. The plan's measures are designed to provide each user with adapted, facilitated and integrated mobility solutions, enabling them to choose the most appropriate mode of travel for each of their trips, depending on their destination and needs at a given time.

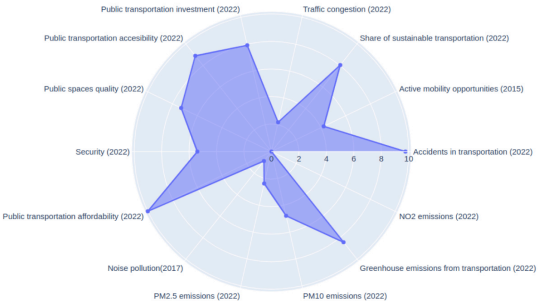
Mobility systems and indicators

In this chapter, we have said very little about the challenges of urban logistics. However, mobility and transport logistics in cities and landscapes are vital elements in the development of sustainable cities. The growth of on-demand economy and e-commerce has led to an increase in transport and mobility activities in urban and metropolitan areas. As these changes reshape urban transport, it becomes increasingly important to identify key performance indicators (hereafter KPIs) that can effectively measure the current state of mobility logistics in smart and sustainable urban areas worldwide. While these issues have received considerable attention from researchers and there are ongoing efforts to standardise KPIs for citizen mobility, a major challenge is the lack of necessary data and the quality of available indicators. Here we will briefly introduce two tools developed by the European Commission.

Firstly, the European Commission has developed a comprehensive set of practical and reliable indicators (the SUstainable Mobility Indicators - SUMI) that assist cities in conducting a standardised assessment of their mobility system and in measuring improvements resulting from new mobility practices or policies. These indicators serve as a tool to identify the strengths and weaknesses of a city's mobility system, thereby enabling the implementation of improvements and the assessment of the impact of such changes.

Secondly, the Urban Mobility Observatory, also funded by the European Commission, provides information and experiences in the field of urban mobility in Europe (https://www.eltis.org). It introduces a guide to the methodology and methods of calculating sustainable urban mobility indicators, the so-called Eltis Method.

Based on the aforementioned references, a subsequent list of KPIs pertinent to mobility can be developed and classified into distinct categories, such as those pertaining to the environment, transportation, or socio-economic development. For example, a case study focused on Barcelona was conducted and resulted in the identification of 14 KPIs for the city (Soriano-Gonzalez et al. 2023). Five of the KPIs relate to the socio-economic study, four to sustainable transportation in the city, and the remaining five assess environmental issues. The results of the KPIs defined for the study can be represented in a radar-like graph (see next figure), which allows the city’s sustainable mobility state to be observed.



KPI values for the city of Barcelona. Source: *Soriano-Gonzalez, Raquel, et al. 2023. 'Analyzing Key Performance Indicators for Mobility Logistics in Smart and Sustainable Cities: A Case Study Centered on Barcelona'. Logistics 7 (4): 75*

The graph for the city of Barcelona above indicates a need for the implementation of policies aimed at improving environmental markers, such as the KPIs for noise and particulate matter. Furthermore, transportation policies are necessary to alleviate traffic congestion in the city. These are the areas that should be the focus of change if the objective is to achieve a more sustainable city. The figure also indicates the dates on which data were updated on the Open Data Barcelona website. It would be beneficial for the city to have a higher frequency of updated data, allowing researchers to compute the KPIs on a more regular basis and quantify the improvements and changes in each area studied.

Future tasks for research

Mobility practices are undergoing a number of changes. Throughout the 20th century, a mobility system based on the car was developed and promoted by various stakeholders. This system is still causing many environmental and social problems today. Although the 20th century was marked by numerous technological innovations, they have played a small role in resolving these problems. Two fields of action are now emerging: alternative technologies (slower, lighter, less space- and energy-consuming) and alternative lifestyles, focusing on public transport and active modes of transport. The relocation of lifestyles is the solution encouraged by the approaches to traffic calming applied in Brussels and Barcelona.

As previously stated, there have been significant shifts in mobility trends over recent years, and these are likely to continue in the near future. There is a clear need for further research into how mobility patterns will evolve, the types of mobility changes that will occur soon, and how cities will adapt to these changes, particularly in relation to climate adaptation trends and open public space transformations. This research will help inform a clear political course that promotes the city, proximity and slow modes of transportation.

References

1. Baldasseroni, Louis, Etienne Faugier, and Claire Pelgrims. 2022. Histoire des transports et des mobilités en France. Histoire. Malakoff: Armand Colin.
2. Barbier-Trauchessec, Elodie, Aurélien Bigo, Frédéric Héran, Francisco Luciano, and Arnaud Sivert. 2022. 'Le nouveau monde des véhicules intermédiaires'. Transports urbains 141 (1): 3. https://doi.org/10.3917/turb.141.0003.
3. Bigo, Aurélien. 2020. 'Les Transports Face Au Défi de La Transition Énergétique. Explorations Entre Passé et Avenir, Technologie et Sobriété, Accélération et Ralentissement.' PhD Thesis, Institut polytechnique de Paris. https://theses.fr/2020IPPAX068.
4. Bigo, Aurélien. 2022. 'Quelle place pour les véhicules intermédiaires dans la transition énergétique des mobilités ?' Transports urbains 141 (1): 20–24. https://doi.org/10.3917/turb.141.0020.
5. Böhm, Steffen, Jones Campbell, Chris Land, and Matthew Paterson, eds. 2006. Against Automobility. Sociological Review Monographs. Malden, MA: Blackwell.
6. Business Insider, World Economic Forum 2016.
7. Calthorpe, Peter. 1993. The Next American Metropolis: Ecology, Community, and the American Dream. New York: Princeton Architectural Press.
8. Cunha, Isabel, and Cecília Silva. 2022. 'Equity Impacts of Cycling: Examining the Spatial-Social Distribution of Bicycle-Related Benefits'. International Journal of Sustainable Transportation 0 (0): 1–19. https://doi.org/10.1080/15568318.2022.2082343.
9. EEA. 2011. 'Urban Soil Sealing in Europe'. European Environment Agency. 19 January 2011. https://www.eea.europa.eu/articles/urban-soil-sealing-in-europe.
10. EEA. 2024. 'Transport and Mobility'. European Environment Agency. 19 January 2024. https://www.eea.europa.eu/en/topics/in-depth/transport-and-mobility.
11. Hebert, Jules, ed. 2022. Atlas Des Mobilités. Faits et Chiffres Sur Les Mobilités En France et En Europe. Paris: Heinrich Böll Stiftung - Paris.
12. Lannoy, Pierre. 1999. 'Un siècle de préoccupations routières. Regard sociohistorique sur le traitement des problèmes engendrés par la circulation automobile'. Recherche Transports Sécurité 65 (October):35–59. https://doi.org/10.1016/S0761-8980(00)88844-5.
13. Mom, Gijs. 2020. Globalizing Automobilism: Exuberance and the Emergence of Layered Mobility, 1900-1980. New York: Berghahn Books.
14. Moreno, Carlos, Zaheer Allam, Didier Chabaud, Catherine Gall, and Florent Pratlong. 2021. 'Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities'. Smart Cities 4 (1): 93–111. https://doi.org/10.3390/smartcities4010006.
15. Offner, Jean-Marc. 1993. 'Les « effets structurants » du transport : mythe politique, mystification scientifique'. L'Espace géographique 22 (3): 233–42. https://doi.org/10.3406/spgeo.1993.3209.
16. Sagaris, Lake. 2019. 'Gender, Transport and Health Studies Open New Horizons for Planning'. Journal of Transport & Health 14 (September):100618. https://doi.org/10.1016/j.jth.2019.100618.
17. Sheller, Mimi. 2018. Mobility Justice: The Politics of Movement in an Age of Extremes. London ; Brooklyn, NY: Verso.
18. Sheller, Mimi, and John Urry. 2000. 'The City and the Car'. International Journal of Urban and Regional Research 24 (4): 737–57. https://doi.org/10.1111/1468-2427.00276.
19. Sietchiping, Remy, Melissa Jane Permezel, and Claude Ngomsi. 2012. 'Transport and Mobility in Sub-Saharan African Cities: An Overview of Practices, Lessons and Options for Improvements'. Cities, Special Section: Urban Planning in Africa (pp. 155–191), 29 (3): 183–89. https://doi.org/10.1016/j.cities.2011.11.005.
20. Stokstad, Erik. 2020. 'Global Efforts to Protect Biodiversity Fall Short'. Science 369 (6510): 1418–1418. https://doi.org/10.1126/science.369.6510.1418.
21. Soriano-Gonzalez, Raquel, Elena Perez-Bernabeu, Yusef Ahsini, Patricia Carracedo, Andres Camacho, and Angel A. Juan. 2023. 'Analyzing Key Performance Indicators for Mobility Logistics in Smart and Sustainable Cities: A Case Study Centered on Barcelona'. Logistics 7 (4): 75. https://doi.org/10.3390/logistics7040075.
22. UITP. 2019. 'Mobility and the SDGs: A Safe, Affordable, Accessible and Sustainable Transport System for All'. Brussels: International Association of Public Transport - UITP.
23. POLIS. 2020. SUstainable Mobility Indicators - SUMI. https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/sumi_es.
24. European Commission. s.d. EU Urban Mobility Observatory. https://urban-mobility-observatory.transport.ec.europa.eu

Dwelling

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Introduction: Research questions and objectives
According to UN Habitat, "(...) *housing contributes directly or indirectly to the implementation of most of the UN Sustainable Development Goals*". Housing is one of the most fundamental human needs. Villages, towns and cities evolved to provide groups of people with safe places to live and access to everyday needs such as food, water and other resources: goods, tools, materials, etc. Slowly, these groups turned into societies. Over time, cities have become more specialised in terms of human activities (work, transport, services and recreation) and socially stratified (urban societies consisted of different economic classes, religious groups, etc.).

Human activities have defined the use of land and have spread unevenly across the territory, creating multifunctional, densely built and populated areas in some places and monofunctional, low-rise and loosely populated residential areas in others. In this way, what was once a relatively homogeneous and compact space has become a vast, heterogeneous, highly complex human ecosystem whose identity is determined by the relationships between spatial, ecological and economic dimensions.

The objective of this chapter is to explain how dwelling (or: housing) relates to landscape economy. We refer to urban landscapes, also referred to as townscapes or cityscapes. And our focus is on the following questions:

- What type of urban landscape form arises resulting from which type of social process?
- Which economic factors shape urban landscapes primarily?
- How might we govern urban development to preserve or even increase its quality and therefore also the value of the landscape?

The structure of the chapter is thus built up by the following issues:

- basic *definitions* distinguishing between the concepts of housing and dwelling, highlighting the social dimension of the urban landscape;
- the *components* of the urban landscape in static and dynamic terms, and the interrelationship between these components;
- the *location*, in terms of situating the place within the city structure, and its meaning for the economic value of the landscape;
- the *factors* influencing the character of urban landscape components. This includes the socio-political system, forms of ownership, stakeholders and environmental threats, amongst others.
- the *directions* of sustainable transformation and positive, constructive and regenerative transition pathways.

All the these considerations, supported by two study cases of new housing districts in Gdańsk in Poland, aim to assess the value of the urban landscape from a landscape economy perspective.

Dwelling and Housing: Definitions, approaches, references and current development trends

The concept of *housing* is usually understood by means of measurable infrastructure and goods: buildings. At the same time, these goods are understood as property and generally as commodities. But *dwelling*, and also *living* as a notion, are embedded in a much broader context. They relate to other components of the city, such as society, environment and all the complex life activities of the residents.

The term *housing* is a complex concept that has to be considered in the context of changing ideas of the nature of the city. Dating back to the mid-19th century, the tendency to give the city and its developmental dynamics the characteristics of a large-scale machine (as part of the fascination with the steam engine), influenced the definition of the modernist planning paradigm. In the ideograms of the functional city, implemented in accordance with the Athens Charter (CIAM, 1933), the concept of housing denoted a hierarchical system of functionally specialised neighbourhoods and residential areas, provided with basic social services (Clarence Perry's *neighbourhood unit concept,* 1928). Green zones separated them not only from the production and industrial areas, but also from the city centre. During the modernist period, the previously integrated concept of dwelling was narrowed down, resulting in mono-functional residential districts, popularly known as 'urban bedrooms'. These areas were designed with an awareness of the importance of the landscape and with favourable proportions and relationships between built and open spaces. During this time the term *urban landscape* was introduced and popularised (Bodenschatz et al.,2009).

However, the post-war European neighbourhoods that followed this concept in the form of huge, mono-structural, multi-family dwellings were a social failure. Accused of being "non-urban and therefore unhuman", they produced what has been described as the "large-scale housing syndrome", i.e. the creation of an environment threatened by the development of a spiral of social decline (van Kempen et al., 2006). This argument was one of a series of arguments against the city-machine paradigm, reinforced by the experience of the negative effects of urban sprawl, which cast a shadow of scepticism on the functional city concept and a general rejection of car-oriented urban development.

The decade of the 1980s put the belief in the effectiveness of the idea of programmatic specialisation and functional separation of urban districts on hold (Jencks, 1978). The search for new solutions led to a new understanding of the nature of the city. In the postmodern era of fuel crisis and growing ecological awareness a city came to be understood as an endless process, resulting in structures like living organisms with their own DNA codes. Housing, or the living environment, becomes a

more ecological habitat in which quantitative indicators do not dominate over qualitative ones. On the rating scale, universalism and standardisation swap places with individualisation and identity construction. The modernist emphasis on semi-rural green living is balanced with the dream of a return to urbanity, understood as living in mosaic-like, socio-spatially integrated urban neighbourhoods with perceptible local identities (New Athens Charter 1998, Leipzig Charter 2007)

Maintaining a balance between improving existing urban districts (compact city, smart growth) and limiting urban sprawl in favour of high-quality inevitable suburbanization (net-city, region-city, in-between-city) puts the topic of urban landscape in a central place of contemporary city planning and management processes. In this approach, housing is expected to take place as a component of integrated urban transformation led by a holistic approach to city planning.

Revitalising, restructuring and improving already urbanised areas are knowledge based processes recognizing both technological and social changes. The city as a network of data and spatial energy complexity (Smart City) is the current challenge. Not so much for building and improving existing housing, but for new models of communities and neighbourhood communities (Pact of Amsterdam, 2016; New European Bauhaus).

Components of the urban landscape

Adopting an understanding of the city as a living organism introduces new concepts into the planning toolbox, opening up a wide range of analysis and design methods. Prominent concepts are *urban morphology*, which deals with the static elements of the urban landscape, and *urban metabolism*, which describes the changing processes and phenomena that occur within the city as it interacts with the climate and the wider environment.

Both of these problem areas, tracing cities as *urban tissue*, fall within the spectrum that seeks objective, tangible and measurable characteristics that are also recognisable for defining economic dimensions. However, understanding the economic aspects beyond the classic assessment of the market value of a property in a given location involves a number of aspects referred to as unmeasurable, intangible, elusive (relative) characteristics. These can only be approximated on the basis of often subjective analyses. In the context of housing development, there are two problem areas to be mentioned here: the form of the urban landscape (urban design) and the sphere referred to as 'genius loci', which integrates many cultural aspects, such as cultural heritage, in an individual way. While the former is analysed and designed according to the current paradigms of spatial composition, the latter must be seen as a phenomenon that escapes criteria, often an ephemeral phenomenon caused by and linked to social or psychological aspects (environmental psychology).

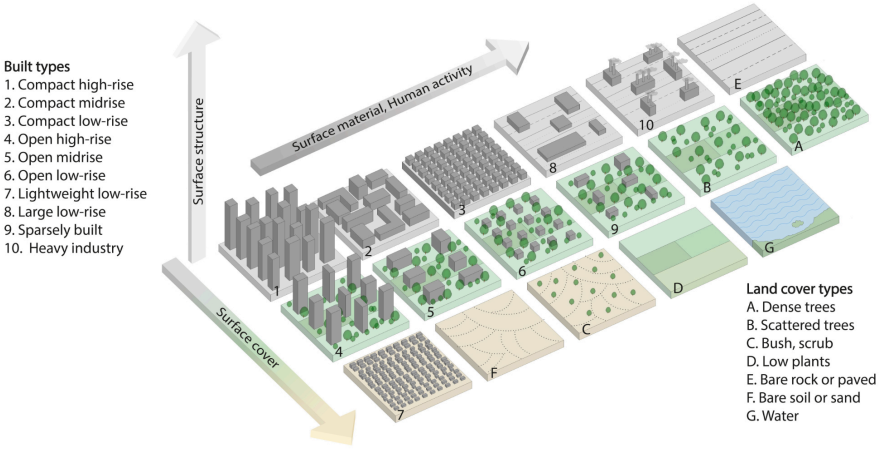
	ANTROPOGENIC	NATURAL
STATIC	Buildings Technical infrastructure	Water reservoirs Plants Soil
DYNAMIC	Human flow Transport Energy	Climate Energy Animals

Components of the urban landscape. *Source: authors*

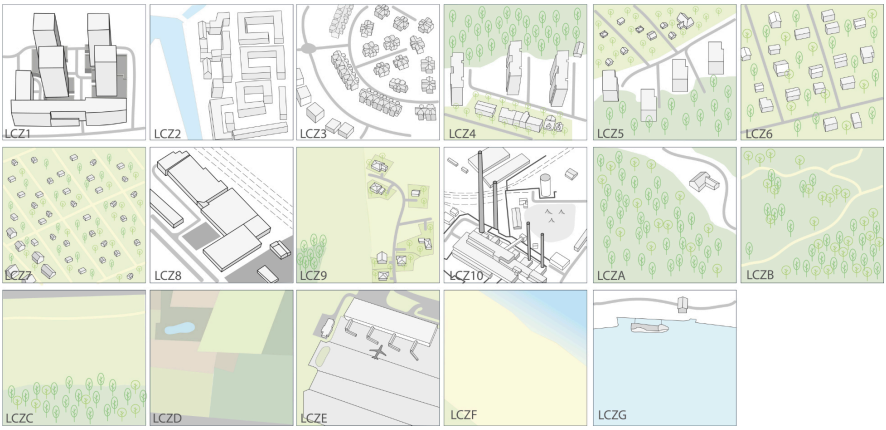
Housing structures, seen as urban landscapes, consist of *static* elements, resulting from the topography of the land, *fixed* landscape elements (embedded), and those *introduced* into the landscape by human activity (anthropogenic infrastructure). It should be remembered that the voids between the built elements are also structural and functional features of the landscape. They can be considered as open space and biologically active greenery, more recently defined as blue-green infrastructure, or as space-filling (void). The urban landscape structure is a kind of construction (frame, wrap) for metabolic urban processes (circulations, flows, relationships) generated firstly by nature in numerous local urban ecosystems – climatic factors (wind, temperature, humidity, dust), water cycles, renewable energy – and secondly as a result of human activity – flows of people, goods, communication, non-renewable energy, etc. (see matrix above). When describing an urban landscape, one can use the analogy of comparing a city with a computer system, where the urban morphology could be consideres as the hardware and the city's metabolism could be considered as the software.

Interaction between the components

The components of the urban landscape remain in a certain relationship to each other. They depend mainly on the predominant functional use of the buildings on the site (e.g. residential, commercial, industrial) and on the prevailing morphology and density of development. These relationships are well reflected in the Local Climate Zone (LCZ) typology, originally developed for climate research (Oke et al., 2017). It considers different types of urban and peri-urban land use on the basis of variations in the type of development, i.e. the anthropogenic elements of the landscape, and land cover, i.e. the natural elements of the landscape (compare figure on the following page). The different LCZs are characterised by similar building types: compact or open, with a distinction between high, medium-high and low, as well as low light, low large-scale and heavy industry (figure on following page). Each is associated with a specific type of technical infrastructure, utilities and energy supply, as well as a specific human activity, expressed in terms of their number, transport needs, thermal load on the buildings, etc. The design and use rules for buildings of a particular typology affect the



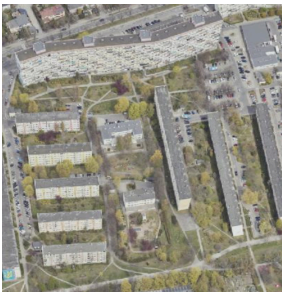
Typology of Local Climate Zones (LCZs) according to Steward & Oke (2012). Source: Authors based on Steward & Oke (2012)



Samples of the morphology of individual LCZs for the city of Gdańsk. Source own based on https://obliview.brg.gda.pl

Examples of medium-rise compact buildings in Gdańsk. On the left: buildings in the medieval urban tissue of Gdańsk; in the middle: 19th century quarters supplemented by contemporary buildings; on the right: post-socialist housing estate designed according to the principles of modernism. *Source: https://obliview.brg.gda.pl*





size of the space between them and therefore the possibilities for land cover with natural elements - high, medium and low greenery and water bodies. Each of these types results in a different type of landscape. Obviously, this approach is still somewhat simplistic, as each of these zones with a specific prevailing density may have a different kind of urban and architectural design solution and style, resulting in changes in both the local urban metabolic pattern and the assessment of landscape economy indicators.

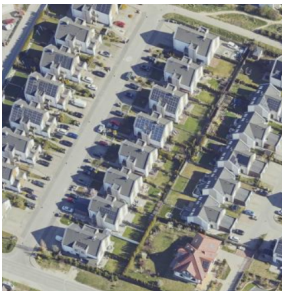
These differences can be explained by comparing two common housing types found in any large city: the medium-rise compact development type (LCZ2) and the open low-rise development type (LCZ6).

Medium-rise compact buildings are characteristic of historic city centres, inner cities and neighbourhoods adjacent to inner cities (see figure above). This typology is also increasingly appearing in suburbs as a cheaper alternative to locations closer to the centre. It is an example of efficient use of land and technical infrastructure. Residents have good access to services, public spaces and public transport. It is a characteristic of the compact city model, in line with the sustainable development idea of making the best possible use of land already occupied by the city rather than occupying new land. However, this type of development offers little opportunity for the introduction of natural elements and biodiversity as much of the land, even when not occupied by buildings, is paved (e.g. roads, car parks, access routes). Areas developed in this way are prone to overheating in summer, and it is difficult to provide smooth ventilation, which contributes to the urban heat island phenomenon and air pollution.

At the same time, buildings can shade each other, limiting the access of daylight to buildings and urban interiors. The perception of the landscape of compact medium-rise developments is primarily related to the spaces of streets and squares created by the buildings. Anthropogenic elements - buildings, pavements, landscaping elements definitely dominate over natural ones. Residents' contact with nature and their access to open views in the immediate surroundings of buildings is limited.

Examples of low-rise open buildings in Gdańsk. On the left: a single-family housing estate on the edge of the forest, in the middle: a chaotic single-family development with small garden crops in the vicinity of a transit road, on the right: a contemporary development estate; *source https://obliview.brg.gda.pl*





Low-rise open development is typical of suburban zones (figure above). It is the realisation of the dream of a house with a garden, chosen mainly by families with young children, people who prefer to live close to nature. Although it is an expression of a pro-ecological approach to the lifestyle of a certain group of people, it is not the realisation of the idea of sustainability from the point of view of the city as a whole, as it is associated with very low land use efficiency and the threat of urban sprawl. In this type of landscape, it is the natural elements that prevail over the anthropogenic ones, creating wide open views. The microclimate that prevails there is favourable for residents, free from many of the problems found in highly urbanised zones. However, these types of settlements tend to be built at the expense of agricultural or environmentally valuable land, they result in the need to build new technical infrastructure, and poor access to services, public spaces and public transport increases the burden on individual transport throughout the city.

The differences between the two types of development described here can therefore be considered not only in terms of landscape characteristics, but also in terms of the opportunities and constraints they offer to residents and their impact on the sustainability of the city as a whole. The LCZ typology allows the different types to be described in terms of measurable parameters (Oke et al., 2017). These include building intensity and height, factors characterising the geometry of urban interiors (e.g. sky view factor, aspect ratio H/W), percentage of undeveloped and biologically active area, heat storage capacity, surface albedo, anthropogenic heat load and many others. In each type of LCZ, these parameters fall within specific ranges. They help to quantify and therefore assess and compare different types of phenomena (e.g. energy, climate, human flows, functional capacity, natural potential, etc.), but they do not express all landscape characteristics. Indeed, within the same type of urban landscape, examples with different visual impact can be found. Depending on the features of the urban composition, the quality of the architecture, the arrangement of greenery, the development of public spaces, different effects can be achieved in terms of aesthetics, the rendering of the identity of a place, the impact of interiors on the well-being of users, i.e. features that cannot be directly and absolutely parameterised.

On the left: view of the residential buildings in the Garnizon district (mid-rise) in the centre of Gdańsk;
on the right: similar morphology of buildings (mid-rise) located on the outskirts of Gdańsk, next to the large shopping mall.
Source: https://obliview.brg.gda.pl

The urban context: Importance of an area's location in the urban structure and its meaning for the economic value of the landscape

The urban morphology, as well as its aesthetics and harmony, are significant factors in determining the perception of a city's landscape and its value. However, it is not the only factor. Another leading key factor is the *urban context*.

This includes:

- the *location* of the area within the city structure (center or periphery)
- *accessibility* to transportation and services (e.g., near a train station, near a tram/metro/bus stop, next to mobility node, near a shopping centre, near a health clinic, school);
- the *proxomity* to biologically active natural elements (e.g., by the sea, next to a park, near a forest, overlooking greenery)
- the *relation* to other land uses (e.g. close to an industrial district, next to a factory, in vicinity of a shopping centre)
- the idea of a *"good neighbourhood"* or "neighbourhood with appropriate social profile" (e.g., quiet neighbourhood, active local community).
- The *identity of the place* and its history (e.g., in the old town, dock district, near the old market)

The greater the number of the above-mentioned factors, usually positively perceived by residents, the greater will be the real estate appraisal of the area, but also usually the greater will be the intangible value and positive perception of the urban landscape, for example, as more cohesive, harmonious and healthier.

The location of different urban landscapes depends on different natural, social and economic conditions. One of the most important triggers and tools for defining the location of a particular urban landscape is the city's planning policy and the designation of suitable areas for different activities. Land use, which co-defines the character of the urban landscape, is governed by Local Development Plans (LDPs), the provisions of which can also significantly influence the value of the landscape.

The value of the urban landscape is therefore a result of the land use, the urban morphology (understood as a set of physical parameters of a group of buildings) and the urban context, which indicates a relationship between these buildings and the surrounding environment.

Driving forces affecting the components of the urban landscape

The components shaping urban landscapes, as discussed above, depend on a variety of driving forces that are often in conflict with each other. The driving forces that shape built-up areas influence both local activities (bottom-up, carried out by spontaneous groups of people, NGOs, neighbourhood authorities) and top-down activities (decisions by the EU, state and municipal authorities).

Decisions on spatial transformation often create a clash of interests among many actors, communities and stakeholders. The effective involvement of all relevant actors in the process of urban landscape transformation depends to a large extent on the local political and economic conditions (including the socio-economic system).

One phenomenon that needs to be taken into account in the design of urban space, especially today, is the impact of environmental threats. Thus, the main driving forces shaping urban landscapes are: society and its cultural, technological, socio-economic level of evolution, and the natural environment in which the society is living. This includes: geographical location, climatic zone, access to water and natural resources. In the further, we describe three of these important driving forces (socio-economic system, stakeholders, environmental threats) in more detail.

Socio-economic systems

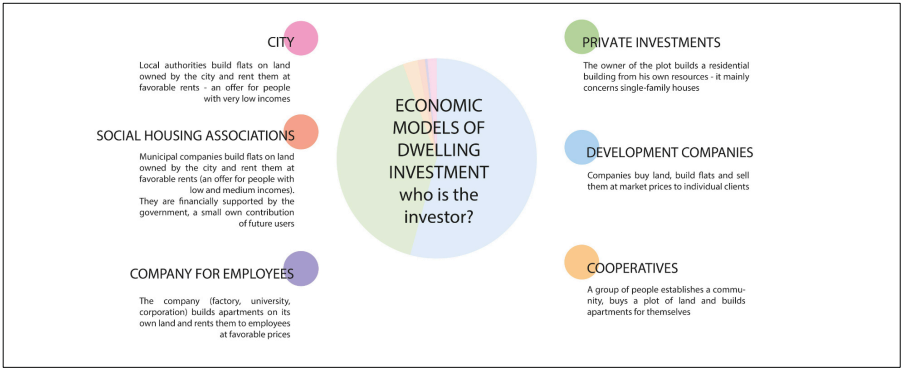
The development of urban areas varies according to the socio-economic system. The economic system determines, amongst others, the ownership structure of the land (Goráwski et al.) and thus strongly influences the urban landscape. Throughout history, the urban landscape has reflected changing economic systems - from feudalism in Europe, through capitalism in the 19th century, capitalism in the 20th century in Western Europe and socialism in Eastern Europe, to contemporary neoliberal capitalism. Three of the latter systems, each with a different approach to ownership of land and housing, are discussed in simplified terms below.

The capitalist system: Private property is key to this system, but it is not the only form of property. The economic system is a market economy in which individual entities are guided by their own interests. Real estate is a commodity whose price is regulated by the market. What is important here is competitiveness between entities from the same industry. In a market economy, construction develops in line with the expectations of developer companies, i.e. it aims to obtain the highest possible profit from real estate. The government and municipality interferes little in the functioning of individual market sectors, while supporting entrepreneurs through relevant institutions. This is done by increasing the density of buildings, limiting recreational areas in favour of development, and using existing services in the vicinity. At the same time, the architectural form,

construction standard and choice of location are competitive. Private apartments dominate among the forms of real estate ownership, often constituting a type of financial investment, some of them are available for rent (Pietrzak, 2018). Housing allows for a wide variety of different forms of buildings and their urban composition. Usually, the space left for recreation and greenery in cities is limited, as its maintenance is rather costly. However, the important place in these cities is the concentration of services (streets, malls) and Central Business Districts (CBDs).

Socialist system: Goods such as means of production and real estate belong to the general public. It should be noted that each state in a socialist system solves the question of private ownership of housing differently. For example in Poland private ownership of land existed all the time during the socialist period from 1945-1989. The dominant form is the centrally planned economy (Stec, 2001). There is no free market and therefore no competitiveness. The housing economy is implemented through housing cooperatives or company cooperatives. Due to the usually high demand for relatively cheap housing, a rapid increase in the supply of housing is sought through the use of modular construction and prefabrication of building elements. This often results in little spatial differentiation of architectural forms and highly functional, albeit small dwellings. The space accompanying the housing complexes is shared and belongs to the whole community. Therefore, the composition of housing complexes has extensive green and recreational spaces and provides access to services, especially social services such as schools and kindergartens. However, communal spaces are not always properly cared for, if lacking a defined host-manager (Stryjakiewicz et al., 2014).

In recent decades, the dynamic **neoliberal system,** which assumes minimisation of the state's influence on entrepreneurship (strong private property rights, free trade and markets), has had a particularly dramatic impact on the urban landscape, as we observe it here in the case of Poland. The process of transformation of the socialist system into the neoliberal one was noticeable especially in Central and Eastern Europe and was manifested in changes in the model of ownership relations and the living environment. Over a long period of time, this system has led to the disappearance of the public sector importance in housing, to an increase in the freedom to shape space and social stratification in the city space. Changes were also made through the reorganisation of the legal order, the spatial planning system and the privatisation of housing resources and public infrastructure (Drozda, 2016).



Different types of investors in the city while building housing estates. Source: authors

Stakeholders and interest groups

As can be seen from the characteristics of socio-economic systems, the essence of the difference between forms of development is the type of ownership and, consequently, different methods of management (figure above).

There are three basic forms of ownership (Matel, 2019):

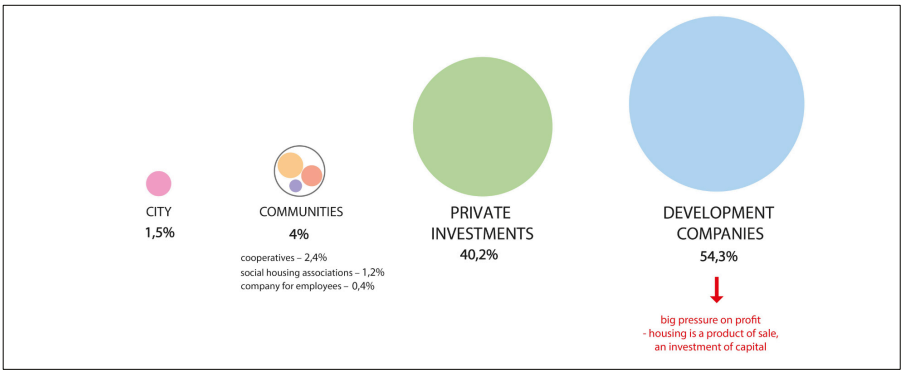
- private
- public (state, municipal)
- social, in the sense of being intermediate between private and public

Private property is in the hands of individual investors, e.g. physical persons or developers, but ownership in the form of a cooperative is also possible. Private investors are, for example, physical persons who decide to build or purchase real estate for the purpose of using it (living, renting). This situation most often occurs with private investors who build single-family houses on their own plot of land.

A developer is usually a company owned by one person or a group of private investors, which, under a purchase and sale agreement concluded with end users (target residents), carries out large construction investments. The aim of such a project is to sell apartments, which are treated as goods. Residential premises are a product sold according to established price rates, usually calculated from one square meter of usable floor ratio area.

Cooperatives are also possible, in which a group of private investors buys a building plot together and, limiting investment costs as much as possible, often uses their skills and implements a construction investment for their own needs. In this case. the builders are also the target recipients, the residents.

Another type of investment is that of a social nature. They are intended for low-income users. Here, the investor is often the city authority, which provide housing in the form of support for those most in need by means of municipal apartments. City authorities can also implement residential investments in urban areas with the help of associations, in the case of Poland this is, for example, the Social Housing Society (pol. Towarzystwo Budownictwa Społecznego - TBS). In the case of TBS construction, partial financial contribution of future residents is required for the



The percentage share of various types of housing investments in Poland in 2014. *Source: authors, based on Twardoch (2014)*

According to EUROSTAT research, 70% of the EU population lived in their own household in 2020, with the remaining 30% living in rented accommodation. The highest proportions of owner-occupiers were observed in Romania, where 96% of the population lived in a household that owned its dwelling, followed by Slovakia (92%), Hungary and Croatia (both 91%). In Germany, half of the population lived in an owner-occupied household and half in a rented household.

The lowest proportions of home ownership were found in Austria (55%) and Denmark (59%). Thus, the majority of dwellings in Europe are privately owned in post-socialist countries (compare figure above), while renting is much more popular in countries with a continuing tradition of a capitalist economy. For example, in Poland, a post-socialist country, in 2024, municipal property accounted for 1.5% of the total, various forms of community ownership (cooperatives, social housing and corporate housing) accounted for 4%, privately owned property accounted for 40.2% and 54.3% was owned by various development companies, which treated property as a product for sale and a capital investment to increase profits (Twardoch, 2017).

An important driving force behind the development of built spaces are therefore stakeholders, i.e. those who are interested in implementing housing investments. Regardless of the political system or economic development of a given country, they can be divided into users and the team implementing the initiatives and belonging to one of these groups does not exclude belonging to the other (Twardoch, 2017). Users include the local community, these are: owners, residents and the people working there. The second group are the initiators of change who commit their financial resources, such as: investors, city authorities, local authorities, national authorities, but also the European Union. Each group discussed has slightly different interests, which is why they sometimes come into conflict with each other.

Environmental threats

Factors influencing the development of built-up areas also include the policy of adapting cities to climate change. This policy forces the search for new, more ecological technological solutions than those previously used and the adaptation of construction to new environmental conditions. An example of such action is changing the heating system of apartments

so that the material structure itself has the highest possible insulation parameters to reduce heating costs and CO_2 emissions. For this purpose, solar energy (photovoltaic panels), wind energy (wind farms) or energy from the ground (heat pumps) are used amongst others. To use the advantages of a place, such as sunlight, it is necessary to know the geographical features of a given location. On the other hand, the existing resources in the form of existing housing infrastructure require adaptation to new technical parameters. That is why facades are insulated, windows and heating systems are replaced. Carefully selected species of greenery are also introduced to absorb harmful dust and shade street spaces in order to avoid the phenomenon of urban heat islands. It analyses the shading and sun exposure of facades, sometimes introducing intelligent panels, etc. Reusing existing buildings and avoiding CO_2 emissions generated by new construction is another very relevant paradigm shift emerging now.

Directions of sustainable transformation and positive transition pathway

In developing cities where population growth is forecast, the housing sector is successively expanded. This is influenced by housing needs and the attractiveness of apartments as a capital investment. Lack of control over the process of introducing new buildings in cities and transforming existing ones may result in urban sprawl on the one hand, and excessive development intensity on the other. Both phenomena pose environmental and social threats. Guidance on the desired directions of transformation is provided by the UN Sustainable Development Goals (SDG) and the provisions of the European Green Deal (EGD) by the European Commission. A large part of the points included in the EGD are directly (e.g. making homes energy efficient) or indirectly (e.g. protection nature, from farm to fork, eliminating pollution, ensuring a just transition for all) related to housing. The necessary change suggested by these goals can be synthetically described by three lines of action in relation to anthropogenic and natural components of the urban landscape.

Firstly, it is postulated to increase the quality of anthropogenic elements. The emphasis on quality rather than quantity results from environmental threats and the need to reduce the strictly consumer and investment oriented approach to the resource that is housing. Therefore, we should strive first to make better use of this resource, not to multiply it. Increasing the quality of buildings and technical infrastructure involves:

- increasing energy efficiency and reducing the environmental footprint
- increasing the functionality and aesthetics of buildings
- resource recovery – adapting existing buildings to new functions
- development of public spaces, increasing the urban quality.

These changes should be guided by the goal of social justice postulated by the EGD. It implies the postulate of inclusiveness and accessibility of public spaces regardless of various types of limitations (economic, physical, age, etc.) and the need to introduce a housing policy that promotes the economic availability of housing.

The second visible direction of changes consistent with the EGD is the increase in the quantity of natural elements, which is expressed as:

- protection of undeveloped areas, including existing elements of blue-green infrastructure
- increasing the biologically active area at the expense of paved areas
- introducing new green areas, green roofs and walls, retention reservoirs, etc.

The third direction is to increase the quality of natural elements. A very good tool for assessing this quality is the theory of ecosystem services, which talks about four types of roles played by elements of nature: supporting, provisioning, regulating, cultural (Yeang, 2008).

The great advantage of this theory is the integration of natural and cultural dimensions into a common system of values. Increasing the quality of natural elements involves increasing the effectiveness of the roles, i.e. the range of ecosystem services that the same elements can perform.

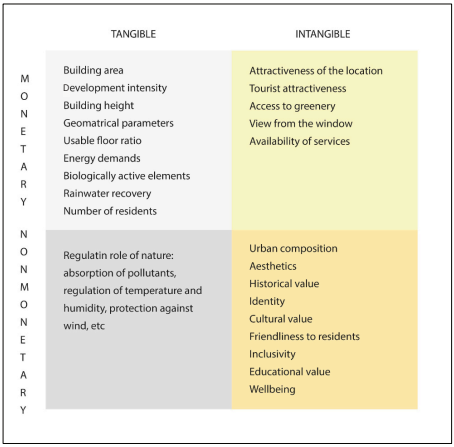
It may involve:

- increasing biodiversity
- on-site management of rainwater
- using the climate-forming role of greenery and water
- increasing the opportunities for residents to grow plants, including edible plants
- creating green places conducive to social and neighbourly contacts, supporting well-being, increasing the aesthetics of these places, supporting their educational role.

How to assess the values of a housing landscape

The value of the housing landscape consists of many elements. Some of them are quantitative and can be measured, and some are elusive and impossible to parameterize. Typical measurable parameters include those related to the geometry of permanent landscape elements, i.e. volumes, surfaces and dimensions. A large part of them, for example land area or apartment area in a given location, can be directly translated into monetary value.

However, many features of the urban landscape related to measurable geometry remain elusive and incalculable. For example, the compositional quality of urban space has neither an appropriate indicator nor a price, even though it results from dimensions and proportions, i.e. measurable parameters. Its value can be estimated indirectly, for example by the higher price of real estate in a given place that people are



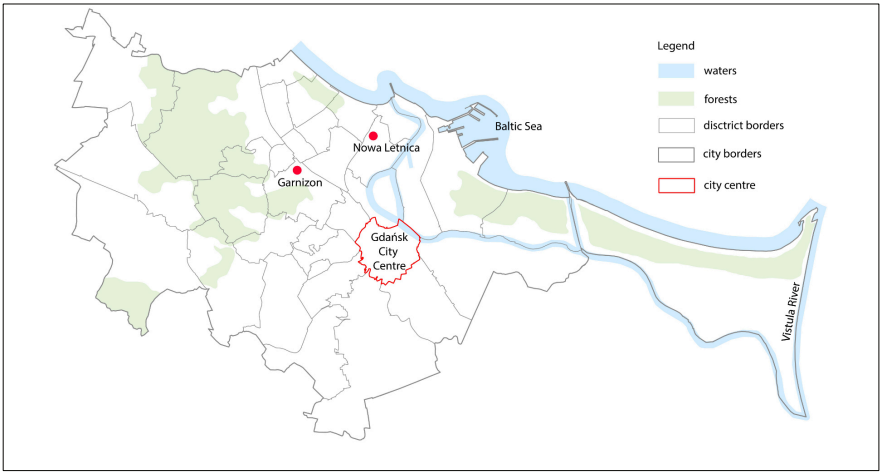
Tangible and intangible values of a housing landscape.
Source: authors

willing to pay or the popularity of a given place expressed by the number of visitors or images posted on social media.

Other types of value that are difficult to fully parameterize and evaluate are elements of nature in the city landscape. The value of, for example, one tree can be estimated based on various components, such as the profit from the fruit it can bear, the amount of pollution it can absorb, the energy savings its shade can provide, or a measure of stress reduction for people within its reach. A more or less accurate quantitative assessment of these components is possible, although it requires interdisciplinary expert knowledge. This certainly makes it easier to estimate the value of a tree, but it is still not enough for this value to compete with such economically strong, easy-to-value elements such as a parking space or a square metre of a building. It is also important to ask: Who uses the given values? Who pays for them? What is the time horizon of profit?

It is often the case that investment profits are achieved by a small group of people, and the general public is responsible for the environmental (including landscape) consequences of the investments from which others have gained. For example, the cost of counteracting unfavourable climatic phenomena resulting from overloading the area with buildings and technical infrastructure is not borne by those who benefited from their construction and sale, but by city authorities financed by taxpayers. Current economic models are not able to fully capture the values of the housing landscape, and the evolution of these models towards social justice and valuing environmental issues remains one of the most important contemporary challenges. It is even more important to look for tools to fully assess the value of the urban landscape. This process is progressing, although many aspects still remain elusive. The figure above is an attempt to capture the current state of knowledge about the parameters and the possibility of assigning them monetary values.

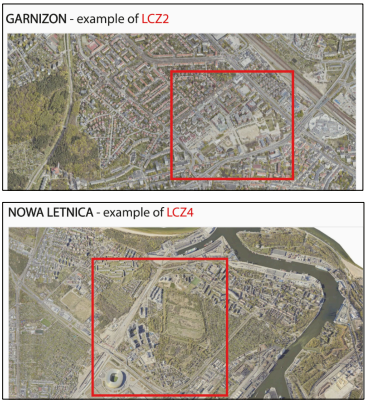
Localization of the districts: Garnizon and Nowa Letnica in Gdańsk. *Source: authors*



Study Cases in Gdańsk: Garnizon and Letnica

The two case studies located in the city of Gdańsk, Poland, have been described in this section as different images of a city, two different examples of physic-morphological urban features and two different approaches to the urban landscape. These are: Garnizon estate (the Garrison) in the district Wrzeszcz and Nowa Letnica (the New Letnica) estate in the district Letnica.

A description and comparison of both case studies is based on: quality of public space, culture, relation to natural landscape. These districts represent two different examples of physic-morphological urban features – Local Climate Zones: LCZ 2 AND LCZ 4, described earlier.



Physic-morphological urban features, Local Climate Zones: LCZ 2 - Garnizon and LCZ 4 – Letnica.
Source: https://obliview.brg.gda.pl

General view of the district Wrzeszcz in Gdańsk including the Garnizon neighbourhood. *Source: photo by Ł. Bugalski*

Garnizon

Garnizon (the Garrison) is a multifunctional development complex in the centre of Wrzeszcz district in Gdańsk (see previous page and figure above), located in the area of the previous Prussian military garrison. The project, executed to the plan selected in a competition, is staged and still needs to be completed. The ultimate goal of the concept was to create an open, multifunctional and buzzing city area with a rich service offer, densely developed and diverse, set in meticulously designed public space. This housing estate is also an example of compact mid rise urban tissue and a good approach to the revitalization of post-military areas in the inner city. This is also one of the most popular districts on the real estate market in Gdańsk. Garnizon has been developed by one local developer with an ambition to create a vivid and integrated part of a city in order to create a new city image.

Varied functions of the Garnizon are grouped in zones, and they are: offices in the eastern part of the area, housing and services units on the western side, and culture and recreation dominating in the southern side of the neighbourhood.

Among many different ecosystem services in the district, the cultural one are very important:

- high aesthetic values
- DNA of a place: cultural identity and heritage
- recreation and tourism
- vivid public space system.

Also, the quality of the following anthropogenic factors is important:

- buildings and their infrastructure,
- emphasis on modernisation and revitalisation,
- changing the functions of buildings rather than arising new ones,
- accessibility of public spaces and services (architecture and urban planning),
- high aesthetic values.

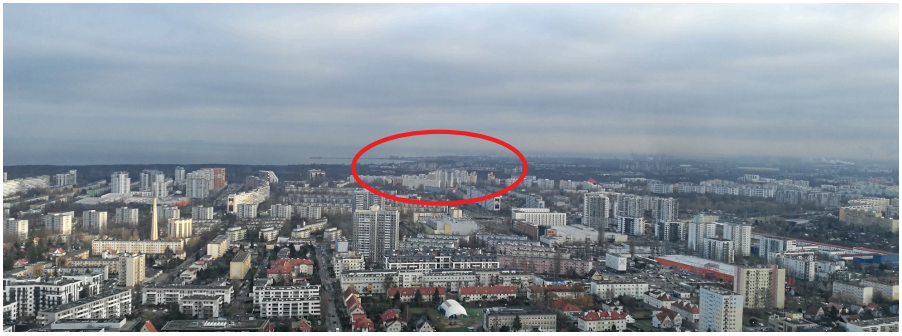
Public areas and green squares in Garnizon. *Source: M. Rembeza*

The public space system at Garnizon (see pictures above) is planned so as to blend it with the urban fabric of the surrounding area. The composition is crowned with squares and parks which open views of the estate and scenic axes which penetrate its expanse to bring historic structures into view.

Nowa Letnica – New Letnica

Our second case study is Nowa Letnica (New Letnica) in the Letnica district in Gdańsk (see figure below). The general function of this new housing estate is a multifamily housing area. The design is based on urban quarters with semi-public, recreational space inside. The local Climate Zone is 4 LCZ4.

This new district is located in a very demanding context. The Old Letnica neighbourhood dates back to the second half of the XIX century. This is an industrial and post-industrial district with factories and industrial plants (glassworks, steelworks), the brick, small scale housing units are under the process of revitalisation.



General view of New Letnica development. *Source: K. Krośnicka*

Old Letnica neighbourhood. *Source: M. Rembeza*

Ecosystem services in the Nowa Letnica district in relation to cultural values are:

- debatable aesthetic values
- no strict relation to DNA of a place
- recreation and tourism because of the close proximity to the Baltic Bay
- semi-public space system.

New Letnica (see also aerial view) has a debatable functional and aesthetic quality and limited accessibility of public spaces and services (architecture and urban planning). The concept of semi-public spaces is combined with water and green space design but unfortunately, these elements cannot fully balance the high intensity and building height of the new housing development.

Comparison of Garnizon and Nowa Letnica

When comparing the two case studies, it is important to stress that Garnizon was developed by one local developer. The ecosystem services in the area are more extensive and diverse, and it is a very good reference to the DNA of place: integrating the old, post-industrial part into the whole concept of a multifunctional neighbourhood. The district has a well-developed public space system. Overall, Garnizon is creating a strong, new city image connected with a context of a place and its history. In the case of Nowa Letnica the global developer was responsible for the whole concept.

Ecosystem services are less extensive and public, semi-public spaces are less connected with the general system of public space in the close neighbourhood of an area. There is no reference to the DNA of the place, the so-called "old" part of the Letnica district, which are the brick, small scale housing units. Nowa Letnica is creating a new city image more connected to the rapid urban development, rather than the DNA of a place, pointing the disturbing direction of development of new residential areas in Gdańsk.

Conclusions

Important driving forces shaping the urban landscapes are emerging from a society with a certain level of cultural, technological and socio-economic development, and the natural environment in which that society lives. Factors with particularly strong influence on the contemporary and historic urban landscape include the socio-economic system, the investment processes and the way in which stakeholders are involved, as well as design and planning paradigms that to some extent reflect available technology and knowledge, and environmental risks. The economic system determines, among other things, the structure of land ownership, which is the backbone of all urban investment. Throughout history, the urban landscape has reflected changing economic systems and social relations (from federal, capitalist and socialist systems to modern neo-liberal capitalism). The resulting urban governance and investment processes have defined the actors involved in shaping the urban fabric. The urban landscape has also changed with urban planning paradigms (e.g. modernist, postmodernist, contemporary), which were taking a very different approach to shaping the morphology of cities and were based on different design and aesthetic assumptions. Finally, by adapting to local natural conditions (surface topography, climate, natural disasters), urban landscapes have also reflected site-specific functional and spatial solutions and building forms not found elsewhere.

The physical (tangible) components of an urban landscape are static elements (such as land, buildings, transport and energy infrastructure, green and blue infrastructure) and dynamic elements (including flows of people, energy, freight, air masses, water). These components can also be divided into anthropogenic and natural, depending on their origin. The physical components of the urban landscape have a different character depending, amongst others, on the functions they perform. The layer of physical components is overlaid by a layer of intangible components resulting from psycho-social factors typical of people living in cities, such as cultural layers, perception of space, collective memory, biophilia, network of associations. Intangible components are important in creating the so-called 'genius loci' of a place. Only the combination of these two layers (tangible and intangible) allows us to assess the value of a cityscape. However, the intangible components are largely unquantifiable and the dynamic components are extremely difficult to determine due to the need for large databases.

The value of an urban landscape is a result of the function of the land and buildings, the morphology of the development, the aesthetics and spatial order of the development (including the urban composition), and the context of the place, which indicates the relationship between the components of the townscape and the surrounding environment. It is therefore a complex set of factors, both quantifiable

and non-quantifiable, which can only be fully determined by expert judgement over many years.

The measurable indicators that we currently use to characterise urban landscapes are primarily physical quantities that define the parameters of the landscape components and their interrelationships, such as building footprint, building intensity and height, biologically active area, factors that characterise the geometry of urban interiors, e.g. distances between buildings, sky view factor, but also heat storage capacity, surface albedo, anthropogenic heat load and many others. These relationships determine, among other things, the type of urban morphology and are well reflected in the typology of Local Climate Zones (LCZs).

The components of the urban landscape interact to form subsystems of the urban landscape at different scales (landscape patches), such as zones, settlements, neighbourhoods, districts, suburbs, and metropolitan areas. In assessing these landscape units, it is again important to consider their relationship to the surrounding environment. Irrespective of scale, therefore, townscape units should be assessed in the context of their surroundings.

References

- HABITAT. 2021. Housing and the Sustainable Development Goals The transformational impact of housing https://www.habitat.org/sites/default/files/documents/Housing-and-Sustainable-Development-Goals.pdf (26.06.2024).
- Haccoû H., Deelstra T., Krośnicka K., Dol M., Kramer M. et all, 2007, MILU guide. Handbook for Multifunctional and Intensive Land Use, Habiforum Fundation, Gouda, ISBN/EAN: 978-90-806647-5-3, 1-87.
- Living conditions in Europe – housing https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Living_conditions_in_Europe_-_housing#Key_findings (10.01.2024)
- Mumford, Eric (2000). The CIAM Discourse on Urbanism, 1928-1960. The MIT Press.
- Perry, C. 1998 The Neighbourhood Unit (1929) Reprinted Routledge/Thoemmes, London, 1998, p.25-44
- Bodenschatz, Düwel, Gutschow, Stimmann: Berlin und seine Bauten. Hrsg.: Architekten- und Ingenieur-Verein zu Berlin. DOMA, Berlin 2009, ISBN 978-3-938666-42-5.
- van Kempen, R.; Murie, A.; Knorr-Siedow, T.; Tosics, I. Regenerating Large Housing Estates in Europe: A Guide to Better Practice; Urban and Regional Research Centre: Utrecht, The Netherlands, 2006.
- Jencks, Charles (1978). The Language of Post-modern Architecture. Balding and Mansell Ltd.
- Report of the World Commission on Environment and Development: Our Common Future (PDF). United Nations. p. 16.
- New Athens Charter 1998; https://archive.ectp-ceu.eu/ectp-ceu.eu/images/stories/download/Athens-Charter-1998.pdf (22.06.2024).
- Leipzig Charter 2007; https://urbact.eu/knowledge-hub/leipzig-charter (26.06.2024).
- Pact of Amsterdam 2016 Pact +; https://ec.europa.eu/regional_policy/sources/policy/themes/urban-development/agenda/pact-of-amsterdam.pdf (12.06.2024).
- New European Bauhaus; https://new-european-bauhaus.europa.eu/index_en (11.07.2024).
- Oke T.O., Mills G., Christen A., Voogt J.A, Urban Climates, Cambridge University Press, Cambridge 2017.
- Górawski B., Wendt J. A., Polityczne uwarunkowania kształtowania krajobrazu miasta [in:] https://ecir.kz/assets/docs/JINS%201%281%29%202019.pdf#page=30 (16.03.2024).
- Pietrzak M., Własność wspólna w kapitalizmie, [in:] Ząbkowicz A., Miszewski M., Chmielnicki P., Czech S. (ed.) Zrozumieć kapitalizm. Podejście ewolucyjno-instytucjonalne, z przedmową Geoffrey'a M. Hodgsona, Forum Myśli Instytucjonalnej, Sosnowiec-Kraków, 2018, pp. 107-120.
- Stec P., Reprivatisation of Nationalised Property in Poland [in:] Elizabeth Cooke (ed.). Modern Studies in Property Law. Bloomsbury Publishing. pp. 357–360.
- Stryjakiewicz T., Męczyński M., Stachowiak K., Role of creative industries in the post-socialist urban transformation, QUAESTIONES GEOGRAPHICAE 33(2), 2014, pp.19-35
- Drozda Ł., Własność w modelu neoliberalnym na przykładzie polskiej przestrzeni zurbanizowanej po 1989 roku, Studia Regionalne i Lokalne Nr 4(66)/2016 https://studreg.uw.edu.pl/dane/web_sril_files/573/2016_4_drozda.pdf (14.01.2024)
- Matel. A., Czynniki różnicujące status mieszkaniowy gospodarstw domowych w Polsce [in:] https://repozytorium.uwb.edu.pl/jspui/bitstream/11320/8742/1/A_Matel_Czynniki_roznicujace_status_mieszkaniowy_gospodarstw_domowych_w_Polsce.pdf (16.01.2024).
- EUROSTAT https://ec.europa.eu/eurostat/web/products-eurostat-news/-/wdn-20211230-1 (10.01.2024).
- Twardoch A. (2017). System do mieszkania, Bęc Zmiana publishing house, Warszawa.
- Sustainable Development Goals; https://sdgs.un.org/goals (10.01.2024).
- European Green Deal; https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en (12.12.2023).
- Yeang K., Ecomasterplanning, John Wiley & Sons, Ltd., New York 2008.

Energy Landscapes

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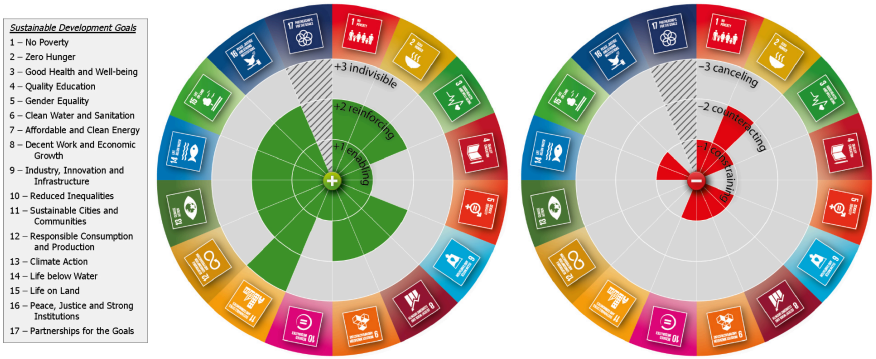
Introduction

Europe is currently facing major challenges with regard to its energy supply. On the one hand, the challenge of climate change must be met more quickly and effectively, while on the other, Russia's war against Ukraine has painfully highlighted geopolitical dependencies. Both challenges require sustainable energy solutions. These solutions require more energy efficiency and a shift from fossil fuels to renewable energies (RE).

As part of the sustainability challenges humanity is facing, the importance of RE is reflected in the UN's Sustainable Development Goals (SDG). The cross-cutting nature of *SDG 7 Affordable and Clean Energy* becomes apparent, when investigating its linkages with the other SDGs. While most of them are positively facilitated by SDG 7, there are also conflicting objectives, particularly with *SDG 2 Zero Hunger* (see figure), which is directly related to the availability of agricultural land (McCollum et al., 2018).



Positive and negative relations between SDG 7 and other SDGs, *Source: McCollum et al., 2018, p. 13.*

In Europe, countries have set targets to reduce emissions and progressively implemented measures to move towards more sustainable energy systems. The European Green Deal and the 'Fit for 55' package, which adapts existing climate and energy legislation to meet the EU's new target of reducing greenhouse gas (GHG) emissions by at least 55% by 2030, have boosted the European Union's energy agenda.

This decarbonisation changes the energy system as we have known it since industrialisation. Energy systems based on renewables are decentralized and vary in scale. They can be used to generate energy in places where there was previously no potential for energy generation, either because there were no fossil fuels or because local density was considered to be too low. These changes in generation systems and infrastructures come along with transformation of land use, reshaping European landscapes (Frolova et al., 2019, p. 318). But this is not unique to the current energy transition, energy and space have been constantly changing each other over history. Each era and dominating energy source has had its own spatial characteristics. (Sijmons, 2014, p. 10). Thus, each RE technological system – solar, wind, bioenergy, geothermal, hydro – brings specific impacts, depending on the context of the landscape they unfold in (Frolova et al., 2019, p. 318) (Enserink et al., 2022, p. 1).

The pace of the transition to renewable energy has accelerated in recent years and has gained further momentum in Europe in particular since Russia's war on Ukraine. This is linked to a growing interest in understanding the landscape-energy nexus. REs are the visual proof that our energy is generated somewhere, which reminds us of the effects and consequences of our energy-intensive lifestyles. Beyond this visual reminder, energy is immanent for socio-economic practices, attracting investments, creating jobs, shaping new stakeholder networks, demanding new integrative spatial policies and forms of governance (Nadaï & Van Der Horst, 2010, p. 144). This composition of energy systems and spatial changes is recognized in the concept of energy landscapes, which is defined as *"multilayer landscape characterized by one or more elements of the energy chain comprising combinations of technical and natural sources of energy within landscape. Energy landscapes are best understood in terms of their multiple spatiality, including material and immaterial dimensions."* (Frolova et al., 2019, p. 318).

Making the case for a positive transition pathway: Energy landscapes are shaped by the perceptions and goals of a wide range of stakeholders. They involve different ideas about how landscapes are used, shared and valued. Both in rural areas and in urban-rural dynamics, energy transition processes offer the opportunity to reshape energy-related socio-economic conditions. In such productive landscapes, agriculture and the renewable energy sector do not simply coexist. Rather, a co-evolution of diverse landscapes takes place based on the

prevailing local characteristics. An interplay of agriculture, forestry, energy, water and socio-economic parameters empowers local communities to shape their future without neglecting their heritage. Rural areas can be the beneficiaries of new value creation and employment effects. In densely populated areas where energy consumption is concentrated, urban energy landscapes can be designed to create sustainable energy systems for self-sufficiency.

This chapter explores renewable energy landscapes at different scales: First of all, it is analysed how they affect traditional rural landscapes by looking at four aspects influencing landscape characters: *direct impacts* with expected impacts and internalized costs, *indirect impacts* with variable effects and externalised costs, mitigation measures helping to overcome the negative direct and indirect impacts (as suggested by Pasqualetti, 2012, p. 13; Roth et al., 2018) as well as potential positive impacts (Roth et al., 2018). Second, the case of a specific project shows how the transformation has already been successfully achieved at local level.

The renewable energy landscape as a technological landscape

In the design of sustainable energy landscapes, ethical considerations, aesthetic challenges and planning and design issues are of particular importance, as they are linked to changes in land use (Frolova et al., 2019). Thus, the focus of this part is on the technological and the spatial characteristics of RE landscapes. In order to understand the changes in landscape character resulting from the transition to renewable energy, it is important to consider which negative effects can be avoided and how positive effects can be enhanced (Frolova et al., 2019, p. 319). The specific effects of each RE technology on the landscape, which then characterize these technological RE landscapes, are summarized below as described by (Roth et al., 2018).

Energy landscape examles pictures 1 + 2

Geothermal energy landscape examles pictures 3 + 4

As for the **direct landscape impacts** of bioenergy, there is a trend to large industrial scale facilities, which evokes a change in agricultural cultivation. Pre-existing agricultural activity is converted into new, often more intensive forms. So-called energy crops, such as maize, are often grown in monocultures. Also scale-dependent impacts of processing facilities and technical infrastructure also change the landscape character. **Indirect landscape impacts** become evident in changes in the ecosystem, altering flora and fauna, which might lead to a loss of biodiversity. The operation of biogas plants might cause water contamination, gaseous emissions, unfamiliar smells and increased traffic due to biomass transport. The shift from low-height crops to above-eye-height crops might influence intervisibility. To **mitigate** these impacts, the cultivation of energy crops is best on marginal or abandoned land. Additionally, the usage of a wider range of substrates, e.g. domestic, economic and forest waste, manure and residues is favorable. Closing the biomass loop, in the sense of a circular economy does not only help to mitigate the impacts, but also holds potentials for **positive** impacts, such as the recovery of fertilizer from the fermentation residues.

For geothermal energy, the **direct impacts** are closely related to technical infrastructure. The drilling of wells, the installation of pipelines and the construction of access roads are spread over kilometers. Visual quality is affected by the industrial appearance of power plants (steam generators, cooling towers, piping, generator buildings). The process of exploiting geothermal energy itself has an **indirect impact** on the environment: thermal changes in the ground might influence slope stability and trigger landslides, fluid extraction affects land subsidence and the reinjection of heat might alter hot springs and fumaroles or even cause earthquakes. To **mitigate** the effects of landscape quality, measures are smart drilling, underground pipelines, the application of colors that harmonize well with the landscape and the design of inconspicuous buildings. Also, the reclamation of destroyed vegetation with

local species, helps to mitigate impacts. Although infrastructure is a major feature of geothermal landscapes, there are examples of regions that have managed to make positive use of it e.g. using the spill water of geothermal power stations in a SPA which has become a major tourist attraction in Iceland.

In the case of hydropower, serious impacts can be identified, particularly in the case of large projects. **Direct impacts** are similar to those of geothermal energy, mainly related to the technical infrastructure of plants. The presence of large structures, such as power stations, dams, artificial reservoirs, pipes and transmission lines significantly alters landscape features. Villages can even be flooded to create water reservoirs (see Picture 5). Pipes, turbines and pumps also have a direct impact on the subsurface. Smaller installations, such as run-of-the-river systems with a canal or pipe that turns turbines, have less impact but also require infrastructure systems. The **indirect effects** should not be underestimated and can go far beyond local power generation. Building reservoirs can dry up large watercourses. The damming of lakes and rivers can lead to bank erosion, which can also occur downstream of power plants. Drastic changes in water-related ecosystems (physical and chemical) can be triggered by changes in flow velocities. Cases of large hydropower dams with extreme challenges and impacts can be found around the world. The most famous are the Balbina Dam in Brazil, the Three Gorges Dam in China or the Grand Ethiopian Renaissance Dam, all of which have serious environmental and societal impacts and even cause political tensions with neighboring countries. These serious impacts can be **mitigated** by using existing infrastructure and reservoirs, and by seeking underground solutions for power plants and transmission lines. Simple solutions such as fish ladders are also available on a small scale. While the impact may seem enormous, depending on the original state of the landscape and its cultural value, artificial lakes are often perceived as a **positive** attraction. They often become major regional attractions, boosting tourism and local incomes.

Hydro energy landscape examles pictures 5 + 6

Wind energy landscape examles pictures 7

Wind energy is the technology with which the general public has the most emotional attachment. Wind turbines have a striking **direct** visual impact due to their height. They range from single turbines to wind farms of 20-30 turbines. They can be off-shore or on-shore, in open fields or in forests. Wind turbines are accompanied by infrastructure development such as access roads, power lines, buildings, night lighting for aircraft, shadow flicker, etc. The actual visual appearance depends on the orientation of the wind turbines, the type of landscape, the size of the wind turbines and the proximity of settlements and cultural heritage sites to the wind turbines.

The change in landscape character appears most striking in coastal areas and mountain ridges. **Indirect impacts** are mainly related to risks to birds and bats, noise pollution and habitat destruction and degradation. Impacts on water bodies such as groundwater, surface water and also coastal erosion. As a **mitigation strategy** and to increase acceptance, it is sensible to avoid the visibility of sensitive viewpoints. In addition, sites and their design can be adapted to the surroundings to better align with the landscape, for example by using different shades of color. Landscapes where technical installations are already present can be adapted more easily, as people already associate them with industrial structures or infrastructure. In contrast to emotional conflicts over wind farms, they can promote local identities by creating a **positive** identification with progress, technological efficiency and climate friendliness. In coastal areas, they can also help to create new sources of income and new habitats by reducing pressure from shipping.

Solar energy is a widespread form of RE across the globe as not the highest amounts of solar radiation are needed for economic operation. They can be integrated in different scales, from the residential balcony power plants to solar roofs, and industrial parks to concentrated solar power systems. Because

Solar energy landscape examles pictures 8 + 9

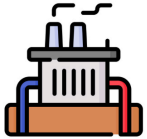
of the different scales, the **direct effects** vary greatly. Impacts are evident for larger scale stations. For example, large-scale ground-mounted PV has implications for land use, biodiversity, water-related aspects and visual-aesthetic challenges. Glare may also be an issue. In the case of concentrated solar thermal power plants, the main direct impacts are glare from mirrors, the visual impact of tall cooling towers and the challenges of water management in arid regions.

Mitigation can include siting larger solar fields in former mines, industrial areas and low visibility locations, design to fit the landscape in which it is embedded and integration into buildings. There are **positive** options for dual use of land, such as coexistence with agriculture and grazing, which could lead to an increase in crop production, and the structures of PV can be used for land stabilization. In urban areas, PV panels can be used to provide shade or to define certain areas such as public spaces, cycle paths, etc.

In summary, all energy production, including renewable energy, is closely linked to the landscape. For each RE we can identify significant direct and indirect impacts, but we can also identify ways not only to mitigate them, but also to take advantage of the positive development opportunities they offer (see figure on the following page). Landscapes are thus areas of both impact and action.

Landscape planning at all levels can help to minimize these impacts, promote transparency and accountability, and increase social acceptance. Landscape architects and planners are therefore required to contribute to and develop integrated planning and design practices in order to facilitate the rapid transition to renewable landscapes. However, achieving the goal of a comprehensive assessment of the social and environmental impacts requires interdisciplinary understanding and cooperation. It is therefore important to think in terms of multifunctional synergies when developing renewable energy projects. Knowing about the influencing aspects of landscapes with renewable energies, we look at a success story in the next section.

Summary of the four aspects influencing landscape characters.
Source: Author, adapted from Roth et al, 2018. Icons designed by bsd or freepik from www.flaticon.com.

					
Landscape impacts of RE	**Bio Energy**	**Geothermal Energy**	**Hydro Energy**	**Wind Energy**	**Solar Energy**
Direct landscape impacts What are the expected impacts?	• Visual impacts and land use change due to monocultures • Agricultural intensification • Trend to large industrial scale	• Infrastructure development • Industrial looking generation stations	• Large facilities significantly alter landscape features • Underground impacts • Flooding of villages and structures in place	• Visual impact due to great height • Requires the development of a diverse infrastructure • Change in landscape character, esp. in coastal zones and mountain ridges	• Alteration in land use, biodiversity and water-related aspects • Glare from panels and mirrors • Concentrated solar thermal with visual impact of tall towers
Indirect landscape impacts What other variable imapcts might occur?	• Effects on soil and water, gaseous emissions, unfamiliar smells • Changes in the ecosystem, altering flora and fauna, loss of biodiversity • Intervisibility due to high crops	• Hillside stability and landslides • Earthquakes • Alteration of hot springs and fumaroles	• Drying up of large watercourses • Erosion of the shoreline due to the dams and the river banks downstream • Changes in water-related ecosystems due to rapid flow	• Hazards to birds and bats, destruction and degradation of habitats • Impacts on ground and surface water • Coastal erosion	• Shadow casting • Change in micro-climate
Mitigation strategies How can the negative impacts be overcome?	• Biorefineries with closed local loop can limit impacts • Usage of diverse substrates, e.g. domestic, economic and forest waste • Production of energy crops on marginal or abandoned land	• Restoration of vegetation • Intelligent drilling, underground pipelines, buildings and colors	• Use of existing infrastructure and lake reservoirs • Give preference to underground solutions • Simple solutions like fish-ladders	• Landscapes with existing technical installations can assimilate easier • Avoid visibility from sensitive viewpoints • Location and design aligned to surrounding landscape	• Appropriate sitting in sites with low visibility • Integration into buildings • Dual use of land
Positive impacts What positive synergies can be expected?	• Use of waste in a circular economy sense • Production of local fertilizer from digestat	... hard to envisage...	• Water reservoirs turn into a regional tourist attraction	• Windfarms can facilitate local identities • Coastal areas benefit from new source of income and development of new habitats	• Co-existence with agriculture and grazing • Usage of construction for land stabilization • PV as spatial definition of certain areas

Bundorf Solar Park, picture 10

Example of a successful transition case: Bundorf Citizen Solar Park

Having looked at the different energy landscapes and their special features, the question arises as to how the energy transition is already being implemented, especially as the energy transition rests on the shoulders of different actors. As an example of successful decentralized and locally anchored renewable energy generation, the approach of energy cooperatives is presented. In such energy coops, private individuals come together to jointly generate renewable energy. With their democratic participation model, they ensure that the energy transition is implemented in a sustainable way.

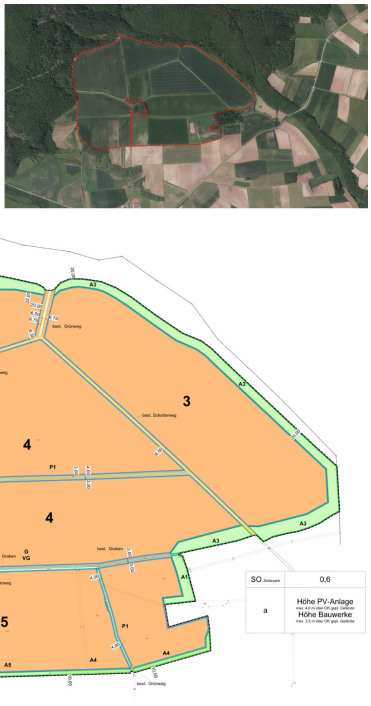
This is illustrated by using the example of solar energy cooperatives in Germany. They have become a symbol for a citizen-oriented energy transition in Germany. The large number of participants shows that citizens can and want to play an active role. In 2022, 220,000 people in Germany were engaged in 877 energy cooperatives. In total, 8 TWh of renewable electricity was generated, which corresponds to a 3% share of electricity generation in Germany in 2022. Participation as members was already possible starting from €732, while the actual participation per member was €5,239 (DGRV 2023). The implemen-tation of the projects involves new forms of local governance, based on the strengthening of existing and the initiation of new local networks. By working closely with these networks, energy cooperatives contribute to regional value creation. This means that local contractors install the systems, existing land is used optimally, and local banks finance and advise the projects. In addition, profits from production stay in the region and are invested in new projects (DGRV, 2023).

Projects are implemented in close cooperation with local communities. As Schmid et al.(2020) found in an empirical study, municipalities are members of 60% of German energy cooperatives. This constellation can benefit from a good exchange of information, the consolidation of networks and thus the building of trust.

A Bavarian citizens' cooperative – EGIS eg – took the energy transition into its own hands in 2013, growing to a cooperative of 2,400 members within 10 years and now implementing projects beyond the district. They are committed to ensuring that the large-scale facilities blend in harmoniously with the mostly rural surroundings. The concerns of community represen-tatives and local residents regarding the landscape and agricultural land on which the solar farms are to be built are therefore taken into account at the project planning stage. This also applies to the greening concepts to be implemented (EGIS a, 2023).

One of the flagship projects is the Bundorf Citizen Solar Park, which was commissioned in 2023. The

Excerpt from the development plan for the Bundorf citizen solar park. Source: *VG Hofheim (2022)*



project covers an area of 125 hectares. With an installed capacity of 125 MWp, it will generate enough electricity to supply around 37,500 four-person households. In addition to the solar park, a district heating network was built to supply residents and municipal buildings. An e-charging infrastructure has also been created.

The PV park consists of six sub-fields (see Fig. 2), which are planted and managed differently. Long-term monitoring is used to investigate which areas are best suited for nature and thus biodiversity to recover and spread. Special emphasis was placed on lean meadows, which are particularly threatened with extinction, but which also have a high level of biological diversity. In addition, due to the size of the project, a wildlife corridor is in place (EGIS b, 2023).

Under the bottom line

In order to develop measurable KPIs for the uptake of the energy transition and its impact on the landscape, it is worth taking a look at the existing literature. On the one hand, renewable energy systems must make an equivalent contribution to achieving the energy supply targets as fossil systems: security, affordability and environmental compatibility. On the other hand, the decarbonization of the energy system brings in new players, new business models, decentralization, and also new customer behavior – imagine operating your own PV panel and adjusting your energy

consumption patterns. We also need to think beyond these aspects when we want to look at the energy landscape economy. We have to think about the SDGs that may benefit from renewable energy systems, and those that may come into conflict (see first figure on SDG goal conflicts).

There is no single list that researchers and policymakers agree on when it comes to key figures for renewable energy landscapes. This is certainly partly due to the enormous scope of energy – reducing CO2 emissions in all sectors – but also due to its high interdisciplinarity. We have to admit that it was not possible to identify such a set in the context of the TELOS ERASMUS project, but we still have very good opportunities to cover them.

The reports published by the International Renewable Energy Agency (IRENA, 2022) [1], as well as scientific articles for smart cities (Angelakoglou et al., 2020) [2], allow us to explore appropriate KPIs for our context.

The table below provides an overview of the KPIs based on the two sources [1]/[2] mentioned above. The list is not exhaustive. It intend to illustrate appropriate KPIs. As it is primarily the system characteristics that can be influenced, it is necessary to consider which aspects of the indicators can be used to measure them. KPIs should be able to indicate the extent to which change has occured..

In the case of defined targets, as in the case of the energy transition at EU, national, regional and city levels, they can provide information on the degree of target achievement. It is particularly important to select factors for which data can be generated and which are comparable. It is not trivial to find the appropriate KPIs for the chosen research area and the corresponding scale of the perspective taken on that area. This depends very much on the research question being asked. The following list of KPIs has been identified as important in the context of landscape economy.

1	Share of renewables in electricity generation (%)	***(1)***
2	Share of renewables-based electricity generation in electricity consumption (%)	***(1)***
3	Addition of renewable energy capacities (GWh/year) by technology	***(1)***
4	Investments in renewable energy generation (EUR/year) by technology	***(1)***
5	Share of renewables in final energy consumption (%)	***(1)***
6	Development of heat pump stock (number and installed capacity/year)	***(1)***
7	Development of PV collectors (m^2 and installed kWp/year)	***(2)***
8	Percentage of positive energy buildings (%)	***(2)***
9	Greenhouse gas emissions (kg CO_2/year)	***(2)***
10	People benefiting from the project (#)	***(2)***
11	Connection to the existing cultural habitat (Likert scale)	***(2)***
12	Local community involvement in the implementation and planning phase (Likert scale)	***(2)***
13	Degree of satisfaction (Likert scale)	***(2)***
14	Social compatibility (Likert scale)	***(2)***
15	Technical compatibility (Likert scale)	***(2)***
16	Market demand (Likert scale)	***(2)***
17	Diffusion to other locations (Likert scale)	***(2)***
18	Environmental impact assessment according to applicable law, in accordance with Directive 2011/92/EU	own

KPIs for renewable energy landscapes. Source: author based on IRENA (2022), Angelakoglou et al. (2020).

Suggest research and analysis tasks for learners

"With the energy transition in mind, we can look at the same space through new eyes, and discover something there that had not been seen before: different spatial qualities, different forms of using space and different perception of space" (Sijmons, 2014, p. 11).

Two basic questions can serve as a good starting point, especially when working with students who are just beginning to engage with the complex issue of an ever-changing energy landscape:

- What kind of **energy future** do we envision as individuals and communities, and at different regional scales? Past developments shape our future options, which need to be embedded in existing landscapes.
- What kind of **governance,** regulatory or planning systems are needed to steer the processes to make the energy transition fast and yet sustainable for the European landscapes? (Nadaï & Van Der Horst, 2010, p. 153).

Deeper insights can be gained by looking at other pressing areas of social action: Questions of energy justice are also becoming increasingly important. Let's take the example of energy cooperatives. These are growing in rural areas.

- Who can actually participate in the energy transition? Who can actively participate in them? What about tenants in blocks of flats in cities?

Another important question is how we can make intelligent use of the space available. Given that renewable energy takes up more space (m2/kWh) than fossil fuels (Sijmons, 2014), we need to think more in terms of multifunctional systems so that space can be used twice in the future.

- Which conflicts can arise from multifunctional systems and what are the planning challenges?

References

1. Angelakoglou, K., Kourtzanidis, K., Giourka, P., Apostolopoulos, V., Nikolopoulos, N., & Kantorovitch, J. (2020). From a Comprehensive Pool to a Project-Specific List of Key Performance Indicators for Monitoring the Positive Energy Transition of Smart Cities—An Experience-Based Approach. Smart Cities, 3(3), 705–735. https://doi.org/10.3390/smartcities3030036
2. DGRV. (2023). Bundesgeschäftsstelle Energiegenossenschaften. Bundesgeschäftsstelle Energiegenossenschaften
3. EGIS a. (2023). Photovoltaik. https://www.egis-energie.de/unsere-projekte/photovoltaik/
4. EGIS b. (2023). Bürgersolarpark Bundorf. https://www.buergersolarpark-bundorf.de/das-projekt/.
5. Enserink, M., Van Etteger, R., Van Den Brink, A., & Stremke, S. (2022). To support or oppose renewable energy projects? A systematic literature review on the factors influencing landscape design and social acceptance. Energy Research & Social Science, 91, 102740. https://doi.org/10.1016/j.erss.2022.102740
6. Frolova, M., Centeri, C., Benediktsson, K., Hunziker, M., Kabai, R., Scognamiglio, A., Martinopoulos, G., Sismani, G., Brito, P., Muñoz-Cerón, E., Słupiński, M., Ghislanzoni, M., Braunschweiger, D., Herrero-Luque, D., & Roth, M. (2019). Effects of renewable energy on landscape in Europe: Comparison of hydro, wind, solar, bio-, geothermal and infrastructure energy landscapes. Hungarian Geographical Bulletin, 68(4), 317–339. https://doi.org/10.15201/hungeobull.68.4.1
7. IRENA. (2022). World Energy Transitions Outlook 2022: 1.5°C Pathway. International Renewable Energy Agency. www.irena.org/publications
8. McCollum, D. L., Echeverri, L. G., Busch, S., Pachauri, S., Parkinson, S., Rogelj, J., Krey, V., Minx, J. C., Nilsson, M., Stevance, A.-S., & Riahi, K. (2018). Connecting the sustainable development goals by their energy inter-linkages. Environmental Research Letters, 13(3), 033006. https://doi.org/10.1088/1748-9326/aaafe3
9. Nadaï, A., & Van Der Horst, D. (2010). Introduction: Landscapes of Energies. Landscape Research, 35(2), 143–155. https://doi.org/10.1080/01426390903557543
10. Pasqualetti, M. J. (2012). Reading the Changing Energy Landscape. In S. Stremke & A. V. D. Dobbelsteen (Eds.), Sustainable Energy Landscapes (pp. 11–44). CRC Press. https://doi.org/10.1201/b13037
11. Roth, M., Eiter, S., Röhner, S., Kruse, A., Schmitz, S., Frantál, B., Centeri, C., Frolova, M., Buchecker, M., Stober, D., Karan, I., & Van der Horst, D. (Eds.). (2018). Renewable energy and landscape quality. Jovis.
12. Schmid, B., Meister, T., Klagge, B., & Seidl, I. (2020). Energy Cooperatives and Municipalities in Local Energy Governance Arrangements in Switzerland and Germany. The Journal of Environment & Development, 29(1), 123–146. https://doi.org/10.1177/1070496519886013
13. Sijmons, D. F. (Ed.). (2014). Landscape and energy: Designing transition. Nai010 Publ.
14. VG Hofheim. (2022). Rechtskräftige Bebauungspläne. Gemeinde Bundorf. https://vghofheim.de/bauen/bauleitplanung-bebauungsplaene/rechtskraeftige-bebauungsplaene.html

Pictures

1. Picture 1: Biogas Plant, author: Martina Nolte, Licence: Creative Commons by-sa-3.0 de (Last accessed 15.10.2024).
2. Picture 2: Energy maize. Online: https://www.landundforst.de/landwirtschaft/pflanze/energiemais-anbaurisiko-moeglichst-weit-streuen-568579 (Last accessed 23.02.2024).
3. Picture 3: Geothermal pipelines. Online: https://volterratur.it/wp-content/uploads/galleria-geotermia-2.jpg (Last accessed 23.02.2024).
4. Picture 4: Geothermal plant. Online: https://www.tz.de/muenchen/stadt/hallo-muenchen/muenchen-energie-serie-erneuerbare-energien-geothermie-erdwaerme-energieagentur-tipps-buerger-91521167.html, © Romy Ebert-Adeikis. (Last accessed 23.02.2024).
5. Picture 5: Reschensee. Source: Wikimedia Commons (Last accessed 23.02.2024).
6. Picture 6: Rappbodetalsperre, Source: Wikimedia Commons (Last accessed 23.02.2024).
7. Picture 7: Wind energy landscape, flickr.com, creative commons, share alike, author: Thorsten Krienke
8. Picture 8: Photovoltaic system residential building. Online: https://www.bundesbaublatt.de/imgs/100539513_0eacd346a5.jpg (Last accessed 23.02.2024).
9. Picture 9: Open-space PV system, Wikimedia commons
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Positive Energy Districts (PEDs)

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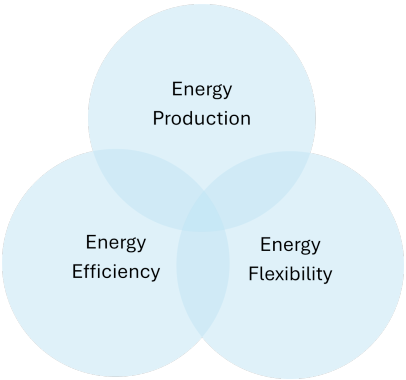
Energy policies and the European framework to address the energy transition of urban areas

The urgent need to address climate change and reduce dependency on fossil fuels has accelerated the global energy transition towards renewables. As cities account for a significant portion of global energy use and CO_2 emissions, the focus on urban areas for clean energy solutions has intensified (IEA, 2021). As densely populated areas are characterised by the concentration of energy consumption, urban energy landscapes can be designed to create sustainable energy systems aiming at self-sufficiency, while concurrently addressing the challenges of a "just" energy transition. This involves the necessity for new social business models to engage different stakeholders on an equal basis, and significantly influence sustainable human lifestyle.

Several approaches have been proposed over time to address these challenges and provide cities with the enabling tools to ensure the achievement of decarbonisation and energy security goals, including Positive Energy Districts (PEDs) currently considered the main European framework for energy transition. PEDs has been set as an emerging concept as part of a broader shift to create renewable energy landscapes to prioritise local energy production, efficient district energy systems, and energy flexibility (European Commission, 2022).

PEDs are energy-efficient and energy-flexible urban areas or groups of connected buildings which produce net zero greenhouse gas emissions and actively manage an annual local or regional surplus production of renewable energy (see figure below). They require integration of different systems and infrastructures and interaction between buildings, the users and the regional energy, mobility and ICT systems, while securing the energy supply and a good life for all in line with social, economic and environmental sustainability (JPI Urban Europe, 2020).



Positive Energy Districts Framework

The European Union's Strategic Energy Technology Plan (SET-Plan) has set an ambitious objective of implementing at least 100 PEDs in Europe by 2025. This has resulted in an initiative by a group of stakeholders, including researchers, practitioners and municipalities, to define operational methods for implementing and replicating virtuous models that can direct decarbonisation strategies in urban areas while ensuring the achievement of the target of energy surplus from renewable energy sources.

Several international working groups were formed, the most prominent of which are the COST Action Positive Energy Districts European Network CA19126 and the IEA Annex 83 Positive Energy Districts. These groups comprise various stakeholders who have collaborated to define and propose to different stakeholders innovative methodologies and effective solutions for determining the achievement of the set targets. The research and case studies conducted in Europe revealed several distinctive features, which collectively constituted a set of shared best practices aiming at replication in a variety of urban contexts.

PEDs as a Model for Renewable Energy Multiscale Integration

In contrast to conventional urban energy models that depend on centralised grids and fossil fuels, PEDs employ renewable energy sources such as solar, wind, and geothermal power, enabling them to be self-sufficient and frequently net-energy positive. The decentralised and interconnected design of PEDs is meant to facilitate the integration of distributed renewable energy systems, thereby accelerating the transition away from centralised fossil fuel-based grids. Furthermore, PEDs underscore the role of distributed energy resources as foundational elements in reshaping energy landscapes. PEDs function as microgrids where highly efficient energy systems generate and distribute renewable energy at the local level, thereby enhancing energy flexibility and security. They contribute to the stabilisation of national energy grids by reducing demand peaks and allowing surplus energy to flow into surrounding areas. The active generation and distribution of renewable energy by PEDs serves to reduce grid dependency and minimise transmission losses, thereby supporting the development of a more resilient and adaptable energy system.

Making the case for a positive transition pathway: Energy transition and the decentralisation of power generation

Decentralisation is a key principle of the energy transition, facilitating the development of renewable energy landscapes that prioritise local, renewable resources over fossil fuels. PEDs embody this shift, creating urban areas where energy is generated, consumed, and managed on a community level, often involving citizens as "prosumers" who both produce and consume energy (Derkenbaeva et al., 2022). This model transforms urban energy dynamics and accelerates renewable adoption by empowering communities to take ownership of their energy use.

Decentralised PEDs also mitigate challenges associated with renewable intermittency by integrating energy storage systems, such as batteries and thermal storage, and advanced demand-response solutions. These technologies enable PEDs to store surplus energy and deliver it during periods of high demand, supporting a more flexible, resilient, and renewable-dominant grid (Anastasovski et al., 2024). As a result, PEDs help create renewable energy landscapes that are less reliant on centralised energy production and more adaptable to fluctuations in energy demand and supply.

Technological and social innovations in PEDs to support the energy transition

The effectiveness of PEDs in the energy transition relies on both technological advancements and community engagement. Technologically, PEDs integrate renewable energy generation, storage, and smart grid technology, allowing for dynamic management of local energy flows (Haase et al., 2024). These technologies enable PEDs to provide energy services that are flexible and responsive to real-time energy demands, enhancing grid stability and supporting the transition to renewables.

Socially, PEDs encourage community engagement by involving citizens in the planning and management of local energy resources, fostering energy literacy, and building a shared commitment to sustainability. This participatory approach transforms citizens from passive consumers to active energy stakeholders, promoting a culture of sustainability within PEDs. By increasing local buy-in and engagement, PEDs not only contribute to the success of renewable energy projects but also enhance long-term community resilience.

PEDs and energy security in the context of geopolitical instability

In light of recent geopolitical tensions and energy market volatility, energy security has become a priority in the energy transition. PEDs offer a localised approach to energy generation that enhances energy resilience and reduces dependency on imported fossil fuels (IRENA, 2023). By leveraging local renewable resources, PEDs contribute to energy independence, which is particularly valuable during times of supply chain disruptions and fluctuating energy prices. The energy autonomy that PEDs provide strengthens urban resilience, ensuring that communities have reliable access to clean energy regardless of global energy market conditions.

PEDs can play a crucial role in national energy strategies by reducing urban demand on centralised energy grids, which are vulnerable to geopolitical disruptions. This localised energy model diversifies the energy landscape and promotes energy sovereignty, an increasingly important consideration for nations facing energy security challenges.

Policy implications and strategic recommendations

The integration of PEDs into urban planning requires supportive policies and strategic investments to overcome financial and regulatory challenges. Policymakers play a key role in facilitating PED adoption by offering incentives for renewable energy installations, subsidies for smart grid infrastructure, and streamlined permitting for PED projects (Kuzov et al., 2023). Additionally, harmonised standards for PED technologies and practices can enhance inter-operability and scalability across different urban areas, supporting widespread PED deployment. The success of PEDs also depends on robust partnerships between governments, private companies, and local communities. Collaborative approaches can secure the financial and technical resources necessary for PED projects, especially in cities with limited budgets. Public-private partnerships can further help deploy smart grid and storage solutions that are essential for PED functionality.

Positive Energy Districts Case studies: La Fleuriaye West, Carquefou, France

The La Fleuriaye district in Carquefou, which forms part of the Nantes metropolitan area in France, is a forward-thinking, sustainable neighbourhood that has been designed to become a Positive Energy District (PED).

The objective of this project is to achieve a positive energy balance, whereby the generated energy exceeds the consumed energy, through the utilisation of renewable resources, innovative technology and natural solutions. By prioritising environmental objectives and improving the quality of life for residents, La Fleuriaye provides an exemplar for future urban developments.

District of La Fleuriaye, Carquefou in France
image source: Construction 21

Goals

- *Achieve positive energy status*: The primary objective is for the district to produce more energy than it consumes, focusing on renewable sources and highly efficient building design. *Enhance environmental quality*: The project aims to create a low-carbon, energy-efficient district with minimal environmental impact, aligning with France's national goals for reducing carbon emissions.
- *Promote slow mobility*: With integrated green spaces, pedestrian-friendly areas, and low-emission transport, La Fleuriaye supports an eco-friendly lifestyle.
- *Foster social and community engagement:* The district encourages a sense of community and aims to promote a lifestyle that prioritizes sustainability and environmental awareness.

Strategies for positive energy achievement

- *Energy-efficient building design and construction*: The district's buildings are designed to high energy performance standards, minimizing the need for heating, cooling, and other energy-intensive systems.
- *Local renewable energy generation*: Solar panels and geothermal energy are the main sources of renewable energy, designed to exceed the neighbourhood's consumption needs.
- *Smart energy management and storage:* A microgrid system with battery storage enables energy sharing among buildings, optimizing the use of locally generated energy.
- *Nature-based solutions*: Integrated green spaces, green roofs, and water management systems support biodiversity, reduce urban heat, and enhance overall environmental quality.

Adopted Solutions

Energy Production

Solar Photovoltaic (PV) Panels:

- Capacity: La Fleuriaye has around 10,000 m^2 of rooftop and facade-mounted solar PV panels, generating approximately 1.5-2 MW of installed solar capacity.
- Energy output: The PV panels produce around 2,000-2,500 MWh of electricity annually, enough to cover a significant portion of the district's electricity demand, particularly during daylight hours.
- Self-consumption strategy: Most of the energy produced is consumed on-site. Excess energy is stored in local battery systems or fed back to the regional grid, supporting Nantes' wider renewable energy goals.

Geothermal Energy:

- Ground-Source Heat Pumps: The district is equipped with a network of ground-source heat pumps, which provide low-carbon heating and cooling by harnessing underground thermal energy.

- Energy output: The geothermal system provides around 1,200–1,500 MWh of heating energy annually, covering the bulk of the heating and hot water needs for the district's residential and commercial buildings.
- Efficiency: The heat pumps operate with a high Coefficient of Performance of around 4, meaning that one unit of electricity generates four units of heat, making it highly efficient.

Battery energy storage:
- Capacity: The neighbourhood includes a central battery storage system with a total capacity of around 500–700 kWh. Additionally, individual buildings are equipped with smaller battery systems to store locally generated solar energy.
- Energy Flow Optimization: The storage system helps balance supply and demand, ensuring a consistent energy supply even during peak demand or periods of low solar production.

Energy consumption

Energy-Efficient Building Envelope:
- Passive Design Standards: The buildings in La Fleuriaye meet France's stringent RT 2012 and RT 2020 energy regulations, featuring high-performance insulation, double or triple-glazed windows, and energy-efficient construction materials.
- Reduced Heating and Cooling Demand: Passive solar design and insulation reduce heating and cooling energy needs by around 40–50% compared to conventional construction.

Energy-Efficient Appliances and LED Lighting:
- Low-Energy Appliances: The buildings are equipped with energy-efficient appliances, which reduce electricity consumption in residences and commercial spaces.
- LED Lighting Systems: LED lighting is installed throughout the district, consuming up to 75% less electricity than traditional lighting and reducing lighting-related energy demand.

Smart Energy Management and Automation:
- Smart Meters and IoT Sensors: Smart meters and IoT sensors allow real-time monitoring of energy use, providing data to optimize consumption and adjust energy flow based on demand.
- Home Automation: Automated systems for heating, cooling, and lighting are standard, ensuring that energy is used only when and where it's needed.

District Heating and Cooling Network:
- Efficient Distribution: The geothermal system is integrated into a district heating network, which efficiently distributes heat to all buildings in the district.
- Lower Carbon Emissions: Centralized heating and cooling reduce the need for individual systems, cutting overall emissions by approximately 20–30% compared to standalone systems.

Open space in the district of La Fleuriaye, *Source: Construction 21*

Mobility and Transportation:

- Electric Vehicle (EV) Charging Stations: The district is equipped with EV charging points to encourage the use of electric vehicles, reducing transport emissions.
- Bike and Pedestrian Infrastructure: Extensive bike lanes, pedestrian-friendly pathways, and connections to public transport encourage sustainable travel within and around the district.

Nature-Based Solutions

Green Roofs and Green Walls:

- Vegetated Roofs: Many of the buildings are topped with green roofs, which provide natural insulation, reduce rainwater runoff, and support local biodiversity by creating habitats for insects and birds.
- Green Walls: Green facades are used on several buildings, improving air quality, insulating the buildings, and enhancing aesthetic appeal

Rainwater Harvesting and Water Management:

- Rainwater Collection: Rainwater is collected from rooftops and stored in tanks, used for landscape irrigation, and, in some cases, for non-potable applications like toilet flushing.
- Bioswales and Permeable Surfaces: To manage stormwater runoff, permeable surfaces and bioswales are incorporated in public spaces, allowing rainwater to percolate naturally into the soil. This helps prevent flooding and improves groundwater recharge.

Community Green Spaces and Biodiversity Enhancements:

- Native planting design: Public spaces are planted with native and drought-resistant vegetation, reducing water requirements and creating habitats for local wildlife.
- Biodiversity Corridors: Green corridors connect different parts of the neighbourhood, allowing flora and fauna to thrive in an urban environment.
- Urban Cooling: Green spaces help reduce the urban heat island effect, providing shaded, cool areas for residents to relax and enhancing overall liveability.

The La Fleuriaye district in Carquefou represents a model of sustainable and resilient urban development. By attaining Positive Energy District (PED) status through the generation of renewable energy, the utilisation of energy-efficient building design, and the incorporation of nature-based solutions, it exemplifies the potential for urban areas to minimise environmental impact while simultaneously enhancing quality of life. The district's green infrastructure, water management, and emphasis on sustainable mobility contribute to its status as an eco-friendly, vibrant community. The district is designed to produce renewable energy on annual basis approximately around 3,200 to 4,000 MWh, while the energy surplus is in the range of 10-15% of more energy than the district's annual consumption. By employing smart energy solutions, fostering community engagement, and pursuing ecological design, La Fleuriaye serves as a replicable model for future PEDs across Europe and beyond.

Schoonship, Amsterdam

The Schoonschip project in Amsterdam represents a pioneering floating neighbourhood and is regarded as one of the most ambitious and sustainable Positive Energy Districts (PEDs) in Europe. Situated on a canal in Amsterdam's northern district, the Schoonschip project is designed to generate more energy than it consumes on an annual basis, while exemplifying pioneering and community-driven methodologies for sustainable living.

Goals

1. *Achieve positive energy balance:* The primary objective is for the neighbourhood to produce more energy than it consumes through renewable energy sources and energy-efficient design.
2. *Create a circular, self-sufficient community:* Schoonschip seeks to implement circular

Schoonship overview, *source: Archivibe*

economy principles, with minimal waste production, efficient water use, and sustainable resource management.

3. *Emphasize community and social cohesion:* Designed as a cooperative, the community has been actively involved in the development and management of the district. The neighborhood promotes communal responsibility, sustainability, and energy sharing.
4. *Increase the biodiversity of the area:* Schoonschip is committed to enhancing biodiversity and implementing nature-based solutions to support local ecosystems and water quality.

Strategies for Positive Energy Achievement

1. *Community-driven energy production and consumption*: Schoonschip has established a neighbourhood-owned energy cooperative to manage and distribute energy within the community. This cooperative also educates residents on energy-saving practices, fostering a culture of conscious energy use.
2. *100% Renewable Energy Integration*: The district uses only renewable energy sources to meet all energy needs, focusing on solar energy and efficient energy storage.
3. *Smart energy management and sharing:* A smart microgrid allows homes to share energy, ensuring efficient distribution and maximizing the use of locally produced energy. Surplus energy is fed back to the grid, supporting the broader Amsterdam power network.
4. *Water-based infrastructure and low-impact design*: Built on water, the district uses floating foundations for all homes, reducing land footprint and allowing buildings to adapt to rising sea levels.

Adopted Solutions

Energy Production

Solar Photovoltaic (PV) Panels:

- Capacity: Each of the 46 floating homes is equipped with rooftop solar panels, collectively producing around 150 kW of solar capacity across the neighbourhood.
- Energy output: The PV panels generate approximately 280,000 kWh of electricity annually, exceeding the neighbourhood's total energy needs. Each home is designed to be self-sufficient in terms of energy production, though energy sharing ensures efficient distribution across the district.

Heat Pump Systems:

- Water-Source Heat Pumps: Schoonschip utilizes water-source heat pumps that extract thermal energy from the canal water to heat and cool the homes. These systems are particularly efficient in water-based environments and reduce reliance on conventional electric heating.

- Efficiency: Each pump can achieve a Coefficient of Performance (COP) of around 4, meaning it generates four units of heat energy for every unit of electricity used, significantly reducing the total energy required for heating.

Energy Storage:

- Battery Storage: Homes are equipped with batteries (around 10 kWh per household) to store excess solar energy generated during the day. This storage capacity allows for a stable energy supply, even during non-peak generation hours.
- Energy Flow Optimization: The battery storage is coordinated through the smart grid to balance supply and demand efficiently, reducing the need for grid energy during peak times.

Smart Microgrid System:

- Schoonschip's energy distribution is managed through a microgrid, allowing residents to share energy efficiently. Surplus energy from one home can be used by others in the community, maximizing the efficiency of energy usage.
- Blockchain Technology: A blockchain-based platform facilitates peer-to-peer energy exchange, enabling residents to trade excess energy with each other in a transparent and efficient way. This blockchain system enhances autonomy, accountability, and community-based energy management.

Energy Consumption

High-Performance Building Envelope:

- Thermal insulation and Triple-Glazed Windows: Each floating home is built with high-performance insulation and triple-glazed windows, reducing heat loss and minimize energy requirements for heating and cooling.
- Energy Savings: Well-insulated building envelopes reduce heating and cooling energy demand by approximately 40-50% compared to typical standards.

Efficient Appliances and LED Lighting:

- All appliances are energy-efficient models, reducing the energy demand for domestic tasks. LED lighting systems are used throughout the homes and public areas, which consume up to 75% less electricity than traditional lighting.
- Energy Impact: The use of efficient appliances and lighting cuts overall energy consumption by an estimated 15-20%.

Smart Energy Management Systems:

- Home Automation and Monitoring: Each household is equipped with a smart energy management system, which allows residents to monitor and adjust their energy consumption in real time.
- Reduced Consumption: Automated systems lower unnecessary energy use, helping the district achieve overall energy savings of 10-15%.

Nature-Based Solutions

Floating Gardens and Green Roofs:

- Floating Gardens: Floating planters are used to introduce green spaces on the water surface, promoting biodiversity by creating habitats for fish, birds, and insects.
- Green Roofs: Many homes have green roofs planted with native vegetation, providing natural insulation, reducing rainwater runoff, and supporting local wildlife.
- Environmental Impact: These green elements improve water quality by absorbing pollutants, enhance local biodiversity, and reduce urban heat island effects.

Sustainable Water Management:

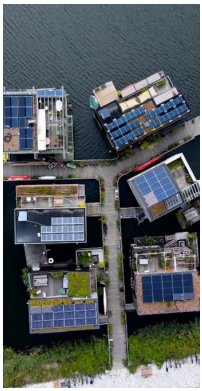
- Rainwater Harvesting: Rainwater is collected and filtered for use in non-potable applications, such as irrigation, reducing the neighborhood's reliance on municipal water supply.
- Wastewater Treatment: An innovative system treats and reuses graywater (non-potable water from sinks, showers, etc.) within the community, supporting circular water use.

Passive Cooling Techniques:

- Natural ventilation and shading techniques reduce the need for air conditioning during warmer months. By maximizing passive cooling, Schoonschip minimizes its cooling energy requirements.

Schoonschip represents a prototypical instance of sustainable urban living. The generation of surplus renewable energy and the efficient management of consumption enable the achievement of the Positive Energy District (PED) target. The project is designed to produce renewable energy on annual basis of approximately 600 MWh from solar PV, with additional heating provided by heat pumps.

Schoonship is designed to be energy self-sufficient, producing enough to meet or exceed its collective demand. This floating district exemplifies how urban development can be energy-positive, environmentally responsible, and community-driven, thereby establishing a new standard for sustainable neighborhoods in urban areas worldwide. Furthermore, the integration of nature-based solutions serves to reinforce the neighbourhood's resilience, biodiversity, and environmental benefits. The utilisation of blockchain-based energy sharing establishes Schoonschip as a paradigm for community-centric, pioneering energy solutions.



Solar PV rooftops on the houseboats,
Source: Space&Matter

Hunziker Areal, Zurich

The Hunziker Areal project in Zürich, Switzerland, represents an innovative, community-centred approach to urban development that is grounded in sustainable principles.

The project has been designed with the objective of meeting ambitious environmental goals, with the intention of becoming a Positive Energy District (PED) through the reduction of energy consumption and the maximisation of renewable energy production. The cooperative-led project incorporates energy efficiency, community engagement, and nature-based solutions with the objective of creating a liveable, energy-positive environment.

Goals

1. *Achieve Positive Energy*: Hunziker Areal aims to generate more energy than it consumes annually, with a focus on renewable energy sources and efficiency in building design.
2. *Promote Sustainable Living and Social Cohesion*: Developed by the cooperative Mehr als Wohnen ("More than Housing"), the project aims to foster community spirit and cooperative living while prioritizing sustainability.
3. *Implement Circular Economy and Low-Carbon Solutions:* The district is designed with a focus on minimizing waste, reusing resources, and reducing carbon emissions.
4. *Enhance Biodiversity and Environmental Quality*: Nature-based solutions and green spaces are integrated to improve local biodiversity and well-being, creating a resilient urban ecosystem.

Haus E at Hunziker Square by Müller Sigrist Architects
Source: buildingsocialecology.org

Strategies for Positive Energy Achievement

1. *Energy-Efficient Building Design*: The project focuses on passive building design, insulation, and high-efficiency construction materials to reduce heating and cooling demands.
2. *Integrated Renewable Energy Systems*: Solar photovoltaic (PV) panels and ground-source heat pumps provide clean, locally-produced energy to meet the district's power and heating needs.
3. *Smart Energy Management:* Hunziker Areal utilizes a neighborhood-wide energy management system to optimize energy use and monitor consumption in real time.
4. *Mobility Solutions*: Car-sharing, cycling, and public transportation infrastructure encourage low-emission transport options within and beyond the district.

Adopted Solutions

Energy Production

Solar Photovoltaic (PV) Panels:

- Capacity: Hunziker Areal has installed approximately 1,200 square meters of solar PV panels across rooftops, which collectively generate around 180,000 kWh annually.
- Energy Output: Solar PV provides about 20% of the district's total energy needs, covering a substantial portion of electricity demand for communal spaces and individual apartments.
- Self-Consumption Strategy: The energy produced is primarily used within the district, with surplus energy fed back into the local grid when demand is low.

Ground-Source Heat Pumps:

- Heat Production: The district employs ground-source heat pumps that draw energy from geothermal wells, providing renewable heating and hot water for the buildings.
- Capacity: The ground-source system covers nearly 80% of the district's heating demand, reducing reliance on conventional heating and achieving significant energy savings.
- Efficiency: With a Coefficient of Performance (COP) of around 4, the heat pumps efficiently convert each unit of electricity into four units of heat, significantly lowering heating energy requirements.

District Heating Network:

- Renewable Heat Sources: Hunziker Areal is connected to Zürich's district heating network, which supplies any additional heating required during peak demands.
- Heat Source Mix: The city's district heating network uses a mix of waste heat, biomass, and other renewable sources, further enhancing the area's sustainability profile.

Energy Consumption

High-Performance Building Envelope:

- Passive Design Standards: The buildings meet the Minergie-P standard, a Swiss energy label similar to the Passivhaus standard, ensuring high insulation and minimal thermal bridging.
- Energy Savings: This design reduces heating demand by approximately 40-60% compared to conventional construction, minimizing energy consumption while enhancing comfort.

Energy-Efficient Appliances and LED Lighting:

- Low-Energy Appliances: All apartments and communal spaces are equipped with energy-efficient appliances that consume significantly less electricity.
- LED Lighting Systems: LED lighting is installed throughout the district, reducing lighting energy use by up to 75% and extending bulb life.

Smart Metering and Home Automation:

- Real-Time Monitoring: Residents have access to smart meters that display real-time data on energy usage, helping them track and reduce their consumption.
- Automated Systems: Automated heating, ventilation, and lighting systems ensure energy is only used when needed, reducing waste and optimizing comfort.

Sustainable Mobility and Transportation:

- Car Sharing and E-Mobility: The district provides car-sharing services and EV charging stations, reducing private car ownership and promoting low-emission transport.
- Bicycle Infrastructure: Hunziker Areal is bike-friendly, with dedicated bike lanes and ample parking to encourage cycling. Additionally, public transit connections reduce the need for personal vehicles.

Nature-Based Solutions

Green Roofs and Façades:

- Green Roofs: Many buildings feature green roofs planted with native vegetation, enhancing insulation and supporting local biodiversity by creating habitats for insects, birds, and small mammals.
- Green Façades: Green walls and façades contribute to natural cooling, reducing building temperatures in summer and improving air quality.
- Impact: These green elements act as natural insulators, reducing the district's overall heating and cooling demand by approximately 10-15%.

Rainwater Harvesting and Greywater Recycling:

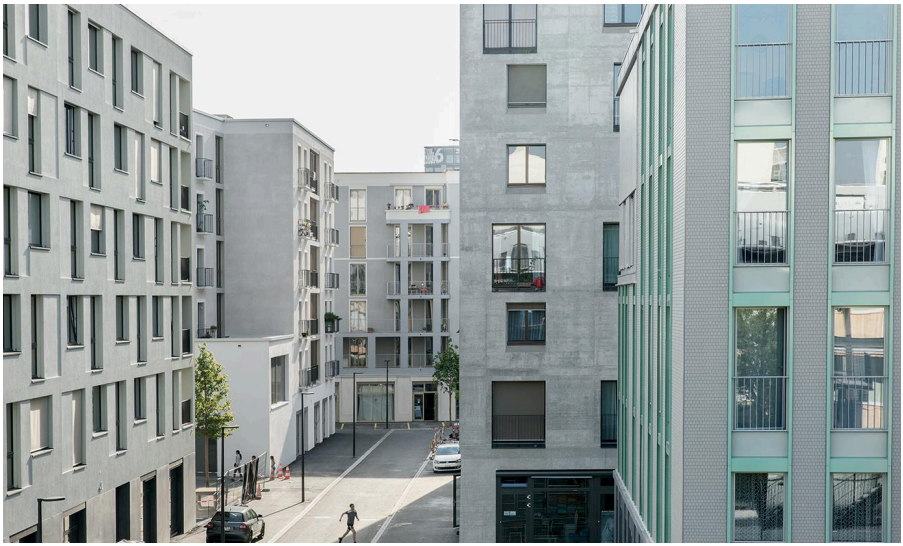
- Rainwater Collection: Rainwater is collected for irrigation and toilet flushing, reducing dependency on potable water and relieving strain on municipal water infrastructure.
- Greywater Recycling: Greywater from showers and sinks is treated and reused for non-potable

purposes, supporting a circular water system within the district.

Community Green Spaces and Biodiversity enhancing:

- Native Vegetation: Public spaces are planted with native species, which require less water and provide food and habitat for local wildlife.
- Ecological Corridors: Connected green spaces form corridors that allow wildlife to move through the district, enhancing local biodiversity.
- Cooling and Quality of Life: Green spaces provide shade, reduce the urban heat island effect, and create recreational areas for residents, enhancing well-being and fostering community interaction.

The Hunziker Areal project exemplifies the integration of energy-efficient design, renewable energy production, and nature-based solutions into a dense urban environment, thereby achieving Positive Energy District (PED) status. The project is designed to produce renewable energy on annual basis of about 1,180 to 1,680 MWh (solar PV and heat pump production combined). By generating surplus energy through renewable sources, Hunziker Areal not only meets its energy demands but also contributes to Zürich's objective of reducing city-wide carbon emissions. The cooperative model encourages community engagement, while the integration of nature-based solutions enhances biodiversity and environmental resilience, thereby establishing Hunziker Areal as a model for future sustainable urban developments.



Hunzikerareal, from left to right, buildings by: Müller Sigrist, Duplex Architekten, Miroslav Šik, Pool Architekten (last two buildings on the right).
Source: www.espazium.ch

Under the bottom line

In order to evaluate the performance of PEDs, KPIs were selected for the purpose of understanding their impact on the renewable energy landscape and their potential contribution to the energy transition of urban areas.

PEDs embody the principles of self-sufficiency, highly efficient-urban energy system implementation and energy flexibility. Their effectiveness in renewable energy landscapes can be attributed to the following key factors:

1. *Local energy production and reduced transmission losses*: PEDs prioritize localized renewable energy sources, such as solar, wind, and geothermal energy. This reduces energy losses associated with long-distance transmission, resulting in higher efficiency and reduced environmental impact.
2. *Energy storage and demand response technologies:* PEDs integrate advanced energy storage solutions, such as batteries and thermal storage, alongside demand response mechanisms. These technologies facilitate the balancing of energy supply and demand within the district, improving reliability and resilience.
3. *Enhanced energy efficiency and building standards*: PEDs incorporate energy-efficient building designs, smart grids, and intelligent control systems. Energy-saving measures and optimized consumption reduce overall demand, enabling districts to maintain positive energy balances.
4. *Social and economic benefits*: PEDs create energy-secure communities, often at lower costs, and promote local economic growth. With residents and local businesses benefitting from reduced energy costs and potential revenue from energy exports, PEDs foster community engagement and acceptance.
5. *Contribution to climate goals and policy alignment*: Many cities and regions have ambitious climate targets that require substantial reductions in emissions. PEDs directly contribute to these goals by providing measurable reductions in carbon emissions, aligning well with government policies and international climate agreements.

To assess the performance of PEDs, several approaches and methods can be used, including:

1. *Energy balance calculations:* A PED's net energy balance is calculated by comparing total energy production with total energy consumption within the district over a defined period (e.g., annually). This balance should be positive to classify the district as a PED.
2. *Life Cycle Assessment (LCA):* LCA methodologies are employed to assess the environmental impact of PEDs, considering the entire lifecycle of energy systems, materials, and resources used.

This can reveal the long-term sustainability of the district's energy solutions.

3. *Simulation and Modeling Tools:* Digital twins and simulation software (e.g., EnergyPlus, OpenStudio) are used to model PED's energy flows and predict their performance. These tools allow for testing various scenarios, such as fluctuating energy demand, weather conditions, and technology upgrades.
4. *Energy Monitoring Systems*: Real-time energy monitoring systems track PED performance by capturing data on energy production, storage, and consumption. Smart meters and IoT devices provide a comprehensive view of energy use patterns and potential areas for optimization.
5. *Economic and Social Impact Studies:* PEDs influence local economies and social structures. Surveys and econometric analyses can measure the financial benefits, job creation, and social acceptance of PEDs within communities.

Key Performance Indicators (KPIs) for Renewable Energy Landscape Economy in PEDs

The evolving connotation of the PED concept has prompted international research initiatives to define methodologies and key performance indicators that can effectively and efficiently assess the performance of PED in diverse urban contexts. Nevertheless, there is currently no established evaluation system in place, as international implementation experiences are required to test strategies and solutions that are still in the validation phase.

Notwithstanding the aforementioned limitations, the most frequently occurring indicators in the extant scientific literature are presented. These indicators have been previously elaborated upon the basis of prior experiences in the field of decarbonisation of urban areas and district and city transformation processes. This elaboration has been conducted through an examination of the existing certification protocols of strategies and solutions at the neighbourhood and district scale. The aforementioned strategies and solutions include LEED-Neighbourhood and Districts, BREEAM Communities, and WELL.

Through an examination of the scientific literature and existing certification systems, as well as an assessment of their recurrence, relevance to the scale of intervention, and alignment with European and international decarbonisation and renewable energy objectives, specific KPIs were selected and classified. This approach provides evidence that the implementation of PEDs requires an integrated, hence systemic, approach to enable the virtuous process of urban transformation in the context of energy transition.

Several categories of KPIs fundamental to the assessment of the efficacy of PED in the renewable energy landscape are presented below and only the most representative key performance indicators are presented to provide a valid although synthetic reference for the implementation of Positive Energy Districts in urban settings.

Environmental KPIs

- *Carbon Emissions Reduction* (tCO2eq): Tracks the reduction in carbon emissions achieved by PEDs compared to conventional urban areas.
- *Energy Autonomy* (%): Measures the proportion of locally sourced renewable energy in meeting the district's total energy demand.
- *Resource Efficiency* (kWh/m²): Assesses the energy efficiency of buildings and infrastructure within the district.

Energy and Technical KPIs

- *Net Energy Balance* (kWh): The difference between energy produced and consumed, confirming the district's positive energy status.
- *Renewable Energy Utilization* (%): Indicates the percentage of energy derived from renewable sources.
- *Grid Resilience and Stability Index*: Evaluates the district's ability to maintain stable energy supplies, even under external stressors.

Economic KPIs

- *Cost Savings* (%): The reduction in energy costs for residents and businesses due to the use of renewable energy sources.
- *Return on Investment (*ROI): Evaluates the financial feasibility of PED projects over time, taking into account both initial investments and ongoing savings.
- *Local Job Creation* (number of jobs): Measures the number of jobs generated directly and indirectly by PED implementation, contributing to the local economy.

Social and Community KPIs

- *Social Acceptance Rate* (%): Measures public support for PED initiatives based on surveys and feedback.
- *Quality of Life Index:* Evaluates improvements in community well-being, such as health benefits from reduced pollution and increased access to reliable energy.
- *Energy Equity (%)*: The degree to which affordable and sustainable energy is accessible to all residents within the district.

Policy and Regulatory KPIs

- *Alignment with Climate Goals (%)*: The extent to which PEDs contribute to national or regional climate targets.
- *Regulatory Compliance Rate (%)*: Measures the PED's adherence to local, regional, and international energy standards and regulations.

Some recommended research and analysis tasks for landscape economy learners:

In light of the information currently available, it is evident that a comprehensive and integrated approach to the energy transition of urban areas is imperative. Positive Energy Districts address contemporary challenges through inter-scalar strategies and solutions, encompassing the scale of individual buildings, districts, and cities, and

extending to the regional level. They actively involve citizens in order to facilitate an effective and efficient urban transition. Such initiatives demand particular attention, particularly during the initial stages of the design process. However, they are supported by operational frameworks derived from scientific research and a wealth of experience in the field.

In order to facilitate the dissemination of the requisite knowledge for the design and implementation of PEDs, a series of guiding questions have been developed to ensure a comprehensive framework, regardless of the specific contextual factors involved. These questions provide a foundation for learners to analyze the multifaceted aspects of PEDs and to think critically about their potential impact on sustainable energy landscapes and urban environments.

Conceptual Understanding of Positive Energy Districts (PEDs)

- What are Positive Energy Districts (PEDs), and how do they differ from traditional urban energy systems?
- Why are PEDs an important concept in the transition to sustainable and renewable energy landscapes?
- How do PEDs align with broader climate goals, such as the reduction of greenhouse gas emissions?
- PEDs and Renewable Energy Integration
- What types of renewable energy sources are typically used in PEDs, and why?
- How do PEDs address the challenges of intermittent renewable energy sources, like solar and wind?
- What roles do energy storage solutions (e.g., batteries, thermal storage) play in making PEDs viable?

Design of Resilient Infrastructure of PEDs

- How can renewable energy infrastructure in PEDs be designed to withstand extreme weather events, such as high winds, floods, or heat waves?
- What roles do energy storage systems play in making PEDs resilient to climate-related disruptions in energy supply, and how does this contribute to both adaptation and mitigation?
- How can adaptive building materials (e.g., cool roofs, flood-resistant foundations) contribute to both energy efficiency (mitigation) and durability against climate impacts (adaptation)?

Nature-Based Solutions and Green Infrastructure in PEDs

- How can nature-based solutions, such as green roofs, urban forests, and permeable surfaces, be incorporated into PED design to support climate adaptation while also reducing energy demand?
- In what ways can green infrastructure in PEDs reduce urban heat island effects, thereby decreasing cooling energy requirements and emissions?
- How can the integration of green spaces and water management systems in PEDs help

manage stormwater, reduce flooding risks, and contribute to a balanced energy landscape?

Energy Demand Flexibility and Climate-Responsive Design

- How can flexible energy demand management (e.g., demand response, adaptive lighting) in PEDs help balance energy loads during extreme weather events, reducing strain on the grid and emissions?
- In what ways can climate-responsive building designs, such as passive solar heating, natural ventilation, and thermal mass, enhance both energy efficiency and comfort in a changing climate?
- How can district heating and cooling systems be optimized for both climate resilience (adaptation) and emissions reduction (mitigation) within a PED?

Measuring and Monitoring PED Performance

- How do we determine if a district qualifies as a Positive Energy District?
- What measurement tools and methods are used to track the energy balance in PEDs?
- What kinds of data are necessary for evaluating the success of a PED, and how is this data collected?

Key Performance Indicators (KPIs) for PEDs

- Which environmental KPIs are most relevant when evaluating PEDs?
- How do social and economic KPIs contribute to understanding the broader impacts of PEDs on communities?

Social and Economic Impact of PEDs

- How might PEDs benefit local communities economically? Consider factors such as job creation and energy cost savings.
- What are the potential social benefits of living in or near a PED?
- How can PEDs promote energy equity and ensure that renewable energy access is fair and inclusive?

Challenges and Limitations of PED Implementation

- What are some of the main barriers to implementing PEDs in urban settings?
- How might high initial capital costs affect the scalability of PEDs?
- What are some regulatory or policy challenges that could hinder PED adoption?

Future of PEDs in Urban Planning

- How could the PED model influence future urban planning and development?
- In what ways might PEDs evolve with advancements in technology, such as artificial intelligence and IoT?
- What steps could policymakers take to encourage wider adoption of PEDs in cities and regions?

PEDs and Climate Action Goals

- How do PEDs contribute to local, national, and international climate action goals?
- In what ways can PEDs help cities achieve net-zero targets?
- How might the success of PEDs in urban areas inspire similar energy-positive approaches in other sectors, such as industry or agriculture?

References

1. IEA. (2021). Cities and climate change: Urban climate action pathways. International Energy Agency.
2. SET-Plan Temporary Working Group 2018 SET-Plan ACTION n 3.2 Implementation Plan: Europe to become a global role model in integrated, innovative solutions for the planning, deployment, and replication of Positive Energy Districts.
3. Derkenbaeva, E., Halleck Vega, S., Hofstede, G. J., Van Leeuwen, E. (2022). Positive energy districts: Mainstreaming energy transition in urban areas, Renewable and Sustainable Energy Reviews, 153, 111782. https://doi.org/10.1016/j.rser.2021.111782.
4. Anastasovski, A., Andreucci, M.B., Kádár, J., Delli Paoli, M. Energy Storage in Urban Areas: The Role of Energy Storage Facilities, a Review. Energies 2024, 17, 1117. https://doi.org/10.3390/en17051117.
5. Haase, M., Eicker , U., Hachem-Vermette, C., Kayo, G., & Rehman, H. (2024). Lessons learned from analysing PED case studies. In 12th International Conference on Improving Energy Efficiency in Commercial Buildings and Smart Communities (IEECB&SC'24) and European ESCO Conference.
6. Kuzov, T., Shtjefni, D., Kuokkanen, A., Długosz, M., Georgakaki, A., Chinellato, M., Baleva, S., Soede, M., Mrkusova, K., Sobczak, A., Tzimas, E., SET Plan Progress Report 2023, Black, C., Tan, B. (eds.), Luxembourg: Publications Office of the European Union, 2023, doi:10.2760/956347, JRC135396.
7. IRENA. (2023). Energy security and renewable energy: Opportunities and challenges in an unstable world. International Renewable Energy Agency.
8. Andreucci, M.B., Delli Paoli, M., Haase, M. (2023). Exploring tools and indicators to support collaborative planning, design, implementation, operation, and evaluation of Positive Energy Districts. Journal of Physics, 2600, 082001.https://dx.doi.org/10.1088/1742-6596/2600/8/082001
9. Romano, R., Andreucci, M. B., & Giancola, E. (2022). Positive Energy Districts and deep renovation actions to move beyond the 2025 EU Targets. TECHNE - Journal of Technology for Architecture and Environment, (24), 242–253. https://doi.org/10.36253/techne-12887

References for the PED case studies/pictures

La Fleuriaye district, Carquefou, Nantes

https://www.construction21.org/city/fr/district-of-la-fleuriaye.html

Schoonship, Asmterdam

https://www.spaceandmatter.nl/work/schoonschip

https://www.archivibe.com/schoonschip-community-on-floating-houses/

Hunziker Areal, Zurich

https://www.espazium.ch/it/attualita/hunzikerareal-una-periferia-migliore

https://www.buildingsocialecology.org/projects/hunziker-areal-zurich/

Tourism

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Setting the scene
Tourism is a multifaceted phenomenon that encompasses social, cultural, and economic dimensions. It involves the movement of people for various purposes, primarily to spend holidays away from their usual surroundings. As a well-structured and managed industry, tourism integrates a wide range of elements, including information services, accommodation, transportation, gastronomy, entertainment, attractions, and numerous other amenities. Designed to provide pleasure and enjoyment, tourism activities are inherently resource-intensive, relying heavily on both natural and human resources.

What is driving the tourism sector?
Multiple factors drive tourism, including economic conditions, technological advancements, political influences, demographic trends, living and working environments, the desire for authentic experiences, marketing strategies, travel options, and globalisation.

What are typical sustainability conflicts?
The economic value of tourism at global, regional and national levels is undisputedly evident. Tourism has become an engine of the economy for many destinations and it has grown into one of the most important sectors in many countries (World Economic Forum, 2019). Although tourism heavily depends on nature and natural resources, local cultures and heritage, the local communities often do not benefit enough from the sector. Tradeoffs from tourism do not cover the losses in local environments.
Tourism has been considered as a white industry until the 1970's. It was not tourism but awareness about the environmental degradation and how to halt and control it. As Kušen (2010) articulated: tourism is almost the only way that natural, cultural assets and

Driving Forces >>>	**Trends**	**Pressures**	**State**	**Impacts**
Political	Globalisation of the tourism industry Liberal, investor friendly policies Increase in mass tourism	Any land seen as opportunity Heavy demand on natural ecosystems	Land consumption Limited participation in regional and local decision making, new stakeholders Decreasing common good	Weakening of social initiatives Increase of local land and housing prices Job opportunities in tourism sector
Economic	Growing economic dependency on tourism Capitalism in the tourism market Fashionable new tourism products	High travel and product costs Economic transition from agriculture to tourism Power relations	Concentration of people and goods in the tourism destination Generational transition and internal labour migration	Creation of social disparities and vulnerabilities in host communities
Social	Individualisation in tourism after COVID Lack of work force in tourism	Fragiity of the visitor cycle Flow of people for tourism employment	Seasonality of employment, services and visitors New line of tourism employees	Society diversifies Change or loss of local cultural identity
Technological	Digitalisation of tourism Virtual tourism	Generic trends in tourism	Tourism product as identity-oriented globalisation	Highly digitalised tourism product and services
Environmental	Heavy demand over natural resources and landscapes Extending tourism infrastructure	High input costs	Fragile ecosystems	Degradation of ecosystem services
Spectrum of Responses				
Tools, Anticipations and Initiatives	UN Sustainable Development Goals EU Green Deal WU / UNWTO Sustainable Tourism for development		Integrated and sustainable tourism strategies Circular economy related to tourism Enhancing community resilience	

Driving forces, pressure and impacts in tourism (Atik, 2023)

Tradeoffs of and within the tourism system

Tourism is constantly challenged by the co-existence of positive and negative effects of this sector on the territory. Cultural heritage, historic sites, nature reserves, protected areas, coastal and marine areas, islands, cities, city attractions, cultural routes, natural routes, recreation areas, thermal sources and many other amenities are affected by tourism. For applying a systems thinking approach, we need to consider the actors and interests of all related tourism dimensions: travel, accommodation, entertainment, gastronomy, marketing, labour as well as the capacity of the host community. Impacts of tourism have multiple aspects.

Circular tourism as an alternative vision pathway

A tourism product is a combination of tangible and intangible elements, such as natural, cultural and man-made resources, attractions, facilities and services which are priced and sold through distribution channels (UNWTO, 2019a). Tourism systems are soft organisational systems that include various sub systems such as supply, demand, intermediaries, tourists, information. In addition, there are social, material, financial and energetic relations. In the tourism system, these boundaries are also permeable (Jere Jakulin, 2017).

Circularity of leading back to the point from which it started, and circular economy in particular can potentially deliver a regenerative vision for the tourism industry offering a pathway towards a resilient and sustainable tourism ecosystem.

Circular economy, a transformative and regenerative approach that restores and replaces the end-of-life of material, has been touted as a possible solution to mitigate energy, water and waste generation in the tourism industry (Erdiaw-Kwasie et al., 2023). According to Girard and Nocca (2017) and Martínez-Cabrera and López-del-Pino (2021) circular tourism is defined as *"a model able to create a virtuous circle producing goals and services without wasting the limited resources of the planet that are raw materials, water and energy"*.

Circular tourism could be seen as an alternative vision for sustainability in the tourism sector, taking the principles of the circular economy into account. Girard and Nocca (2017) emphasised a series of keywords such as *"recovery, reuse, redevelopment, valorisation and regeneration of the natural and cultural resources that are linked to the concept of circular tourism"*.

Thinking tourism as a system (Atik, 2023)

A story of positive change.
Excess tourism results in destruction of destinations' environments by turning them into so-called *touristic places*. For half a century, the discussion has been continuing of how tourism can become less harmful but still profitable and helpful for economies and local communities. We need different principles and solutions such as sustainable tourism, responsible tourism, smart tourism and circular tourism.

In the field of tourism accommodation circular economy processes involve building and construction, refurbishing, decorating, operation services and circular practices in accommodation (Manniche et al., 2017). The UN Environmental Programme's circularity approach considers the following circularity principles. They are grouped into four categories, going from most to least impactful:

These principles are:
- The first category, 'guiding principles', involves *reduce by design*
- The second category 'user-to-user', involves *refuse, reduce* and *reuse*
- The third category 'user-to-business' involves *repair, refurbish* and *remanufacture*
- The last category, 'business' to business' involves *repurpose* and *recycle* (UN, 2024).

Good practices
One of the examples of good practice is an Innovation Platform for Promoting and Implementing a Circular Economy Strategy in the Tourism Sector of the Valencian Community. The Castellón province is a popular tourist destination and of great importance for the region. The province has a wide variety of tourist attractions, from beaches and natural landscapes to historic cities and architectural monuments. An Innovation Platform for Promoting and Implementing a Circular Economy Strategy in the Tourism Sector of the Valencian Community – The InnoEcoTur project – was conducted for hotel companies, restaurants, and suppliers in the tourism sector to analyse to what extend they adopt the principle of circular economy.

Good practices carried out by tourism companies for the transition to circular economy in Castellón were employee training and awareness-raising on energy saving, reconversion of worn-out hotel sheets into uniforms for their staff, renewal of electrical appliances, such as air conditioning, to replace them with new, more energy-efficient models, measurement of the carbon footprint and the consequent establishment of actions to reduce it, the use of water and light sensors in hotels and restaurants, the creation of own reusable packaging to be used in relations between hotels and restaurants and their suppliers, the purification, use and reuse of water from showers and toilets in hotels. However, raising awareness among both businesses and consumers will be crucial to overcoming the challenges and fostering a more circular and sustainable tourism sector in Castellón (Serbanescu et al., 2024).

An environmental initiative of Martin's Hotels with 14 hotels in 9 cities in Belgium covers accommodation, restaurant, energy and water and work primarily on waste and energy reduction under the phrase "Tomorrow needs today". By collaborating with its suppliers in waste transition, the ultimate goal of the initiative is to extend sustainability focus to circular economies (Manniche et al., 2017).

Based on three pillars, namely prevention, redistribution and circulation, the Global Roadmap for Food Waste Reduction in the tourism sector is an action to accelerate the uptake of food waste reduction strategies by and to raise awareness among tourism stakeholders for a more sustainable and circular management of food (WTO, 2023).

Under the bottom line: Why does the alternative system work?

Unlike other export industries, tourism is a highly differentiated product which directly affects several sectors of a national economy: tourist expenditure is injected into hotels and other accommodation units, local shops and restaurants, local transport facilities and many other outlets, including the purchase of locally made souvenirs (Sadler and Archer, 1975).

The tourism - economy nexus has been more complicated. Investments, creating employment and jobs, improvement of holiday environment, tourism infrastructure and products in tourism supply-chain are all main pillars in tourism economy (Sorin and Einarsson, 2020). Therefore sustainable tourism must be applicable to all forms of tourism in all types of destinations, including mass tourism and the various niche tourism segments.

Many initiatives have been undertaken to sustain the functioning of the tourism sector. At the European level, the Transition Pathway for Tourism, developed as part of the European Green Deal, emphasises the importance of accelerating the green and digital transformation within the European Union's economic system. To achieve this, the strategy advocates collaboration among industry stakeholders, public authorities, social partners, and other key participants. This co-creation process aims to produce transition pathways tailored to each ecosystem.

Tourism, as the most heavily hit economic system by the COVID-19-crisis, will be the first to have its transition pathway. The actions of this pathway will form the key elements of the upcoming European tourism agenda 2030/2050 (European Union, 2022). The transition pathway covers green transition of the tourism system, carbon-neutral mobility, sustainable consumption, resilience of tourism ecosystem, accessibility and social impacts of tourism, improving skills and ensuring quality of work in tourism and overall circularity in tourism.

On the urban level, the European initiative of Smart Tourism is to reward smart and sustainable tourism practices in European cities based on the principles of promote, strengthen, increase, establish, inform and encourage sustainability in tourism (European Commission, 2024).

Recently, the CEnTOUR - Circular Economy in Tourism initiative aims to help SMEs in the tourism industry in moving towards a circular economy by developing an integrated system at the local/regional level. This addresses the challenge of moving from a linear to a circular economy model (CEnTOUR, 2022).

Key performance indicators of sustainable tourism
Taking three main pillars of tourism activities as travel, accommodation, entertainment and gastronomy, there are many measures for sustainability and good practices.

For example ECOTRANS - European Network for Sustainable Tourism Development and VISIT European Initiative for the Promotion of Ecolabels and Sustainable Tourism sets criteria for sustainable tourism development while World Travel & Tourism Council (WTTC) and Tour Operator Initiatives for Sustainable Tourism focus on the in and out bound travel in tourism. From a system approach, the European Destinations of Excellence (EDEN) initiative rewards and promotes sustainable tourism practices in smaller tourist destinations.

Most of the performances were explicated for hotel industry and accommodation in tourism. IHEI International Hotels Environmental Initiative, Green Hotel Association, IHRA- International Hotel & Restorants Association, the Green Key award, The EU Ecolabel tourist accommodations are just some of the initiatives for the hotelier.

The Tourism2030 platform aims to support the tourism sector by making their products and services more sustainable and visible (Tourism 2030, 2023). The EU Green Deal, our commitment to a climate-neutral Europe by 2050, sets a focus on circular economies that will also drive change in the tourism industry. The system will need to change how it operates, including how destinations are managed, to deliver sustainable and quality experience to visitors. Taking various performance indicators into account such as economic viability, local prosperity, employment quality, social equity, visitor fulfillment, local control, community wellbeing, physical integrity in tourist destination, safeguarding biological diversity, resource efficiency can help tourism

sustainability. If we want to achieve circularity in tourism, the following aspects need to be considered:

Sustainable Tourism Development

- Localisation instead of globalisation of the tourism product
- Protection of natural and cultural resources in tourism planning
- Respecting geographic and natural borders in destination planning
- Business viability both in seasonal and sectorial terms
- Endorsement of green transition in tourism as a system

Economic Contributions & Benefits

- Job creation throughout the supply chain of the tourism system
- Fair share of the economic contribution of the tourism sector at regional and local scales
- Community & Social Impact
- Improvement of the environment and quality of life in the host communities
- Empower communication between institutions, the tourism sector, and local and regional stakeholders
- More accessibility for all tourism facilities and amenities
- Support maintenance of social integrity, equity, and accessibility

Environmental Sustainability

- Environmental management systems in each tourism segment (travel, accommodation, gastronomy, entertainment, logging, etc.
- Limiting the consumption of water, energy, and other natural resources
- Harvest, reuse, recycle water, and improve water quality
- Effective waste management, avoid and limit waste production
- Energy conservation and adoption of renewable energy resources in destination management
- Climate change adaptation measures in tourism activities and the destination
- Initiate and promote carbon-neutral mobility

Education & Quality Standards

- Promote environmental communication and education
- Encourage eco-labels and good quality indicators in tourism product and service

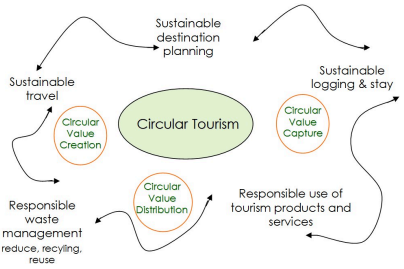
(Author interpretation, 2023)

More specifically, UNWTO (2019b) addressed strategies for urban tourism as promote the dispersal of visitors within the city and beyond, promote time-based dispersal of visitors, stimulate new visitor itineraries and attractions for cities, enhance visitors' segmentation, ensure local communities benefit from tourism, create city experiences that benefit both residents and visitors, improve city infrastructure and facilities, communicate with and engage local stakeholders, set monitoring and response measures.

Which indicators are relevant for landscape economy?

The tourism value chain is the sequence of primary and support activities which are strategically fundamental for the performance of the tourism sector. Linked processes such as policy making and integrated planning, product development and packaging, promotion and marketing, distribution and sales and destination operations and services are the key primary activities of the tourism value chain. Activities involving transport and infrastructure, human resource development, technology and systems development and other complementary goods and services which may not be related to core tourism businesses but have a high impact on the value of tourism (Manniche et al., 2017).

Thinking tourism as a system implies starting from travel to destination and return home back, travel to and in the destination/s, accommodation, gastronomy and entertainment, circular tourism relates travel, consumption, destination environment, host community, recovery models of natural and cultural values. Circular tourism embraces costumers, service providers, tourists, planning institutions, travel and logging industry based on the pillars of sustainability that bring value creation, capture and distribution (see figure below).



The circular pillars of tourism (Atik, 2023)

Main tasks and points for consideration

Any definition runs the risk of either overestimating or underestimating its economic activities of tourism (Ceballos-Lascurain, 1996). Economic relations behind tourism inextricably linked to landscape in many ways. The landscape economy aspects of tourism multifaceted, multidimensional, interdisciplinary due to its social, environmental, spatial, cultural, technologic and economic aspects. Learners can start with the flows of tourism, concepts of tourist, tourist as consumers, variables in tourism products, attractions and amenities, infrastructure, stakeholder in tourism. Starting from a tourism product chain and extending it to a tourism system will help to analyse and manage landscape economy in tourism.

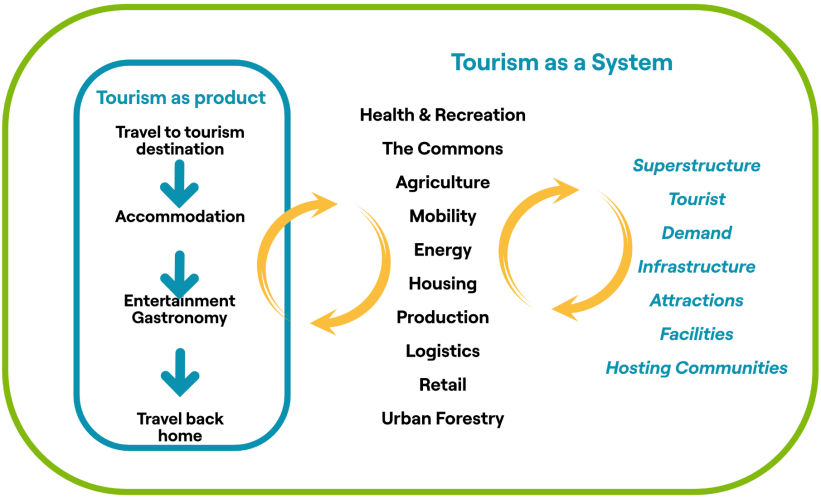
Possible tasks for learners can be:

- thinking about tourism as a system and product and delineating common grounds where product extends to a system
- mapping relations between different aspects, stakeholders both in tourism product and tourism system
- re-defining main challenges for sustainable transitions in tourism from local scales to regional scales
- alternating sustainable value chains in tourism as a system with regard to landscape economy
- giving an account for circular tourism in a globalising world
- setting up a code of key processes, key resources, key products, beneficiaries for circularity in tourism system
- circumscribing circular tourism economy more specifically for cities as destination and
- exploring how tourism can be friendly with the cities rather than tourism friendly cities
- discussing community involvement in local and regional even in city tourism planning, design and management
- reviewing deeply how to link quality of life (involvement of local communities, minimizing the social impact), quality of experience (the uniqueness, imagination and interpretation and curiosity) and quality of resources (nature and management cultural resources preservation) in a circular tourism systems for cities

Circularity for Sustainability in Tourism

Landscape is an area as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Council of Europe, 2000). Tourism has been one of the economic activities that comprise travelling for pleasure and curiosity. Tourism and landscape are highly related. Tourism depends on the diversity and attractiveness of sources in the landscape while tourism economy is rooted natural, cultural and human capital. Landscape economy is about complex economic relations that take part in the landscape but crucially need to be balanced and harmonious with the limits of natural environment. In the frame of TELOS project (Towards a European Landscape Economy for a Sustainable Urban Development) health & recreation, the commons, agriculture, mobility, energy, housing, production & logistics and forestry were the thematic lines, whereby economic value of tourism of generating employment and income, initiating infrastructure, overall creating revenues for tourism city, region or destination are closely linked with the landscape economy. Here, urban landscapes have been key sources as well as revenues for accommodation, food culture, entertainment and placed based activities.

Pertaining travel, accommodation entertainment & gastronomy as the tourism product, TELOS project outreach with social business model, landscape system analysis and modeling opens a new vision for tourism as a system (see figure on the following page). Mobility entails travel and access to infrastructure, attractions and facilities while energy is needed in all phases and component of the tourism activities. Superstructure of public and private sector organization, laws, regulations, plans, and programmes deals with planning of tourism and potentially associated with TELOS thematic lines. Demands coming from tourists living in the country and abroad as well as investors, infrastructure of airports, roads, water supply networks, sewage, communication networks and facilities of hotels, motels, campgrounds, parks, restaurants, cafes, travel agencies, sport and recreation amenities are the tourism components of tourism with high economic significance.



Tourism as product and system (Atik, 2023)

The tourism sector has been in search for low impact and high income tourism activities which has been attached to sustainable tourism, responsible tourism and recently circular tourism. Referring to Sorin and Einarsson (2020), a circular model intentionally designed to be regenerative of natural, human and social capital, operating within the earth's and local destinations' sustainable boundaries.

Circularity is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. Tourism related value chain is a set of activities that operating in tourism and sub industries is to deliver a valuable product to the visitors as an end customer but also added value tourism product for the host communities and tourism destination in a circular manner.

As opposed to the linear "one use only" model, the circular economy focuses on creating systems in which products, materials and resources maintain their value and usefulness as long as possible (Serbanescu et al., 2024). Nevertheless, the transition from the linear to the circular economy requires a complete change of attitude in all aspects of the economy (Kaszás et al., 2021). Circular economy is based on circular value creation, system thinking collaboration, stewardship, transparency. Circular tourism relates with circular value creation of imaginative and sustainable invention of tourism product and services; circular value capture of a successful representation of tourism and circular value distribution for the delivery and incorporation of sustainable tourism system.

When discussing circular tourism as a new development/management model for tourism sector *"In a circular perspective, waste produces by tourism sector can become part of the city system and thus part of the urban processes in order to optimize resources and make tourism more sustainable"* (Girard and Nocca, 2017).

Tourism activities take part in various landscape settings such as historic sites, protected areas, natural reserves, coastal areas, islands and cities economic tourism driven economic relations in the landscapes requires different dimensions. A social business model consists of value proposition, customers, key products, services, channels, key processes, key resources, key partners, costs drivers, revenues and beneficiaries would be an useful tool in revealing complex structure of tourism from a product to a system within a landscape economy perspective.

References

- Atik, M., 2023. Topic 10. Tourism. TELOS Towards a European Landscape Economy for a Sustainable Urban Development Project, online Seminars, 2023, https://telos.hfwu.de/index.php?title=TELOS_Online_Seminar_2023-2024
- Ceballos-Lascurain, H., 1996. Tourism, Ecotourism and Protected Areas. IUCN-The World Conservation Union, Protected Areas Programme, IV World Congress on National Parks and Protected Areas, ISBN 2-8317-0124-4, SADAG Bellergarde sur-Valserine, France, 301 pages.
- CEnTOUR, 2022. Circular Economy in Tourism initiative. COSME project https://circulartourism.eu/
- Council of Europe, 2000. European Landscape Convention. ETS No: 176, Florence. Available https://www.coe.int/en/web/landscape (20.05.2020).
- Tourism 2030, 2023. European Ecolabel for Tourist Accommodation Services and Camp Site Services. Destinet Services https://destinet.eu/resources/certificates/european-ecolabel-for-tourist-accommodation-services-and-camp-site-services
- European Union, 2022. Transition pathway for tourism. European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Available https://op.europa.eu/en/publication-detail/-/publication/404a8144-8892-11ec-8c40-01aa75ed71a1 (25.05.2022)
- European Commission, 2024. European Capital and Green Pioneer of Smart Tourism. Available https://smart-tourism-capital.ec.europa.eu/index_en?prefLang=fr(18.10.2024)
- Girard, L.F., Nocca, F., 2017. From linear to circular tourism. Aestimum 70: 51–74. http://dx.doi.org/10.13128/Aestimum-21081
- Jere Jakulin, T., 2017. Systems Approach to Tourism: A Methodology for Defining Complex Tourism System. De Gruyter Open, Organizacija 50 (3): 208-2015. https://dx.doi.org/10.1515/orga-2017-0015
- Kaszás, N., Keller, K., Birkner, Z., 2021. Understanding Circularity in Tourism. Society and Economy 1-18. https://dx.doi.org/10.1556/204.2021.00025
- Kušen, E., 2010. A system of tourism attractions. Tourism, Review 58 (4): 409-424.Martínez-Cabrera, J., López-del-Pino, F., 2021. The 10 Most Crucial Circular Economy Challenge Patterns in Tourism and the Effects of COVID-19. Sustainability 13, 4940. 4940. https://doi.org/10.3390/su13094940
- Manniche, J., Topsø Larsen, K., Brandt Broegaard, R., Holland, E., 2017. Destination: A circular tourism economy- A handbook for transitioning toward a circular economy within the tourism and hospitality sectors in the South Baltic Region. Centre for Regional and Tourism Research, Denmark, ISBN 978-87-93583-04-7, 158 pages.
- Sadler, P.G., Archer, B.H., 1975. The Economic Impact of Tourism in Developing Countries. Annals of Tourism Research, Vol. III (1):15-32.
- Serbanescu, A., Cháfer,L.M., Fernández, T.M., 2024. Good Practices of Circular Economy in Tourism in Castellón. In book: Managing the Transition to a Circular Economy, Edit M. Segarra-Oña et al. (eds.), Springer Briefs in Business, Chapter 8, pp.79-87. https://dx.doi.org/10.1007/978-3-031-49689-9_8
- Sorin, F., Einarsson, S., 2020. Circular Economy in Travel and Tourism, a Conceptual Framework for Sustainable Resilient and Future Proof Industry Transition. CE360 Alliance, SEIN Consulting, FSO Consulting, Available https://circulareconomy.europa.eu/platform/sites/default/files/circular-economy-in-travel-and-tourism.pdf (Accessed 19.05.2022)
- UNWTO, 2019a. UNWTO Tourism Definitions. UNWTO UN Environment Program and UN World Tourism Organization. Madrid, DOI: https://doi.org/10.18111/9789284420858.
- UNWTO, 2019b. 'Overtourism'? Understanding and Managing Urban Tourism Growth beyond Perceptions. Available https://www.e-unwto.org/doi/pdf/10.18111/9789284420070
- United Nations, 2024. Circularity. United Nations Environmental Programme. Available https://www.unep.org/circularity (25.08.2024)
- World Economic Forum, 2019. The Travel and Tourism Competitiveness Report 2019. Available https://www.weforum.org/publications/the-travel-tourism-competitiveness-report-2019/ (27.09.2024)
- WTO, 2023. Global Roadmap for Food Waste Reduction in the Tourism Sector. UNWTO Madrid, https://doi.org/10.18111/9789284424085

Agriculture and Foodscapes

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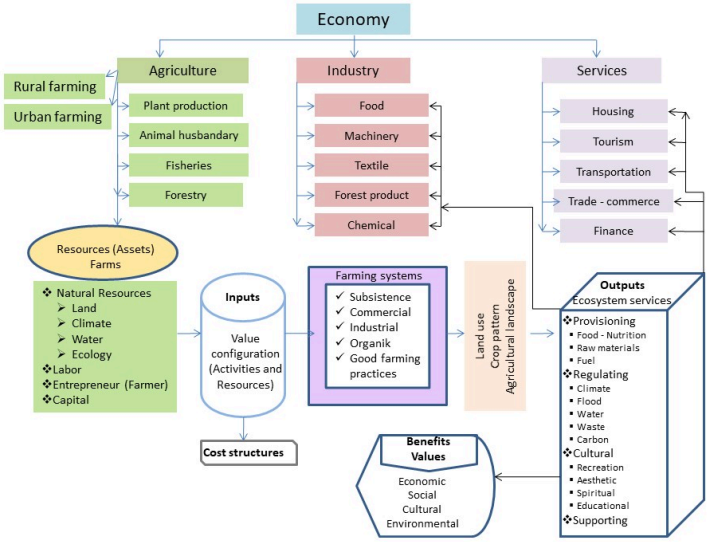
Setting the scene: What is driving the sector?

Agriculture encompasses a wide range of methods for cultivating plants and animals, including crop cultivation, domestication, horticulture, arboriculture, market gardening, animal husbandry, and fisheries. This sector generally involves a complex production process that transforms various inputs into outputs (Figure below). Agricultural systems rely heavily on natural resources such as land, climate, water, and biodiversity, as well as on capital, labour, and entrepreneurship in various combinations. These resources interact to produce the final goods. At the end of this production process are crop and livestock products, as well as biomass, which are sold in agricultural markets for purposes such as food consumption, bioenergy production, and ornamental use. Agriculture also shapes diverse productive landscapes that provide valuable ecosystem services, including water retention, biodiversity support, and spaces for leisure and recreation.

Historically, agriculture evolved from labour-intensive production on small farms to a more market-oriented, internationally integrated sector. Today, it is largely dominated by agribusiness, marked by extensive mechanisation and the use of chemicals and fertilisers.



Agricultural concept map and agricultural systems components, *diagram elaborated by I. Yilmaz, 2024*

The large corporations focus on profit, cost efficiency, and have a global orientation. Authorities influence the sector in a segmented manner, lacking an integrated approach for social, environmental, and economic factors. The agriculture sector's development, sustainability, and productivity are driven by several factors, varying across regions and countries.

I. Economic Factors

1. Market Demands and Agricultural Markets:
Consumer preferences for diverse, high-quality products drive the sector. Farmers adjust production methods and crop choices based on market signals to increase profit (Grunert and Bredahl, 2004). From the 1950s to the 1980s, agricultural production grew significantly due to government support and market drivers, leading to higher self-sufficiency rates in European countries. However, farmers' share of consumer prices declined as the retail sector gained power. Consequently, many farmers pursued economies of scale or left the sector. Currently incentives are in place to encourage young farmers (Morris et al., 2005).

2. Research and Development,
Advances in crop science, biotechnology, and sustainable practices help farmers to increase profitability and adapt to changing conditions. Innovations like modified crops, precision farming, and advanced machinery enhance efficiency and yields (Nicolia et al, 2014; Lowenberg-De Boer, 2017) have contributed significantly to global food output growth since the mid-1960s.

3. Global Trade and Market Integration
International markets, trade agreements, and globalisation influence the competitiveness of agricultural products and the sector's overall structure (Anderson and Martin, 2019). Since 1995, agricultural trade has more than doubled.

4. Government Policies
Agricultural policies, subsidies, and regulations significantly impact production decisions. Policies related to trade, land use, and environmental conservation shape agriculture's direction and structure (Swinnen and Squicciarini, 2012). Environmental protection policies have increased since the late 1980s (Morris et al., 2005).

5. Access to Finance and Inputs
Adequate access to credit, seeds, fertilisers, and other inputs is crucial for adopting modern technologies and enhancing productivity. This depends on farmers' characteristics, organizational structure, financing costs, and risk factors. Many farmers are greatly depending on loans.

6. Agricultural Infrastructure
In underdeveloped and developing countries, agricultural infrastructure development is vital. Availability of irrigation infrastructure and sustainable water management practices in arid regions significantly affects production.

II. Environmental Factors

1. Climate and Environmental Conditions
Weather, climate change and environmental conditions impact agricultural practices. Farmers must adapt to changing climate patterns and environmental regulations.

2. Soil Structures and Topography
Soil structure and topography influence water retention, root development and nutrient availability, affecting agricultural production. There is a growing concern on the negative impact of current farming practices on soil quality.

3. Consumer Awareness and Sustainability
Growing awareness of environmental issues and sustainable farming practices leads to changes in consumer behaviour, driving a shift towards environmentally friendly approaches.

III. Social Factors

1. Demographic Changes
Population growth, urbanisation, and demographic shifts impact food demand, requiring increased productivity and sustainability in agriculture.

2. Cultural and Social Factors
Local traditions, cultural practices, and social norms influence agricultural practices. Farmers' knowledge and characteristics also play a role.

3. Food Security and Safety
Ensuring access to safe, nutritious food is essential for health and nutrition. Food safety is addressed by a farm-to-fork approach focusing on prevention and risk management (Uyttendaelea et al., 2016).

4. Animal Welfare: Society increasingly values animal welfare, prompting changes in infrastructure and practices to improve the well-being of farm animals (Fernandes et al., 2021).

Balancing these dynamic factors while considering local conditions and global trends is crucial for successful agriculture.

Which sustainability conflicts is agriculture facing and co-creating? Which major tradeoffs are prevalent?

The agriculture sector faces several sustainability conflicts, reflecting the complex challenges arising from the need to balance food production with environmental conservation, social equity, and economic viability. Tradeoff refers to the idea that achieving one desirable outcome may require sacrificing another. Agricultural decisions involve balancing multiple factors, and optimizing one aspect may come at the expense of another.

Key sustainability conflicts in agriculture include:

- *Land Use Conflict:* Competition for land among agriculture, urbanization, and natural ecosystems can lead to deforestation, loss of biodiversity, and habitat fragmentation. Expanding agricultural land into forests or wetlands contributes to these issues.
- *Water Scarcity and Pollution*: Agriculture consumes significant water resources. Inefficient use and pollution from pesticides, fertilisers, and other contaminants can deplete water supplies and degrade ecosystems. Over-extraction of groundwater for irrigation can also negatively impact both agriculture and ecosystems.
- *Chemical Inputs and Environmental Impacts:* Pesticides and fertilisers can cause water pollution, soil degradation, and harm to biodiversity and human health. Runoff with excess nutrients leads to eutrophication in water bodies, while intensive farming practices, including heavy chemical use, have detrimental environmental effects.
- *Biodiversity Loss and Monoculture:* Intensive farming often relies on monoculture, which reduces biodiversity and resilience to environmental changes. Increasing crop biodiversity and practicing crop rotation can enhance soil health and ecosystem stability by improving soil organic matter and reducing pest and weed pressures.
- *Climate Change Impact:* Agriculture contributes to greenhouse gas emissions through activities like livestock farming and deforestation. Climate change affects productivity and food security, potentially disrupting crop cycles and yields. However, it might also benefit some crops in certain regions, such as in Northern Europe lengthening the growing season.
- *Social Equity and Food Security*: Inequitable distribution of resources and land tenure issues can lead to social conflicts and threaten food security. Land grabbing for large-scale agriculture can displace local communities, causing unrest and poverty.
- *Technology and Resource Access:* Limited access to modern agricultural technologies and resources can exacerbate inequality, especially among small-scale farmers. While genetically modified seeds and mechanised farming can increase efficiency, they also raise ethical, environmental and employment concerns.
- *Land Degradation and Soil Erosion:* Unsustainable practices like overgrazing and improper irrigation cause soil erosion and degradation. Techniques such as terracing and reduced tillage can mitigate these effects.
- *Over-Extraction of Aquatic Resources:* Aquaculture and fisheries may lead to overfishing, habitat destruction, and contamination, threatening marine biodiversity and coastal communities' livelihoods.
- *Global Trade and Market Pressures*: International trade dynamics can drive unsustainable practices, such as deforestation for new agricultural land driven by commodity demands. Speculation on agricultural products can threaten food security.

Addressing these conflicts requires integrated approaches considering environmental, social, and economic dimensions. Sustainable practices, conservation efforts, and policy interventions are crucial for balancing food needs with ecosystem protection.

The neo-liberal approach has led to open markets with huge flows of import and export, which often resulted in a worse economic position of farmers.

In many countries the productive land and facilities are owned by large companies. The current production methods resulted in large scale landscapes that are suitable for mechanisation. Society boosts industrial production at the cost of the natural capital, people's health and fair incomes for farmers. Consumers, who have no clear understanding of how the system works, prefer cheap and diverse offers of food, and that results in hidden costs for the environment and society. Recently, the approach to agriculture has shifted from a sectoral into a more integral approach that considers healthy food and preserving the natural and social capital. By developing agriculture in a sustainable way, it can contribute to climate resilience and landscape values.

In 2019, IPES-Food (International Panel of Experts on Sustainable Food Systems) clearly defined the main challenges of the current food production system:

- Environmental impacts such as loss of soil, unprecedented impacts on plant and insect life, by pesticides and nitrogen fertilisers, loss of environmental services pollination.
- Policy impacts such as subsidies of the CAP
- Globally, agriculture contributes up to 30% of greenhouse gas emissions, while huge imports of meat and fodder result in deforestation, evictions of local people, pesticide poisoning in the global south.
- Health impacts such as air pollution by ammonia emissions, surface and drinking water pollution by pesticides and fertilisers, antimicrobial resistance and exposure to endocrine disrupting chemicals via foods, food packaging.
- Change in diets by industrial processing and marketing result in overweight and obesity, especially for the poorer population groups.

Socio-economic impacts consist of poor working conditions and livelihood pressures for farmers by power imbalances. For instance, 70% of the global agrochemical industry and seed production is in the hands of only four companies, and up to 90% of the global grain trade is controlled by four multinationals.

The erosion of traditional food cultures and the emergence of urban lifestyles has disconnecting people from how food is produced and from concepts such as the seasonality of fruits and vegetables. The main challenges are shown below:

Food security
Farmers experience insufficient access to land, big corporations buy agricultural land for export production (land grabbing), local and regional authorities pay hardly any attention on the preservation of arable land. At global and national levels there is a loss of arable land due to urban sprawl, climate change and land grabbing. A growing ppopulation requires a larger supply of food. This might be partly addressed by reducing food waste at local, regional and national level. Seeing food as a commodity with speculation on global and national markets results in less food security. Approximately, 30% of the word's population lacked access to adequate food in 2020 and into 2021 (World Bank, 2021).
Failure to put sustainable farming first
Ensuring access to land, water and healthy soils. This results in loss of biodoversity and insufficient resilience to climate change effects such as flooding, draught salination and heat stress. The main stream agricultural system does not support the development of healthy soils and results in release of carbon and less water retention. Competition with other land-use types, such as urban development, infrastructure and biomass production have a negative impact of the availability of productive land in particular in metropolitan and peri-urban areas.
Techno-Fixes that sideline the real situation
It is essential to rebuild climate-resilient, healthy agro-ecosystems, making use of the principles of agroecology. Many of the techno-fixes that are currently developed require high investments, making the farmes more dependent on financial institutions and larger corporations. These solutions might mitigate negative impacts, but they do not change the system in a sustainable way. Patents on varieties and seed cause dependence of farmers on large companies and result in higher costs for the farmers.
The hidden costs pf cheap food and fair income for sustainable farming
Consumers have not enough insight in health effects and the negative impact of cheap food on the environment, producers, processors and the local retail. There is a need for promoting sufficient, healthy and sustainable diets for all. Public procurement should integrate quality standards for healthy and regional food that provides a fair income for producers.
The untapped potential of alternative food system initiatives
There is an urgent need for fairer, shorter and cleaner supply chains. However, there is insufficient support by financial institutions and government regulation to invest and develop this. This calls for a stronger bottom-up movement to enable transformation of the system.
Export orientation and race to the bottom
Putting trade in the service of sustainable development. The dominance of larger corporations regarding the inputs in agriculture (fodder, chemical fertilizers, pesticides, seeds), processing, trade and retail in the food chain results in unfair income for farmers and producers, an overload of processed (less healthy) food.

What consumers ultimately choose to eat and drink directly impacts productive landscapes and the environment. By making informed dietary choices and considering how food is produced when they purchase it, consumers can help foster sustainable landscapes and fair incomes for producers.

However, consumer choices are still largely shaped by the industrial food system, which provides easy access to globally produced and processed foods. This highlights the need to shift the narrative to increase awareness among consumers and producers, while supporting multi-level governance changes to promote a more sustainable food system.

Offer of processed food in supermarkets
(image: wenzday01, flickr.com, creative commons)

Eating locally produced food supports local farmers, reduces climate impact and loss of biodiversity *(image J. de Vries)*

Advocating for a Positive Transition Pathway

The current public debate highlights the urgent need to transform the food system to improve food security, food justice, food democracy, and fair income for producers. At the same time, there is a pressing need to reduce food waste, minimize environmental impact, and adapt to climate change. However, progress in this transition remains slow. International and national policies continue to be fragmented, often influenced by corporate lobbying, and local initiatives are isolated.

To address this, IPES-Food has proposed a *Long Food Movement*, which empowers niche initiatives to drive transformation (IPES-Food, 2021). A key area for this transformation is at the local level, particularly within city regions. Cities have independent strategies and often control the use of public land, allowing them to connect local producers and consumers while potentially implementing integrated social, environmental, and economic policies. Within city governments, sectoral silos can be more easily dismantled, especially when food policies are linked with climate action.

In its 2023 report, From Plate to Planet, IPES-Food states that local governments are leading efforts to reduce greenhouse gas emissions. The report identifies seven ways that local governments are leveraging food system transformation to combat climate change, including supporting sustainable farming, promoting short-supply chains, and ensuring that healthy, sustainable diets are available, accessible, and appealing.

Transforming the food system requires embedding these changes within broader social change. This calls for *food democracy*, where diverse actors reclaim democratic control over the food system to enable sustainable transformation. Working based on agroecological principles makes this shift inherently political, as it challenges and aims to transform existing power structures in society. To create a truly

sustainable food system, society must entrust control of seeds, biodiversity, land, territories, waters, knowledge, culture, and communal resources to the people who nourish the world.

It goes without saying that the pathway to transformation is different for different regions, the situation in Turkey varies a lot from the situation in France or the Netherlands.

In the following, we present three cases to show the possible process of change in France, in Turkey and in the Netherlands.

Case study of the Drôme valley, France

The Drôme Valley is a rural area of 2,200 km² in the Rhône-Alpes region in the South-East of France. Hemmed in by the Drôme river's watershed and surrounding mountains, it is populated by 54,000 inhabitants and comprises 102 small towns and villages. The agricultural landscape is highly diverse due to differences in natural growing conditions, with cereals, poultry, fruit, and seed production in the lower valley, extensive livestock rearing in the mountains, and wine, cereals, and fruit production on the hillsides (Bui, 2015).

Organic production in the Valley emerged as early as the 1970s, driven by peer-to-peer knowledge sharing networks, alternative extension agents promoting organic inputs, and the arrival of migrants from urban areas seeking to reconnect with the land and pursue organic practices. In the early 1990s, a network of cooperatives in the upper valley (supplying cereals, aromatic and medicinal plants, and wine) established a program to develop organic supply chains with a view to accessing higher-value markets.

Changing production practices initially proved challenging. In the lower valley, many continued to question the economic viability of organic agriculture; low availability of organic inputs, lacking extension services, and limited supply chain opportunities for organic products also proved major obstacles. It was not until new modes of inter-sectoral collaboration were introduced that alternative practices and new supply chain infrastructures truly began to emerge.

In the 2000s, the value-creating potential of organic farming was brought to the attention of local institutions, with inter-municipal coordination helping to create the conditions for transition. It culminated in establishing an ambitious sustainable development project for the whole valley: the 'Biovallée project'. The initiative (https://biovallee.net/) aims to establish the Drôme valley as a regional leader in the management and valuation of natural resources.

Its objectives of 2009 are as follows:

TRANSFORMATIONAL

LEVEL 5
Build a new global food system based on participation, localness, fairness and justice

LEVEL 4
Reconnect consumers and producers through the development of alternative food networks

LEVEL 3
Redesign agroecosystems

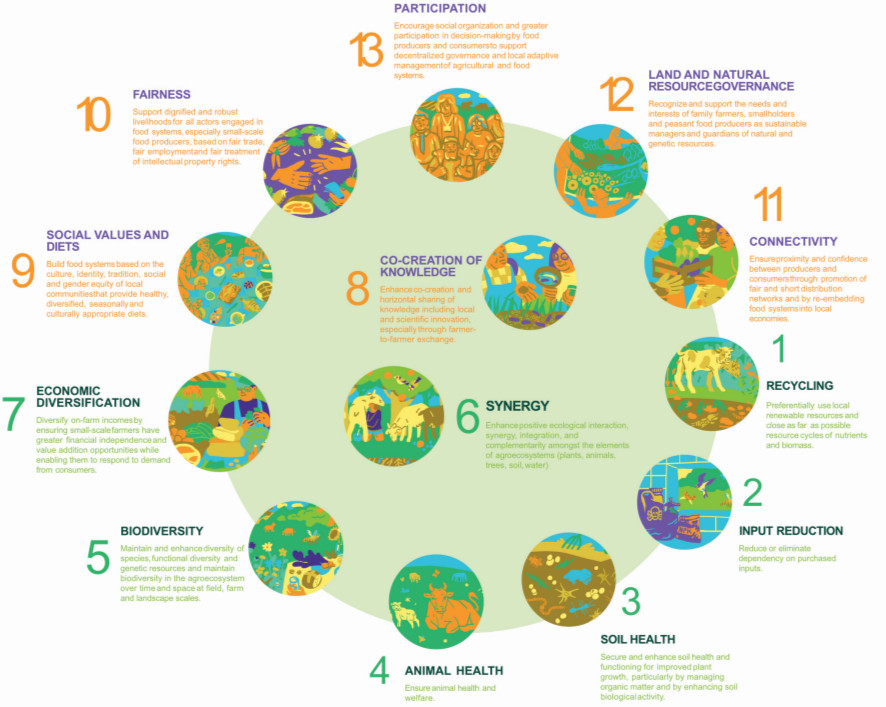
INCREMENTAL

LEVEL2
Substitute conventional inputs and practices with agroecological alternatives

LEVEL 1
Increase efficiency of input use and reduce use of costly, scarce or environmentally damaging inputs

FOOD SYSTEM

AGROECOSYSTEM



SOURCE: HLPE (2019) FIVE LEVELS OF TRANSITION TOWARDS SUSTAINABLE FOOD SYSTEMS AND RELATED PRINCIPLES OF AGROECOLOGY

ILLUSTRATIONS: DOROTTYA PÓÓR

AGROECOLOGY EUROPE

- Develop high-level training opportunities in the field of sustainable development.
- Reduce the territory's energy consumption by 20% in 2020 and by more than 50% by 2040
- Convert 50% of farmers and agricultural surface area to organic agriculture by 2020.
- Supply 80% of the procurement of institutional catering using organic or regional products.
- Supply 25% of energy consumption through locally generated renewable energy by 2020, and 100% by 2040.
- Change urban planning guidelines such that after 2020 no more agricultural land will be diverted to urbanisation.
- Halve the amount of waste brought to waste treatment plans by 2020.
- Develop education and research linked to sustainable development (10 partnerships in 2012, aim of 25 partnerships in 2020).
- Create 2,500 jobs in the eco-sectors between 2010 and 2020.

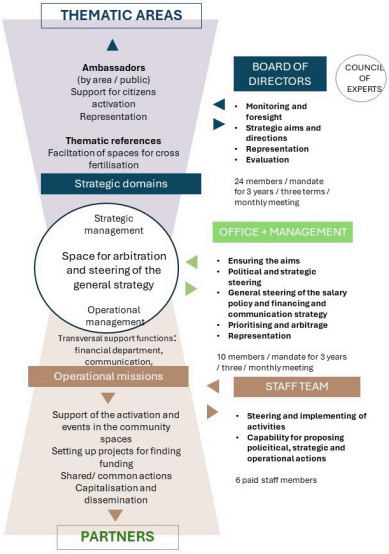
In 2018, the Association of Biovallée Actors (Association des Acteurs de Biovallée®) had 160 members who have committed to contributing to reaching the Biovallée objectives. According to the Biovallée charter, the use of the Biovallée branding is restricted to those members that achieve enough points counting towards the objective. The Association also includes several working groups, such as a working group on an Investment Plan for the Future, allowing local participants to further align their actions.

While the plan's initial goals are yet to be met, some 40% of farmers in the Drôme now use organic practices, the highest share of any French department; country-wide, around 15 % of farmers are certified organic (Agence Bio, 2018). Major challenges have been encountered along the way. Initial plans to build large-scale processing facilities to support public procurement of organic products had to be shelved as major players pulled out. This marked a turning point in the project, with local authorities turning to smaller scale, more 'radical' actors and initiatives for implementing the plan.

The Drôme Valley's transition provides insights into how norms can be shifted over time. Ongoing interaction between mainstream and alternative actors has allowed for rapid upscaling, access to resources, and legitimization of the transition process. The transition has also been advanced through various forms of institutionalisation and a well-planned governance process. Main bodies are the general assembly of members of the association, which validates the strategic goals and starting renewals; the advisory board, which manages the strategy, the outlook and the activities of the network; and the office and direction, which presents the association, and supports activities; and last but not least the working party, consisting of six paid employees, who organises activities and prepares the strategic, tactic and operational activities and policies.

In 2022 the organisation celebrated its 10th anniversary. The transition is still in progress with activities for educating farmers, helping the to make the change to agroecology, engaging civil society and the public at large and carrying out research. The Biovallée organises projects that relate to sustainable development such as circular economy.

Top: Location of the Valley in France
Bottom: Areas connected to the Biovallée



Organisational scheme of the Biovallée de Val de Drome

The Case of the Agricultural Development Cooperative ELMISKO in Antalya, Turkey

The Elmalı district is located on a plateau on the folds of the Taurus Mountains, which cover Southern Anatolia in the Western Mediterranean Region. The height of the district centre above sea level varies between 1050-1150 meters. The district has an economic structure based on agriculture: 36.4% (59,335 ha) is agricultural land and 51.3% (83,572 ha) is non-agricultural land. Of the other areas, 9.2% (15,000 ha) consists of common meadows and pastures and 3.1% (5,093 ha) consists of forest and aromatic crops. Fruit production and animal husbandry are the prominent agricultural activities. According to 2023 data, Elmalı ranks first in Antalya with its share of 83.50% and 374.087 tons of apple production. According to 2019 data, 28,690 tons of milk is produced in Elmalı. It ranks fourth among the districts with a share of 10.30% in milk production (TÜİK, 2024).

Farmers organisations

Farmer and producer organisations are important institutions that provide services and information to their members, facilitate their access to markets and empower smallholder farmers to participate in policymaking. They have an important role to play in achieving inclusive and sustainable rural transformation at local, national and international levels (Source: www.ifad.org). Many farmers work on relatively small family farms (95.2% in the EU) that operate independently of each other. In contrast, there is a much higher concentration of both processors and retailers. This asymmetry in bargaining power makes it difficult for farmers to defend their interests when negotiating with other actors in the supply chain. In this context, the organization of farmers into cooperatives is crucial. The main functions of agricultural cooperatives include supplying inputs to their members under favourable conditions, marketing their members' products, creating added value, providing technical information support to their members, and contributing to local and regional sustainable development.

Cooperatives play a critical role in ensuring that the supply chain of agricultural and food products works efficiently, that farmers receive a fair income, and that producers receive a higher share of the price paid by consumers. In 1972, an Agricultural Development Cooperative was established in the Elmalı district of Antalya. It was set up by a board of founders, including the former mayor, with the participation of some tradesmen and farmers in the district. In 1990, the name of the cooperative was changed into ELMISKO (Elmalı and Surroundings Agricultural Development Cooperative) in accordance with the Cooperatives Law.

In the years of its establishment, it was stated that the primary purpose of the cooperative was to build a cold storage warehouse in Elmalı district, which has an annual apple production of 30 thousand tons and

has problems in storing apples. However, it is also stated that the cooperative started with the procurement of goods needed by the people in the region during the recruitment and strengthening phase. In this period, like a consumer cooperative, the cooperative started by supplying necessities such as detergent, margarine, sugar and pasta, which were difficult to find in the 1970s. In the following phases, the cooperative was involved in the supply of inputs such as tractors and equipment, pesticides and fertilisers that farmers needed. Thus, the cooperative contributed to increasing the efficiency and quality of production. In subsequent periods, the cooperative's activities have diversified, and the various investments utilised in the provision of these activities are discussed in the following.

Common infrastructure for farmers and producers
Later, the construction of the cold storage was started with the contributions of the partners, whose number reached 1500. The first part of the 10 thousand tons/year capacity ELMISKO Cold Storage with a capacity of 5 thousand tons/year was completed in 1984. It is stated that the remaining 5 thousand tons/year capacity part is gradually being put into service. In this facility, where the capacity utilization rate is 100%, a total of 5 people, 1 technician and 4 workers, are employed. This facility also serves to regulate storage prices in the region.

After the completion of the cold storage, to support the sale of the products produced by the producers, a shop was provided in the Antalya Fresh Vegetable and Fruit Market in the section where the brokers are located and the wholesale of the products of the producers was started through the cooperative. One person is permanently employed here. However, this activity could not be sustained due to the inability to compete with brokers and to conduct safe trade with one employee. In addition, to meet the energy needs of the cold storage and other facilities, it was decided to invest in a solar power plant application. The shop was transferred in 2020 to create resources for this.

In 2003, a fruit packaging facility with a capacity of 3000 tons/year was established to improve fruit quality and facilitate exports from Elmalı. This facility enhanced apple quality and contributed significantly to the marketing process, supplying products to domestic supermarkets.

In the 2000s, the cooperative acquired additional properties, including a 6,000 m² building. To boost members' income and regional farmers' value, a dairy factory with a 25,000 tons/day capacity was established in 2006. The factory produces pasteurised milk, curd cheese, feta cheese, cheddar cheese, cream, butter, yogurt, and buttermilk, employing 16 people. Dairy products are produced and distributed adhering to safe food production principles.

In 2020, the cooperative invested in a solar power plant, meeting 70% of its electricity needs, enhancing

energy sustainability and reducing costs. The cooperative adopted a direct-to-consumer sales approach, establishing 26 retail outlets across Antalya, including Elmalı, Finike, Kumluca, Demre, and Kaş. While the Elmalı outlets are operated by the cooperative, others function through a franchising system.

In 2001, the cooperative purchased a 3-hectare field near the cold storage and planted 1540 semi-dwarf apple saplings in 2011, starting exemplary horticultural activities. To address packaging supply issues, a plastic crate factory was established in 2016 on 2.2 hectares, producing apple, mushroom, and other fruit and vegetable crates. This factory regulated crate prices and prevented opportunism, employing 15 people.

The cooperative's investments were primarily financed through its resources, except for a 50% grant-supported loan for the initial cold storage construction and a bank loan for its 2009 rehabilitation. Plans for a fruit and vegetable drying and packaging facility were abandoned. The cooperative's gross sales revenue in 2023 was 72.89 million TRY (2.77 million Euros). Under the ELMISKO name and logo, the cooperative continues to contribute to its members, currently numbering 517, and to the regional economy. A total of 35 people are permanently employed in the cooperative, 15 in the dairy, 15 in the crate factory and 5 in the cold storage. Two of the employees work as managers and one as an accountant.

Overall, it can be said that ELMISKO, which is 50 years old, is the main cooperative that continues to operate successfully in Antalya. Unfortunately, it is not possible to quantify the impact of the cooperative on a regional scale. However, it can be argued that it has made significant contributions to sustainability, particularly in economic and social terms, and to a lesser extent in environmental terms. The cooperative can play an important role in the use and dissemination of environmentally compatible agricultural methods in the region.

There is a need to support the cooperative in this respect. A survey of 50 members conducted by an undergraduate student in the Department of Agricultural Economics, Akdeniz University, showed that cooperative members were largely satisfied with the services provided by the cooperative and its management.

It is clear from this example that management is the key factor in the success of the cooperative. In addition, while similar cooperatives in Turkey are established on a village basis, ELMISKO, unlike its counterparts, is established in the district centre and covers almost all villages with potential as members, which is seen as an important factor that increases success and sustainability. This has also enabled tradesmen who farm in the district to become partners of the cooperative. This structure is thus considered to have helped the cooperative develop its commercial skills.

The Case study Markemodel in the Province of Gelderland, Region Achterhoek, The Netherlands

Agriculture in the Netherlands faces major challenges because of biodiversity loss, high nitrogen and CO2 emissions, and water pollution. The national government started to implement strict regulations, such as the policy programme for the Law on Nitrogen Reduction and Nature Improvement, which in July 2021 came into force.

Lobby by the agribusiness and protests by farmers influenced the political parties to lower their aims, although this results in impacting nature, people's health, and prosperity of agriculture in the long run. Although several farmers are willing to adapt their business model or transform their production methods, many feel that they are overruled by manyfold different and often changing regulations. The rules do not consider the diversity of types of farms, they prescribe the methods and not the results, and are externally controlled.

The current management model places the farmer in a problematic split between the discipline of the free market on the one hand and social demands and requirements on the other. Due to these shortcomings of the current management model, progress is difficult to make, even though governments and chain parties promote nature-inclusive agriculture. Goals are achieved, too late, too slowly, or not at all.

The Markemodel is a pilot in the framework of the Common Agricultural Policy (CAP), and it not only focuses on the quality of agricultural nature and landscapes, but also on soil, water and air. It intends to be an answer to the shortcomings of the current economic and social model.

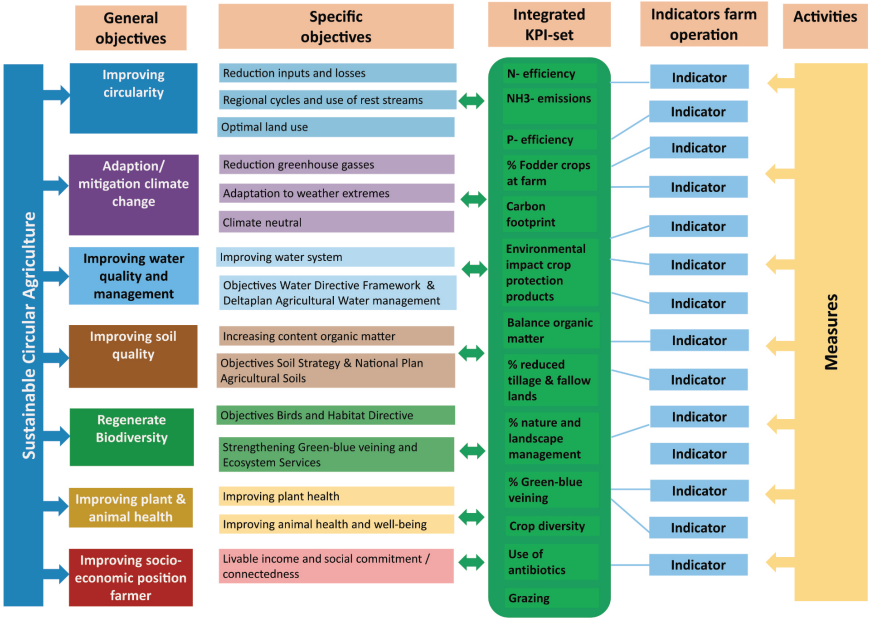
Area, location and characteristics
A group of 35 farmers in Winterswijk and 't Klooster near Zelhem are collaborating within the framework of the so called Markemodel. They are in the east part of the Netherlands, the province of Gelderland, in the region 'de Achterhoek'. The Markemodel has been initiated by a farmers' knowledge community for circular agriculture (VKA) and a farmers' collective for the management and development of cultural agriculture landscapes (VALA). The Markemodel is an approach in which farmers and steering parties jointly arrive at a regional, integral set of quality goals and the associated rewards for future-proof agriculture.

Challenges
The pilot project investigated how the rules of the European goals (Nitrate Directive, Water Framework Directive, Climate Agreement) and goals in the field of nature, landscape and biodiversity fit into a bottom-up governance model. It focuses on quality objectives and the development of an effective remuneration model for farmers. The pilot further aimed at gaining insight into organisational and technical obstacles, as well as obstructive regulations. It aims to reducing implementation costs (control, etc.) and increasing

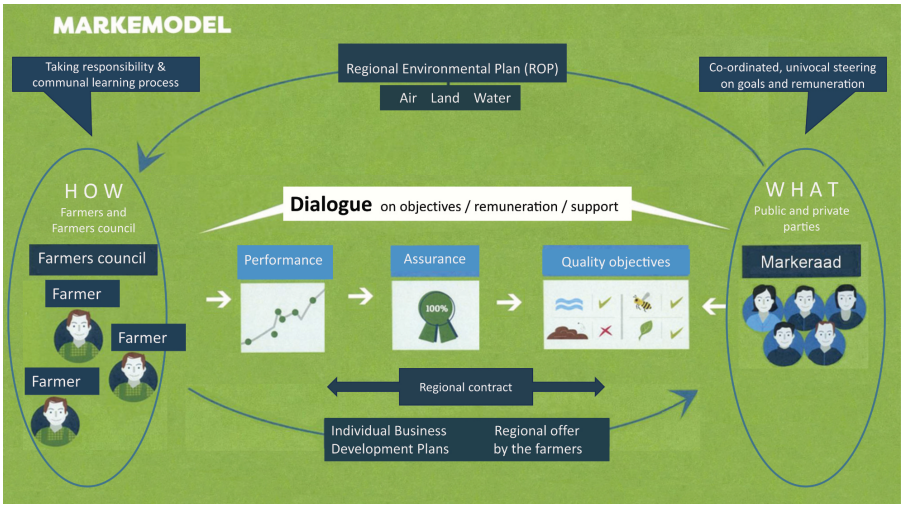
the effectiveness of achieving goals for integrated environmental quality. It should help to build motivation, a sense of responsibility for sustainable development and to further the business interests of the farmers for achieving the quality objectives.

Governance

In the Markemodel, the farmers work together regionally, in a horizontal network model and with chain parties and governments, for fewer operational rules and more control over goals. They will then receive more appreciation/rewards and influence on planning for their region. The system is founded on shared interests, shared responsibilities and a dialogue between the farmers and steering parties in the area. The governance model is based on the following paradigms: (1) integrated, unambiguous network governance, (2) quality objectives on a system level, (3) steering adapted to the characteristics of the sector, region and farmer, (4) stacking of rewards and appreciation, (5) bottom-up control aimed at self-regulation and capacity building, and (6) collaboration within the region with dialogue, empathy and learning process. The governance model consists of two councils: the 'Markeraad' and the 'Boerenraad'. The first with representants of the province of Gelderland, the Waterboard 'Rijn en IJssel', a cooperative bank and a cooperative national dairy company. The second, 'Farmers council' consists of several farmers who do not formally represent an organisation. In December 2022, 10 goals for the management of nature, environment and landscape were established in dialogue between Markeraad and Boerenraad.



Conceptual framework of the KPI-systematic for circular agriculture: relation between general and specific objectives, KPIs and actions, *translated by author from: Van Doorn et al., 2021*



Organisation model and approach of the Markemodel (adapted from van Doorn et al 2021)

Policies, aims, strategy

The goals are derived from critical performance indicators (KPIs) developed by Wageningen Environmental Research (van Doorn et al., 2021). As a farmer realises those goals, there will be a reward. A budget was made available for 2023 and 2024, which allows for a remuneration of some 3,000 and 4,000 euros per participant, depending on performance. The farmers have been working on their goals according to their Business Development Plans. The results of the goals for 2023, recorded in KPIs (Key Performance Indicator), have been collected at farm level and integrated at a regional level.

Development of the area

The results show that the farmers perform above average and are ahead of the target values. As far as biodiverse areas and green-blue veining are concerned, they have already met the 2030 targets. In 't Klooster the average score was 3.74 and in Winterswijk 3.82 on a scale between 1 and 5, where the score 3 represents the target in that year. Much progress has been made on the KPIs that control water quality. During the dialogue, the farmers argued that, in addition to financial compensation, more policy space also has a higher reward value for them, for example for receiving permits or for application of fertilisers. Appreciation and the social learning process between farmers are also important. But finances are the main incentive for progress for which continuity over a longer term is essential.

Currently the model is focused on the business units of the farms. Participants intend to explore how to better integrate it into the processes for the whole area. The participants collaborate with the Ministry of Agriculture, Nature, and Food quality for a uniform system of KPIs for assessing the performance of circular agriculture.

Reflection

The strength of the Markemodel approach is its inclusiveness for various types of farms and farmers. Moreover, it develops common aims and values in dialogue. This empowers the farmers, builds capacity, and fosters collaboration. Working with KPIs simplifies their administration and helps them to track environmental targets. A weakness is the small amount of financial remuneration. In the approach consumers, local retail and food processing industry are not included. Integrating these could help to build a sustainable local food system. Because the partnership consists of individual farms, the area is not sufficiently covered, which is important for integral environmental in the region. Main threats are the ever-changing national laws and regulations and the insecurity of long-term funding. However, the motivation of the partners could help to develop the model further into a regional approach, with additional elements such as branding of products and finding a variety of benefits, including financial support.

The governance behind agriculture and food systems

The European Union has developed a series of policies such as *farm4fork*, the new Common Agricultural Policy objectives (CAP), and recently the food system framework. The production system is steered by a series of subsidies of the CAP. However, the transformation needed goes too slow. This is because policy makers and executors are strongly influenced by lobbies of the corporate businesses. There are still silos between the different policy departments and different perspectives of the various political parties. Therefore, there is now a focus on the governance by city-region networks, supported by the Milan Urban Food Policy Pact Monitoring Framework (MUFPP) and several strategies of metropolitan areas, city-regions and regions.
In city-regions, networks of producer organizations can be established with a focus on solidarity, shared facilities, and capacity building. Consumers and consumer organizations work to raise awareness of the health impacts associated with cheap food, while NGOs focus on improving environmental quality, supporting short supply chains, promoting access to land, and enhancing farmers' skills.

Under the bottom line: Why does the system work?

The new EU CAP proposes nine goals for sustainable agriculture which are supported by the *farm to fork* (F2F) strategy and the New Green Deal. Globally, FAO promotes the transition to sustainable and climate-resilient agricultural policies and governance mechanisms, working with countries on reviewing their policies and investment strategies and helping them align their policies and programmes in support of implementing the 2030 Agenda for Sustainable Development. FAO envisions a sustainable food and agriculture system where food is nutritious and accessible for everyone and where natural resources are managed in a way that maintain ecosystem functions to support current as well as future human needs.

IPES-Food envisions a 'Long Food Movement' where the initiative is reclaimed by civil society and social movements: from grassroots organizations to international NGOs, from farmers' and fishers' groups to cooperatives and unions. This calls for thinking decades ahead, collaborating across sectors, scales, and strategic differences, working with governments and pressuring them to act, and transforming financial flows, governance structures, and food systems from the ground up. IPES-Food has identified a set of key principles to guide the urgently needed transition to sustainable food systems, such as holistic & systemic, power-sensitive, critically engaged, diverse & resilient, democratic & empowering, and socially & technologically innovative.

How do we measure which sustainable performance for agriculture?

Measuring sustainable performance in agriculture involves assessing various environmental, social, and

economic factors to determine the overall impact of agricultural practices. The development of agriculture that support sustainable transitions in the landscape can be assessed through spatial, legal, economic, social, and environmental indicators. The framework of the MUFPP (Carey, 2021; FAO, 2019) is focused on the performance of urban food systems.

The Milan Urban Food Policy Pact Monitoring Framework

The purpose of the Monitoring Framework is to serve as an instrument for cities and urban food stakeholders to identify food-related policy and programme priorities. It also serves to illustrate to what extent "desired changes" are happening and/ or how impactful such changes are. If measured periodically, the framework can be used to evaluate gaps in policy advancement and resource mobilization as well as reveal overall urban food systems improvement. The forty-four indicators relate to governance, sustainable diets and nutrition, social and economic equity, food production including urban-rural linkages, food supply and distribution, and food waste.

The City Region Food System Framework of RUAF

The City Region Food System (CRFS) indicator framework is a practical assessment and planning tool designed to help cities to:(1) Assess the current status and performance of a city region food system following a whole-system approach, (2) Identify priority areas for action with clear desired outcomes and ways of measuring change, (3) Help with planning strategy and action to achieving the desired outcomes, and (4) Establish baselines and monitor changes resulting from (future) policy and programme implementation.

Taking a 'whole food system' approach, the indicators are based on a matrix of food system dimensions: the sustainability areas that reflect the multifunctional nature of the food system; and the components of the whole food system (from production through to waste, and food system policy and planning). It measures social sustainability and equity (improve health and well-being), economic sustainability (increase local economic growth and decent jobs), environmental sustainability (improve stewardship of environmental resources), urban-rural integration (improve city region food supply), food governance (improve governance for sustainable food systems) and reduce vulnerability and increase resilience.

Since there a so many indicators, each city region needs to prioritise. It is important to focus on what is most relevant locally, and what can be defined by a multi-stakeholder identification of key issues. From this a selection can be made for issues which are most potential for change and for which data is available or can be generated.

Performance measurement can be taken from "Strengthen the city region food production and

supply system" which has indicators for (a) City region food production capacity is optimised, (b) Efficient and diverse agricultural supply and value chains connecting the city with food producers in the city region and providing access to a wide range of market opportunities, and (c) Flows of food, nutrients, energy and other resources and services connect across urban and rural areas. The presentation of all 210 CRFS indicators goes too far for this chapter. But all of, these can be viewed in the CRFS report (Carey & Dubbeling, 2017).

Which indicators are relevant for the landscape economy?

New indicators of progress must be developed to capture the benefits of equitable, resilient, diverse, nutrient-rich food systems in ways that productivity growth, net calorie availability and other existing measures do not. Efforts and initiatives to improve the sustainability of food systems should be assessed with a view to seeing continuous improvement; accountability must be clearly assigned to enable actors to monitor to which degree they achieve their objectives.

A selection of the MUFPP and CRFS indicators results in the following set of main indicators for the landscape economy:

- **Spatial**: % of access to land for farmers, access to land for recreation, and connectivity of the land affected by communal regulations and use.
- **Legal framework and policies:** Degree of implementation of the new goals of the CAP and the F2F strategy, regulations of land ownership and agricultural land reserve, establishment of a food strategy for city region.
- **Economic:** % of the farmers who receive a fair income, % of land use by community supported agriculture (CSA), economic activity developed within communal structures (social economy, cooperatives, etcetera) and value of the products that are regulated and managed in a communal way.
- **Social:** % people benefiting or participating in social aspects of food production (urban agriculture, community gardens, care farms, allotment gardens), % of people who have access to healthy food (not living in food deserts).
- **Environmental:** Contribution of agriculture and the farmers to the preservation and improvement of environmental values and assets (carbon sequestration, water retention, ecological connectivity, biodiversity, etcetera, % of land use surface for organic farming; % of land use by circular or nature inclusive farming.

It goes without saying that the indicators that are selected based on the strategy, aims and local context that has to be monitored. A full set of indicators and measurement modes can be found in the publications.

Research and analysis tasks for learners

The landscape economy aspects of agriculture and foodscapes offer a broad selection of subjects and research questions. Learners first need to explore the problem field and then define possible tasks for analysis and/or research based on their field of study and additional expertise, the amount of time that is available for the task and the current challenges that arise from the local landscape and its communities.

- **Exploring the interconnections between global trade and local food systems**: Examine the trade-offs between participating in global markets and maintaining local food sovereignty, with a focus on economic, social, and environmental outcomes. Including mapping the local food system.
- **Investigating food waste reduction strategies**: Study the effectiveness of various strategies to reduce food waste at different stages of the supply chain (production, distribution, consumption).
- **Exploring the ethics of land use in agriculture:** Analyse the ethical considerations of land use in agriculture, focusing on issues like land grabbing, indigenous land rights, and the environmental impact of land conversion for agricultural purposes. Assess how ethical frameworks can inform better land use policies. Inquiring on the available public land and of access to land for farmers. Evaluating the way local people are benefiting or participating in social aspects of food production (urban agriculture, community gardens, care farms, allotment gardens).
- **Analysing the impact of urbanisation on rural agricultural practices**: Research how the expansion of urban areas affects rural agricultural practices, land availability, and food production. Explore strategies for balancing urban development with the preservation of agricultural land and rural livelihoods.
- **Examining the impact of climate change on local food systems**: Research how climate change is affecting local food systems, including changes in crop yields, water availability, and pest pressures. Explore adaptive strategies that local communities and farmers can implement to mitigate these impact, such as the contribution of agriculture and the farmers to the preservation and improvement of environmental values and assets (such as carbon sequestration, water retention, ecological connectivity, and biodiversity).
- Setting up draft elements of a **food strategy for city region** or analysing the implementation of existing strategies.

References

- Anderson, K., & Martin, W. 2019. Agriculture and the WTO: Next Steps. Retrieved from https://www.sciencedirect.com/science/article/pii/S0306919219300603.
- Bui, S. 2015 PhD thesis of Sibylle Bui entitled "Pour une approche territoriale des transitions écologiques: Analyse de la transition vers l'agroécologie dans la Biovallée"
- Carey, J. and M. Dubbeling, 2017. City Region Food System Indicator Framework. RUAF Foundation, Leusden, The Netherlands.
- Carey, J., & Cook, B. 2021. The Milan Urban Food Policy Pact monitoring framework: A practical handbook for implementation. FAO. Rome.
- Doorn, van A. et al. 2021. Integraal sturen op doelen voor duurzame landbouw via KPI's. White paper, Wageningen Environmental Research, No.2021-3092. DOI 10.18174/548327.
- FAO, 2017. Strategic work of FAO to make agriculture, forestry and fisheries more productive and sustainable, accessed on https://www.fao.org/sustainability
- FAO. 2019. World Food Summit, 13-17 November, Rome Italy.
- FAO. 2019. The Milan Urban Food Policy Pact Monitoring Framework. FAO, Rome, Italy. Accessed on https://www.fao.org/publications/card/en/c/CA6144EN/.
- FAO, 2022. The State of Agricultural Commodity Markets 2022. Accessed on https://openknowledge.fao.org/server/api/core/bitstreams/0c7cb6df-c416-4397-b999-bf7bca819b17/content/cc0471en.html
- Fernandes, JN., Hemsworth, PH., Coleman. GJ., Tilbrook, AJ.(2021). Costs and Benefits of Improving Farm Animal Welfare. Agriculture, 11 (2):104.
- Grunert, K. G., & Bredahl, L. 2004. The consumer's perception of and attitude towards organic food. In Organic food and agriculture—new trends and developments in the social sciences (pp. 22-42). CABI Publishing.
- IPES-Food & ETC Group, 2021. A Long Food Movement: Transforming food systems by 2045. www.ipes-food.org/pages/LongFoodMovement
- IPES-Food, 2023. From plate to planet: How local governments are driving action on climate change through food.
- IPES-Food, IFOAM - Organics International, Agroecology Europe, FiBL Europe. 2021. Regeneration International An unifying framework for food systems transformation. A call for governments, private companies & civil society to adopt 13 key principles. Accessed on January 1, 2024, at https://www.ipes-food.org/_img/upload/files/sfsENhq.pdf
- Kumru, S., 2014. Investigation of Partner Cooperative Relations of Elmalı and Surrounding Agricultural Development Cooperative (ELMISKO). Akdeniz University Faculty of Agriculture, Department of Agricultural Economics Undergraduate dissertation.
- Lowenberg-De Boer, J. 2017. Precision Agriculture: A Worldwide Overview. Retrieved from https://www.frontiersin.org/articles/10.3389/fsufs.2017.00008/full.
- Morris, J., Audsley, E., Wright, I.A., McLeod, J., Pearn, K., Angus, A. and Rickard, S. 2005. Agricultural Futures and Implications for the Environment. Main Report, Technical Report and Supporting Appendices. Defra Research Project IS0209. Bedford: Cranfield University. Available on hppt//www.silsoe.cranfied.ac.uk
- Nicolia, A., Manzo, A., Veronesi, F., & Rosellini, D. 2014. An overview of the last 10 years of genetically engineered crop safety research. Critical Reviews in Biotechnology, 34(1), 77–88. https://doi.org/10.3109/07388551.2013.823595.
- Swinnen, J., & Squicciarini, M. P. 2012. Mixed messages on prices and food security. Nature, 484(7395), 7–9. https://doi.org/10.1038/484007a.
- Uyttendaelea,M., De Boecka, E., Jacxsen, L. 2016. Challenges in food safety as part of food security: lessons learnt on food safety in a globalized world. Procedia Food Science, 6 (2016) 16 – 22.
- Willoughby, R. and T. Gore 2018. Ripe for Change: Ending human suffering in supermarket supply chains.

- **Website**s
- https://elmisko.com
- https://www.ifad.org/en/producer-organizations
- TUİK, 2024. Turkish Statistical Institute, https://data.tuik.gov.tr/

Urban Forestry

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Growing the urban forest -
Feeding the landscape economy

Most Europeans currently live in urban areas. By 2050 it is expected that 90% of Europeans and the citizens of other developed countries will reside in urban areas. In this context, a city that feels and functions like a forest is increasingly being proposed as a vision for future sustainable cities. Green infrastructure is widely proposed (e.g. by the European Commission) as a strategy for delivering nature-based solutions that support climate adaptation capacity, carbon neutrality, and in general a regenerative development in Europe and elsewhere.

Research has shown that forested ecosystems are increasingly promoted as key biomes able to provide ecosystem services (MEA, 2005) . Already during 19th century industrialisation, many larger cities developed so-called *forest cities*. Due to their quantity and quality, forest areas located in and around urban areas are therefore foremost in providing the backbone of urban green infrastructure.

Urban forests come in many different shapes and sizes. They include amongst others: urban parks, street trees, landscaped boulevards, gardens, orchards, cemeteries, river and coastal promenades, greenways, river corridors, wetlands and nature reserves. Urban forests, through planned connections of green spaces, form the green infrastructure on which communities depend.

Green infrastructure (GI) has been defined as *"a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services while also enhancing biodiversity"* (European Commission, 2023). Urban green-blue infrastructure has been defined, in turn, as "*the elements of biodiversity and the organised systems that can be traced back to the Natural Capital, of any urban area, valuable or degraded, including the individual technological devices that rely on biodiversity and are integrated in the built environment, such as green roofs and vegetated walls, permeable pavings, rain gardens, and other systems for the collection and management of rainwater, which promote, through the provision of ecosystem services environmental protection, economic feasibility, health and well-being, equity and social inclusion*" (Andreucci, 2013).

Urban forests are dynamic ecosystems that provide critical benefits to people and wildlife. They help filter air and water, control stormwater, conserve energy, and provide animal habitat and shade. They add beauty, form, and structure to urban design. By reducing noise and providing places to recreate, urban forests strengthen social cohesion and add economic value to our communities.

Multiple benefits of urban forest for society, economy and climate resilience, *source: UNECE, 2021*

Urban, Peri-urban and Faraway Forest and the UN Sustainable Development Goals they support
source: https://atlasofthefuture.org/project/cities4forests

Urban and peri-urban forestry has been gaining attention in recent years as a valuable strategy for addressing a number of urban challenges in the development of a more sustainable and resilient city model. The EU Green Deal has set targets of: *"no loss of urban green spaces by 2030", "a 5% increase by 2050", "a minimum of 10% tree canopy cover in every European city, town and suburb",* and *"net gain of green space that is integrated to buildings and infrastructure"* (Konijnendijk, 2023). The new EU Forest Strategy for 2030 is one of the European Green Deal flagship initiatives that builds on the EU Biodiversity Strategy for 2030 and addresses all the multiple functions of forests. It contributes to achieving the EU's greenhouse gas emission reduction target of at least 55% in 2030 and climate-neutrality in 2050. The strategy sets a vision and concrete actions for increasing the quantity and quality of forests in the EU and strengthening their protection, restoration and resilience.

The new European Biodiversity Strategy for 2030 has set new objectives for the protection of biodiversity in the European Union. Among these objectives are to increase the quantity, quality and resilience of the forests in order to retain their function for both biodiversity and climate. The strategy aims for planting at least 3 billion additional trees in the EU by 2030, in full respect of ecological principles. The strategy mentions the particular benefits of tree planting in cities and the role of The New European Urban Greening Platform in facilitating urban tree planting.

Exploring the transition

Transition from the current urban forestry policy and practices to sustainable ones could be done with plans able to offer opportunities to grow the local economy, activating initiatives that can contribute to effective management, protection, and enhancement of local ecosystems. Those plans should align with multiple strategic priorities. They should also identify multiple internal and external stakeholders to support their implementation. Looking at existing practices, the following actions are still needed:

- Incorporation of additional urban forestry considerations in planning and development processes
- Enhancement of tree planting opportunities in consultation with internal and external partners
- Securing funding for urban forestry initiatives through internal and external sources
- Designing and implementing integrated tree inventories and work order management systems
- Developing formalised asset valuation approaches for trees
- Delivering education and outreach initiatives for staff and all interested parties.

An Urban Forest Master Plan for Birmingham 2021-2051 is a case for a positive transition pathway. An Urban Forest Master Plan is a future destination that provides detailed information, recommendations and

Key Performance Indicator	Performance Level				Piority
	Low	Moderate	Good	Optimal	
T1 - Relative tree canopy cover					**High**
T2 - Age Diversity					**High**
T3 - Species Diversity					**High**
T4 - Species Suitability					**High**
T5 - Publicly owned trees *(trees managed intensively)*					**High**
T6 - Publicly owned natural areas *(trees managed intensively)*					**Medium**
T7 - Trees on private property					**High**
T8 - Other elements of the UF: *shrubs, hedges, green walls and roofs, plants, animals and water*					**Medium**
T9 - Tree benefits (incl. Biodiversity)					**High**
T10 - Wider environmental considerations *(including climate change, air quality and water)*					**Medium**

Monitoring matrix of urban forest Key Performance Indicators (KPIs) on the example of the Birmingham UFMP

resources that would inform the community and its tree managers on how to plan a route to achieving "full stocking". Birmingham's Urban Forest Master Plan is the collective vision for all of Birmingham's natural capital and green infrastructure. It outlines how to develop and manage the urban forest and defines the aspirations of stakeholders who will continue to benefit from a healthy and diverse green city. It aims to act as a roadmap, providing detailed information, recommendations and resources to effectively and proactively manage and grow the city's tree canopy. The Master Plan provides structure for the implementation of long-term strategies which can be used to encourage all those involved with the urban forest to understand, respect, and enhance Birmingham's urban forest (Anonymous, 2021).

Birmingham's Urban Forest Master Plan will help to bring existing policies, plans, guidelines and frameworks together under one umbrella. It provides a comprehensive and suitable guide to all practices involving any and all aspects of the urban forest, including both green and blue infrastructure. It will inspire further research into the urban forest, its needs, its impacts, and its progress in Birmingham. This Plan will contribute to Birmingham's reputation as a green city, as well as improving the lives of its inhabitants. Improving the urban forest and its management practices will result in a healthier city. A diverse treescape promotes biodiversity, improves health and wellbeing, and can even influence socio-economic factors such as crime rates, educational attainment and life expectancy.

Through the development of the Urban Forest Master Plan, Birmingham hopes to lead by example and inspire other cities to follow suit. Dividing the Master Plan into smaller targets makes this task more manageable. The Plan outlines a number of key indicators for the overall success and health of the urban forest. Monitoring performance in this way will help achieve Birmingham's goals and ultimately the wider vision.

The UFMP outlines a vision for the development of the urban forest. In the case of Birmingham, it sets out to answer the question where the local urban forestry program wants to be in 30 years. As a framework

document, it sets a series of targets with associated priorities and actions in relation to performance indicators, but it will need to be supported by and implemented through specific strategies and plans for each of these targets.

The UFMP also links to other relevant policies and initiatives at the city level, and even beyond. An example of this is 'Our Future City Plan' which sets out strategic directions for Birmingham towards the year 2040, for example under the theme of City of Nature. A full policy review of relevant documents from international, national, regional and local levels has been undertaken as part of this project to ensure this Master Plan supports and is supported by all aspects of urban forestry policy.

This new Urban Forest Master Plan is championed by Birmingham City Council and Birmingham TreePeople, and was developed in a collaborative process with representatives of the local government; interest groups; and representatives of the community; and with the support of Treeconomics. The Plan outlines key topics, priorities, and actions under three central themes:

1. Trees and Forest Structure,
2. Community Framework,
3. Sustainable Resource Management Approach.

Under the bottom line: How do we measure success?

KPIs can reflect the priorities to expand, protect, improve, and connect urban forests. They display some of the contributions relevant administrations make to people, nature, and the economy through the urban forests. The use of KPIs also reflects their commitment to evidence-based work and helps ensuring that there is robust data available to the urban forestry sector to underpin policies and operational decisions. Among the key performance indicators for urban forestry are urban canopy cover, urban tree diversity, stormwater control, habitat provision, air quality improvement, greenhouse gas sequestration and storage, physical and visual access to nature. Mainly the focus is still too much on the environmental and ecological functions / benefits of urban forests, while more research and study is needed as far as resource management as well as social benefits and economic trade-offs are concerned (Zürcher & Andreucci, 2017).

Some research and analysis tasks for learners

Research questions to be further investigated include but are not limited to:

- Social and economic versus ecological and environmental synergies and tradeoffs of urban forests.
- Economic valuation methodologies: Beside the Ecosystem Services and Benefit Transfer approaches.
- Climate change effect on tree planting and urban forestry in the urban built environment.
- Human perceptions of urban trees and urban forests.
- Ecosystem disservices and appropriate urban forest design strategie

References

- Andreucci, M.B. (2013). Progressing Green Infrastructure in Europe. In Zubir, S.S. & Brebbia, C.A. (eds.) The Sustainable City VIII Urban Regeneration and Sustainability, pp.413–422
- Anonymous, 2021. An Urban Forest Master Plan for Birmingham 2021–2051. Executive Report. Birmingham City Council, UK.
- European Commission, 2022. New EU Forest Strategy for 2030. https://ec.europa.eu/commission/presscorner/detail/en/QANDA_21_3548
- Cotrone, V., 2003. Trends in Urban Forestry Practices, Programs and Sustainability: Contrasting a Pennsylvania, U.S., Study. Journal of Arboriculture 29 (4): 237–248
- Davies C., Andreucci M.B., Zürcher N., 2017. Guideline for urban forestry as critical green infrastructure in European urban areas. DOI: 10.13140/RG.2.2.35181.18405
- European Commission, 2023. Green Infrastructure: Promoting the use of green infrastructure in all EU polşcies to help restore nature and boost biodiversity. https://environment.ec.europa.eu/topics/nature-and-biodiversity/green-infrastructure_en#:~:text=Green%20infrastructure%20has%20been%20defined,example%2C%20water%20purification%2C%20improving%20air
- Eurostat, 2022. Eurostat Statistics explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Forests,_forestry_and_logging#Forests_in_the_EU
- FAO, 2018. Terms and Definitions. Forest Resource Assessment Working Paper. Rome.
- Gulsrud et al., 2018. Urban Forest in a European Perspective. IGN Report, Department of Geosciences and Natural Resource Management, University of Copenhagen, Denmark
- Hetemaki, L, 2020. The Green Deal and the EU Forest Sector. (https://www.researchgate.net/publication/339325926_The_Green_Deal_and_the_EU_Forest_Sector [accessed May 26 2022]
- Konijnendijk van den Bosch, C., 2003. A Decade of Urban Forestry in Europe. Forestry Policy and Economics, 5:173–186.
- Konijnendijk van den Bosch, C., 2023. From regional visions to local meaningfulness: Making multi-scalar green space governance and planning work. Presentation at Le:Notre Landscape Forum Nürtingen, Germany.
- Lara A. Roman, Tenley M. Conway, Theodore S. Eisenman, Andrew K. Koeser, Camilo Ordonez Barona, Dexter H. Locke, G. Darrel Jenerette, Johan O¨ stberg, Jess Vogt, 2020. Beyond 'trees are good': Disservices, management costs, and tradeoffs in urban forestry. Ambio, https://doi.org/10.1007/s13280-020-01396-8
- Livesley SJ,, McPherson, EG and Calfapietra, C., 2016. The Urban Forest and Ecosystem Services: Impacts on Urban Water, Heat, and Pollution Cycles at the Tree, Street, and City Scale. Journal of Environmental Quality, 45: 119–124
- Loupa Ramos I., Silva R., 2015. The European Landscape Convention at urban scale: insights from an exploratory approach in Lisbon. Belgeo 3 (2015) : 1-15.
- Millennium Ecosystem Assessment (MEA) (2005). Ecosystems and Human Well-Being: Biodiversity Synthesis. Washington DC: World Resources Institute.
- Randrup, TB., Konijnendijk van den Bosch, C., Dobbertin, MK., Prüller, R., 2005. The Concept of Urban Forestry in Europe. in book: Urban Forests and Trees (pp.9–21)
- Salbitano F, Borelli s, Conigliaro M, Chen, Y, 2016. FAO Guidelines on Urban and Peri Urban Forestry. FAO Forestry paper 178. Rome, Italy.
- Saraev, V., 2012. Economic benefits of greenspace: a critical assessment of evidence of net economic benefits. Edinburgh Forestry Commission Report, Scotland.
- UNECE, 2021. Sustainable Urban and Peri-Urban Forestry: An Integrative and Inclusive Nature-Based Solution for Green Recovery and Sustainable, Healthy and Resilient Cities. United Nations Economic Commission for Europe (UNECE), Switzerland.
- Wolf, K. L. 2004. Economics and Public Value of Urban Forests. Urban Agriculture Magazine, Special Issue on Urban and Peri Urban Forestry, 13: 31–33.
- Zurcher, N., Andreucci, M.B. (2017). Growing the Urban Forest: our Practitioners' perspective, pp. 315–346. - Future City. [10.1007/978–3–319–50280–9].

Landscape Economy Curriculum

Curriculum design principles
Taxonomy of learning objectives
Landscape economy learning model

Curriculum Design Principles

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Goals of the landscape economy curriculum

In earlier chapters, we discussed the pressing need for change in depth. Urban and peri-urban land is becoming increasingly scarce, with ongoing conflicts over land use and ownership. In and around cities, there is a growing demand for spaces that support climate adaptation, water retention, biodiversity, affordable housing, innovative industries, sustainable energy, transportation, social integration, and agriculture. These complex sustainability challenges have proven resistant to conventional, short-term, and sector-specific approaches, especially given the constraints of political cycles.

This situation calls for an urgent shift towards integrated knowledge building, forward-looking vision, adaptive practices, and advocacy across all levels of society.

The landscape economy curriculum contributes to this shift by fostering educational transformation. It prepares a new generation of visionary professionals, decision-makers, and engaged citizens to address sustainability challenges through integrated, problem-solving approaches. This involves developing skills in systems thinking, anticipation, value-driven deliberation, strategic planning, and collaboration across government, business, and civil society. Through this approach, the curriculum bridges the often-competing systems of ecology and economy, fostering both knowledge and actionable connections.

Target groups and settings for the landscape economy curriculum

The landscape economy curriculum is an interdisciplinary programme primarily aimed at university students at the master's level. The course may also be suitable for advanced bachelor's students and could be of particular interest to PhD students, especially those focusing on sustainable development. In an ideal setting, students collaborate in interdisciplinary teams on real-world cases.

Groups of landscape economy learners should, at a minimum, include the following perspectives:

- Economic Perspective: Fields such as economics, business administration, real estate, or agronomy.
- Ecological Perspective: Fields like agro-ecology, ecology, landscape planning, or landscape ecology.
- Planning and Design Perspective: Specializations in spatial, urban, or landscape planning and design, as well as business design, visual design, and the arts.

Developing the landscape economy curriculum

The development of the landscape economy curriculum has been a challenging process, driven by ambitious goals. This course is designed to reach an interdisciplinary audience of both higher education teachers and students. While its core participants are primarily from spatial planning and design fields, a key

objective of the programme is to actively engage other disciplines, including agriculture, geography, economics, entrepreneurship, transport, and real estate. Additionally, the programme aims to cultivate transformative skills and inspire creative potential for systems design and innovation.

Existing European competence frameworks have been very helpful in this regard. The key documents we referred to were GreenComp, the European Sustainability Competences Framework (Bianchi et al, 2022) and EntreComp, the Entrepreneurship Competence Framework (Bacigalupo et al, 2016; Mc Mullan et al, 2018). These very concise frameworks provide curriculum designers with stable, tested and generally agreed upon definitions and terminologies for describing key competences. This supports in particular intercultural and interdisciplinary teams (such as the TELOS ERASMUS group) and helps arriving at a shared understanding of the educational objectives.

GreenComp emphasizes the importance of embracing sustainability values, such as appreciating nature, recognizing complexity through systems thinking, critical thinking, and problem framing, and, most importantly, envisioning sustainable futures. The extended concept of landscape (introduced in Chapter 1) has proven to be an effective approach for helping diverse audiences understand complexity and cause-effect relationships within a concrete territorial context.

EntreComp greatly enhanced our approach by adding the dimension of innovation for sustainability and identifying specific competencies for generating new value propositions that can drive systems toward sustainability and regeneration. Key competencies from the EntreComp framework are organised into three main areas: ideas and opportunities (visioning, opportunity identification, and ideation); resources (with a focus on 'landscape' economic literacy); and the ability to take action, which we supported primarily through the business model canvas method.

However, competence frameworks alone are not sufficient for curriculum design, especially when it comes to defining detailed learning objectives and testing learning pathways. A well-aligned approach that connects learning objectives, learning activities, and evaluation is essential to the success of any academic program.

We therefore looked more deeply into the theory of learning objectives. The so-called 'Bloom Taxonomy' has been highly influential over decades (Bloom et al, 1956). This theory suggests an evolution of learning across six phases: remembering, understanding, applying, analysing, evaluating and creating. The TELOS team went further by applying a revised version of Bloom's taxonomy suggested by Lorin Anderson and Daniel Krathwohl in 2001. The authors call this 'a taxonomy for learning, teaching and assessing'. The Anderson & Krathwohl taxonomy keeps the six phases developed by Bloom. On that

basis, their model offers a structured framework for categorising educational goals, objectives, and assessments across two key dimensions: the *Knowledge Dimension* and the *Cognitive Process Dimension.*

The Knowledge Dimension categorises the type of knowledge that students are expected to acquire, breaking it down into four types:

- *Factual knowledge*: Basic elements students need to know to be acquainted with a discipline or solve problems. This includes terminology, specific details, and elements of a subject.
- *Conceptual knowledge:* The interrelationships among basic elements within a larger structure that enable them to function together. This involves understanding principles, models, theories, and classifications.
- *Procedural knowledge*: Knowing how to do something. This includes methods, algorithms, techniques, and procedures.
- *Metacognitive knowledge:* Awareness of one's cognitive processes, including strategic knowledge, self-awareness in problem-solving, and understanding one's learning processes.

These categories well reflect the complexity and depth of knowledge required to learn effectively in a given domain.

The Cognitive Process Dimension focuses on what students are expected to do with the knowledge they acquire. It is structured into six levels, according to Blooms earlier model, organized from lower- to higher-order thinking skills:

- *Remember:* The ability to recall or recognize information and facts. It's the most basic cognitive skill, involving retrieval of learned material.
- *Understand:* Grasping the meaning of information. This can include interpreting, classifying, summarising, inferring, and comparing.
- *Apply:* Using knowledge in new situations. This involves executing tasks and implementing procedures.
- *Analyse*: Breaking down information into parts to explore relationships or causes. It includes differentiating, organising, and attributing.
- *Evaluate*: Making judgments based on criteria and standards. This involves critiquing and assessing the quality or value of information.
- *Create:* Putting elements together to form a coherent or functional whole or producing something new. This involves generating, planning, and producing.

Each cognitive process level builds on the previous, with 'remember' as the foundation and 'create' as the most advanced.

Cognitive Process Dimension	Landscape Economy Knowledge Dimension			
	Factual ...the basic elements students must know to be acquainted with a discipline or to solve problems within it	Conceptual ...the interrelationships among the basic elements within a larger structure that enable them to function together	Procedural ...how to do something, methods of inquiry, or criteria for using skills, techniques and methods	Metacognitive ...knowledge of cognition in general as well as awareness and knowledge of one's own cognition
Remember ...to recall specific bits of information	...can list the main concepts related to landscape and economy, ...can list the main concepts of at least one other discipline different to his/her own discipline	..can recognize these concepts in a new context	...can recall these concepts in a new context	...knows how to retrieve missing information using multiple strategies
Understand ...to construct meaning from information	...understands the main concepts related to landscape and economy, ...understands the main concepts of at least one other discipline different to his/her own discipline	...can define the conceptual connections between landscape and economy ...can define the conceptual connections of the main concepts of at least one other discipline different to own discipline	....can use this knowledge to understand new landscape economy contexts	...is aware of the limits of his/her knowledge
Apply ....to use methods, concepts, principles in new situations	...remembers the main methods relevant for a landscape economy approach such as DPSIR, Scenario Building, Collective Visioning, Prototyping, Modelling	...knows which methods can be applied at a certain state in the process	...is able to apply the main methods relevant for landscape economy approaches	...is aware of the limits of those methods ...is aware of his/her personal strengths with regard to each method
Analyse ....to identify how parts relate to another or to a larger structure	...can translate the main concepts of landscape and economy to a specific context (urban, rural, peri-urban) ...can translate the main concepts of at least on other discipline to this context	...can understand how landscape economy systems are functioning in this context	...can identify the interrelations of different elements within the landscape economy system and identify their impact on other systems ...can identify past and present landscape economy processes ....can build scenarios of possible futures	...is aware of the limits of knowledge of each system and the relationships between the system
Evaluate ...judge the value on the basis of criteria, processes, standards	...can name evaluation criteria in relation to sustainable development	...can effectively link the evaluation criteria to the analysis findings	...can evaluate the impact of past and present landscape economy processes ...can evaluate the impact of scenarios ...can evaluate the impact of a (new) landscape economy model ...can evaluate the plausibility and stability of a (new) landscape economy model	...critically reflects conflicts between sustainable development goals ...critically reflects trade-offs created in competition between system logics
Create ...to generate a coherent functional whole and to recognize new patterns	...knows the sustainability challenge/conflict that needs to be addressed ...knows innovative practices that have successfully addressed these challenges/ conflicts	....can contextualise all these elements and translate them into a collaborative process	...can design / co-create a new landscape economy model (i.e. a spatial model and/or a business, governance or cooperation model for a concrete study area)	...can critically reflect the impact and feasibility of the new model

The complete Landscape Economy Matrix of Learning Objectives matching the Cognitive Process Dimension and the Landscape Economy Knowledge Dimension according to *Anderson and Krathwohl, 2001: A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives*, author of matrix and matrix visualisation: Ellen Fetzer

Anderson and Krathwohl's revised taxonomy uses a matrix structure that allows educators to connect specific types of knowledge with particular cognitive processes. For example, a learning objective might require students to "Analyse (Cognitive Process) Conceptual Knowledge (Knowledge Dimension)," such as analysing the system of a specific land use sector, for example agriculture or transport, within a concrete landscape context. This dual-dimensional framework enables educators to more precisely define and assess learning objectives, enhancing the depth and clarity of educational planning and assessment.

The TELOS team applied this taxonomy to conceptualize, organize, and articulate the learning objectives of the landscape economy curriculum, as presented in the matrix on the previous page. The instructional design supports all knowledge and cognitive process dimensions in an integrated manner. Assignments are diverse and iterative, allowing them to address these dimensions effectively. For instance, pre- and post-seminar concept mapping, along with seminar lectures, support the factual and conceptual dimensions, aiding learners in processes of 'remembering' and 'understanding.' Additionally, landscape system analysis tasks foster skills in analysis and evaluation, ultimately leading to the creation of new knowledge through a new landscape system model.

Throughout this pathway, metacognitive and reflective elements are also incorporated. In particular, the development of the post-seminar concept map offers learners a chance to reflect on their individual learning processes. Systems thinking runs throughout all areas, representing an integrative learning outcome. The landscape economy learning pathway will be described in greater detail in the following chapter.

References

- Anderson, Lorin W.; Krathwohl, David R. (2001): A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives, complete edition
- Bacigalupo M, Kampylis P, Punie Y and Van Den Brande L. (2016): EntreComp: The Entrepreneurship Competence Framework, Publications Office of the European Union; Luxembourg, https://dx.doi.org/10.2791/593884
- Bianchi, G., Pisiotis, U. and Cabrera Giraldez, M., (2022): GreenComp: The European sustainability competence framework, Punie, Y. and Bacigalupo, Publications Office of the European Union, Luxembourg, https://dx.doi.org/10.2760/13286
- Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Vol. Handbook I: Cognitive domain. New York: David McKay Company.
- European Commission (2018): Joint Research Centre, McCallum, E., McMullan, L., Weicht, R., Price, A. et al., EntreComp into action – Get inspired, make it happen, O'Keeffe, W.(editor) and Bacigalupo, M.(editor), Publications Office, 2018, https://data.europa.eu/doi/10.2760/574864

The Landscape Economy Learning Model

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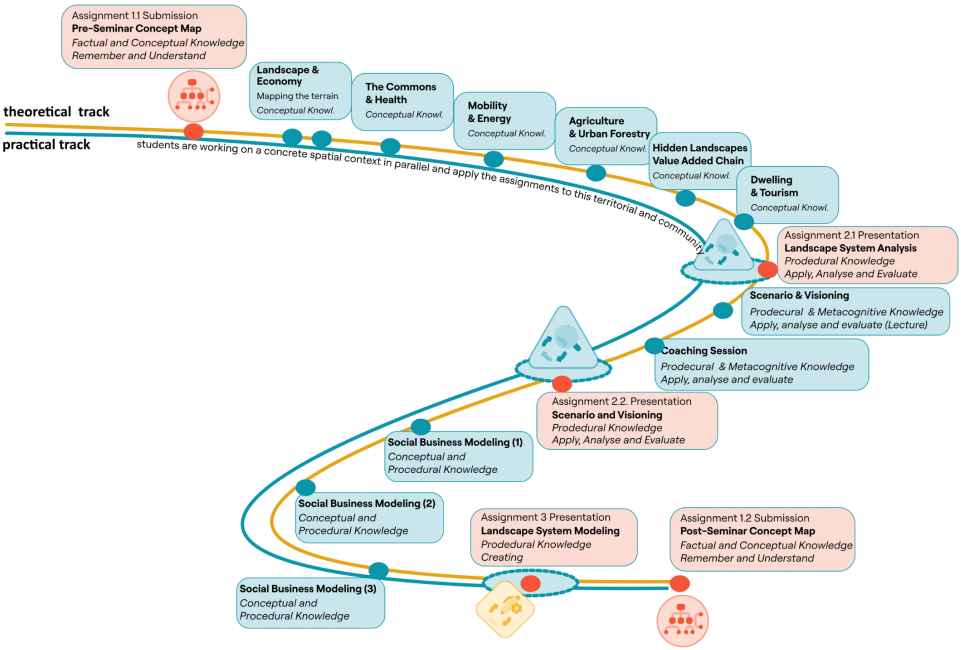
Within the framework of the TELOS ERASMUS project, we developed and tested a version of the landscape economy curriculum that allows participants to gain a maximum of 25 credits within the European Credit Transfer System (ECTS), which corresponds to a workload of one semester. In general, we have applied a flexible model and participants were able to choose the intensity of workload and involvement, depending on their possibilities. The pilot learning activities were conducted primarily as a transnational online programme of twelve weeks or one semester duration. A smaller number of participants joined also the subsequent onsite intensive study programmes of ten days duration either in Nürtingen in 2023 or in Antalya in 2024.

In the following, we first explain the instructional design of the landscape economy online seminar and then present the structure of the onsite intensive study programmes on the example of the Antalya Winter School that took place in February 2024.

General learning pathway of the landscape economy online programme

The graphical representation of the learning pathway on the following page shows how the landscape economy pilot online seminars have been implemented. Since October 2022, three editions of the 4-months course have been tested. The programme was delivered digitally as a transnational seminar with all partner universities involved. Starting from the second edition, the course received already a lot of wider attention and participation also included professionals and students from other universities, even from other continents. This growing diversity greatly enriched the seminar discourses, presentations and the overall knowledge exchange. In parallel to the weekly seminar sessions, all students were following a practical track in local working groups. For this, the student teams, or their supervisors, had to choose their own landscape context as a study case. Many students chose the landscape context suggested by the annual international student competition issued by the LE:NOTRE Institute and its partners. Over the period of the testing phase, three competition sites were integrated into the landscape economy seminar: 'Neckar Landscape Park – Re-Imagining the Productive City Region' (2022), 'Emajogi River in Tartu, Estonia' (2023) and 'Budapest North and the Danube Bend' (2024). The students received additional lectures focusing only on the local conditions of the competition landscapes. The Akdeniz group focused on the landscape of the Antalya Bay. The external participants introduced various other landscape contexts such as the urban river in Damascus, Syria, peatland redevelopment in the Midlands Region in Ireland or transit-oriented development in Honduras.

The course had a very intensive first phase with lectures on the different land use sectors that are typically competing in an urban territory. Overall, the students followed a pathway of initial concept mapping, system analysis and evaluation, creation of an innovative, more sustainable and regenerative landscape system and final reflection via their post-seminar concept map. The process includes three transnational group presentation sessions. In the following, we will present each element of the course in more detail.



The learning pathway of the landscape economy online programme. Students work on a landscape case study (practical track in blue) and transfer learnings from the theoretical track (in yellow) to their study context. Blue fields are input sessions. Light red fields are assignments and team presentations. *author: Ellen Fetzer*

Seminar sequence, assignments and activities

Seminar kick-off: Briefing and Mapping the Terrain
The first session gets everyone on board. It introduces the course rationale and the general learning objectives. Learners are introduced to the seminar assignments, the time line of activities and the course requirements. The first thematic input is called 'Mapping the Terrain'. This includes a general introduction to the concept of landscape and a clarification of how landscape is understood in the seminar. Then follows an equally brief and focused introduction of how economy is understood and a first presentation of the conceptual connections between both concepts.

Participants have one week to work on the first assignment, the so-called pre-seminar concept map.

Assignment 1: Pre-and post-seminar concept mapping and the learning theory behind

Concept mapping plays a very important role in this seminar as it allows the individual learner to represent his/her knowledge in a meaningful and effective way. These 'Landcsape Economy Concept Maps' provide also highly valuable information to the team of instructors as they indicate the initial understanding of the learners and this provides information on the existing levels of knowledge among the group. Concept mapping, as developed and advocated by Joseph D. Novak (2012), is considered an effective learning method because it helps learners visualise and organise knowledge, making it easier to understand and retain complex information. Concept mapping aligns well with the contemporary learning theory of educational constructivism (Reich, 2006). Educational constructivism assumes that learners actively construct knowledge through experiences and interactions, building on their prior knowledge and understanding. It emphasises that learning is a personal and social process where individuals make meaning from their unique perspectives, rather than passively receiving information. Concept mapping supports this learning approach because of the following features:

Concept maps facilitate *meaningful learning*: Novak emphasized the importance of meaningful learning, where learners connect new knowledge to what they already know. Concept maps encourage this by linking concepts through labeled connections, showing relationships between new and existing knowledge. This process reinforces understanding and helps learners integrate new information into their cognitive framework.

Concept maps further help *structure knowledge* hierarchically, starting with broad, general concepts at the top and progressively adding more specific details below. This hierarchy clarifies the organization of knowledge and aids learners in seeing how larger ideas break down into smaller, interconnected pieces. Constructing a concept map requires learners to

actively process information, making decisions about how ideas are related, which terms to use, and where to place connections. This active engagement promotes deeper understanding and helps learners reflect on their own thinking, which is a key aspect of metacognition.

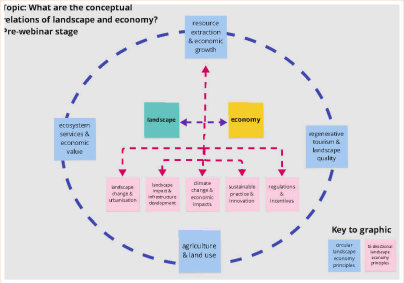
Because concept maps organise information visually and spatially, they leverage both visual and spatial memory, which can improve retention. The relationships shown on the map also create cues that aid in recall, as remembering one concept often helps in recalling related ideas.

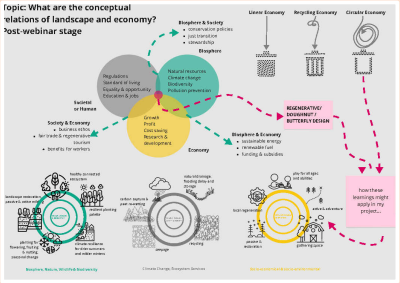
By requiring learners to actively construct connections and interdependencies, concept maps strengthen problem-solving and critical-thinking skills. They help learners, and their peers, identify gaps in their understanding and clarify complex problems by visually breaking them down into more manageable, interrelated parts. They can be used both individually or in group settings. In the landscape economy seminar, we only applied individual concept mapping.

Novak's concept mapping approach is widely used across education, from elementary levels to higher education, because it transforms passive learning into an active, structured process that enhances comprehension, retention, and critical engagement with material. We therefore asked the participants to develop a concept map at the beginning, before they would start to engage with the seminar contents. This created a great opportunity for capturing their initial understanding. Learners had to revisit their initial concept map at the very end of the seminar process and redevelop it based on the new knowledge and concepts they had acquired and internalised during the process. On that basis, the teaching team was effectively able to identify individual learning progress and the learners had a chance to reflect their own learning process in a very individual way.

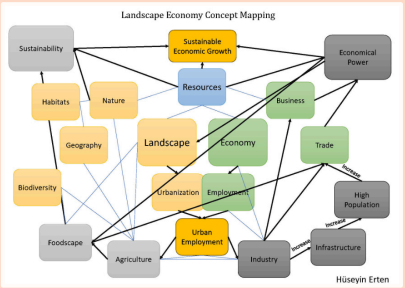
This method is also very effective for very diverse audiences, which was certainly the case in the landscape economy seminars. The participants could use any digital or analogue tool for representing their concept map. We also suggested digital concept mapping tools: Cmap software is a result of research conducted at the Florida Institute for Human & Machine Cognition (IHMC). It empowers users to construct, navigate, share and criticize knowledge models represented as concept maps. VUE, Visual Understanding Environment, is a flexible concept mapping tool for managing and integrating digital resources in support of teaching, learning and research developed by Tufts University.

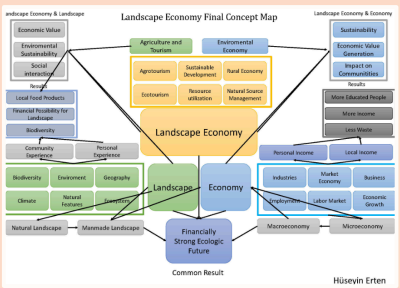
The following overview shows a few examples of pre- and post-seminar concept maps with the aim to demonstrate the diversity of knowledge models prevalent among the learners.



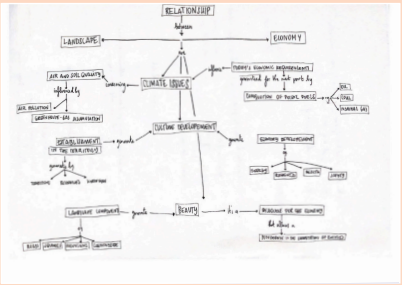


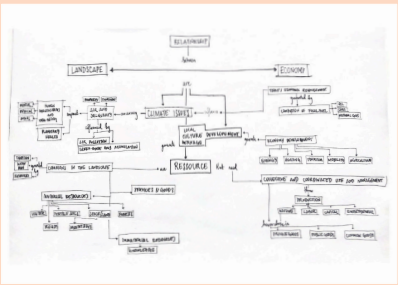
Pre- and post landscape economy concept maps, *author: Jeanne Coughlan*
second pilot programme October 2023 - January 2024



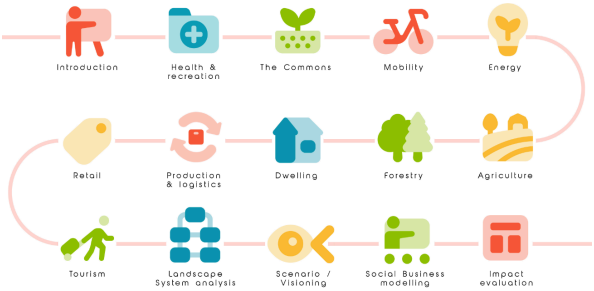


Pre- and post landscape economy concept maps, *author: Hüseyin Erten*
second pilot programme October 2023 - January 2023





Pre- and post landscape economy concept maps, *author: Beatrice Cattaneo*
first pilot programme October 2022 - January 2023



Conceptual knowledge: Discovering multiple perspectives on the landscape

The first five weeks of the seminar are designed in a very intensive way. From an educational point of view, there were some compromises we had to accept in this regard. Our initial idea was to focus the seminar sessions on 90 minutes to make sure that the learners' attention levels can be met. We also wanted to avoid that the overall session length would compete too much with other study commitments. In particular since finding a common time slot among five universities is already a challenge. On the other hand, we wanted to integrate both the conceptual and the procedural knowledge domain into one semester process which required intensive lecturing during the first phase. Otherwise, it would not have been possible to introduce the learners to all the different land uses and also make them work on their own landscape system analysis and system design within the limits of 14 semester weeks. Therefore, we decided to have double sessions of two times 75 minutes over the first five weeks. This allowed us to introduce ten different landscape dimensions to the learners as a theoretical foundation for their landscape system analysis.

The sessions were held in the following sequence:

Session	Lectures	Responsible partner
1	Urban Forestry	Akdeniz University
	The Commons	LE:NOTRE Institute
2	Agriculture	Akdeniz University
	Dwelling	Gdańsk University of Technology
3	Health and Well-being	Sapienza University of Rome
	Tourism	Akdeniz University
4	The Global Value-Added Chain	Nürtingen-Geislingen University & Gdańsk University of Technology Combines the dimensions of production, logistics and retail
5	Mobility	Université Libre de Bruxelles
	Energy	Sapienza University of Rome

All lecture materials are available as open educational resources with the following elements:

- Lecture recordings
- Seminar slides
- Text book chapters

Framework for the thematic lectures

The lecturers were asked to introduce the respective landscape dimension according to the following guiding questions:

- Contextualise the respective theme in one or several of the five TELOS urban regions
- Explain the 'mainstream' economic motivation behind the driving force: Which value propositions for whom are driving this system?
- Explain past and present trends and impacts, what are the obvious trade-offs and sustainability goal conflicts
- Who are the typical stakeholders/actors, what are their motivations and values?
- Name and explain the key concepts used in this sector and explain how they interrelate
- Link the sector to the European Green New Deal and possible transition pathways: Where are the windows for system change
- Conclude with a case of positive change/ successful transition, explain why it is positive and which trade-offs remain
- Name the key performance indicators (KPIs)
- Provide a focused reading list for self-study, ideally with open access material
- If applicable: Give references to the main EU Policies and Strategies relevant for this theme, give information on the main EU Funding Schemes

Access Learning Materials

Scan QR code

Or click here

Assignment 2: The Landscape System Analysis

The second assignment was divided into two parts:

1. Understanding the evolution of the landscape system from the past to the present
2. Building scenarios of possible futures with an integrated vision

In the first part of the landscape economy seminar, students were introduced to the system logic of various relevant land use sectors, including agriculture, housing, production, mobility, and more. Building on this foundational knowledge, students were tasked with analysing the landscape of their study area through the lens of these different land use systems. Consistent with the principles of educational constructivism, this interpretation draws on both their prior knowledge and the new insights gained from thematic lectures and related readings.

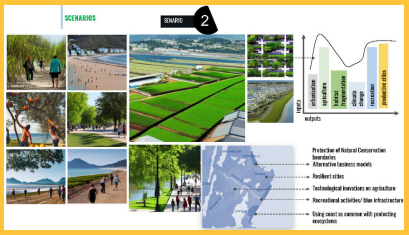
Learners were encouraged to take a system thinking perspective by means of the so-called DPSIR method (European Environment Agency, 1999). DPSIR (Drivers, Pressures, State, Impact, Response) is a framework for analyzing environmental issues by identifying the relationships between human activities (drivers), their effects on the environment (pressures), resulting changes in environmental conditions (state), impacts on ecosystems and human health, and possible societal responses. This model helps in understanding systemic cause-effect relationships and guides planning, design and also policy to address and mitigate environmental challenges effectively.

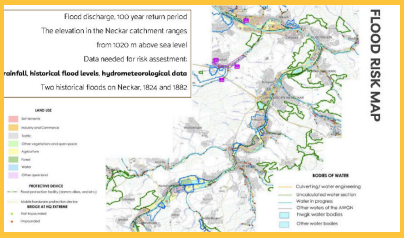
Learners received a presentation template with the following guiding questions:

- How has this landscape developed over the past to its present state? Which cause-effect relationships have driven this development? Which value schemes were dominating?
- Which values has this landscape generated by this past transformation? Which values got lost? You may use the UN Sustainable Development Goals for making this explicit and comparable across locations.
- What are the main circular relationships in your landscape? Which resources come in from elsewhere (such as workforce, energy, food, materials….) and where do they end up? Which resources flow out from your landscape to other places (such as products, knowledge…)? Show these circular relationships.
- Combine the different land use layers: Which goal conflicts exist? Who/what wins and who/what loses?

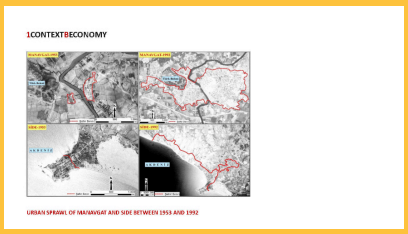
The student teams gave a first presentation in the seventh seminar week. The focus was on presenting the landscape development from the past to the present situation and to evaluate which sustainability challenges are at stake. The teams had 15 minutes to elaborate and present their cases followed by 15 minutes feedback and group discussion.

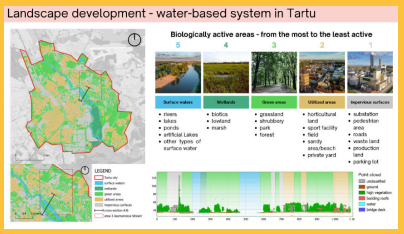
The following overview shows a few examples of how the learners have developed their landscape system analysis:



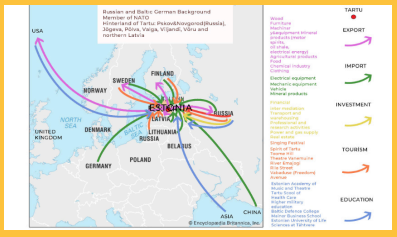


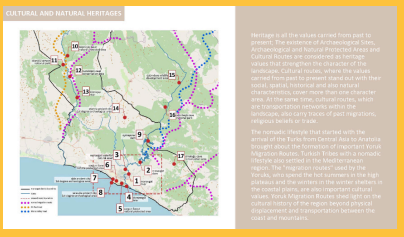
Course examples Landscape System Analysis, left: Team Akdeniz University, *right: Team Sapienza University*
First pilot programme October 2022 - January 2023





Course examples Landscape System Analysis, left: Team ULB, right: *Team Gdansk University of Technology*
First pilot programme October 2023 - January 2024





Course examples Landscape System Analysis, left: team *Gdansk University of Technology,* right: *team Akdeniz University*
First pilot programme October 2023 - January 2024

The following thematic session introduced the students to the second assignment part: *scenario building and visioning*. Scenario building in spatial planning is both an analytic and a strategic process used to envision and evaluate multiple potential future developments for a given area, considering various economic, environmental, social, and political factors. Learners are asked to create and compare different area-based scenarios. They take varying assumptions of how driving forces might create future impact on the landscape.

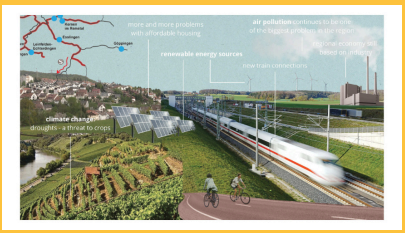
Drawing from that, we can assess how different actions, policies, or external changes might shape the landscape over time. This approach is important because it helps planners anticipate risks, opportunities, and the potential impacts of different decisions, allowing for more resilient and adaptable planning that can better respond to future uncertainties.

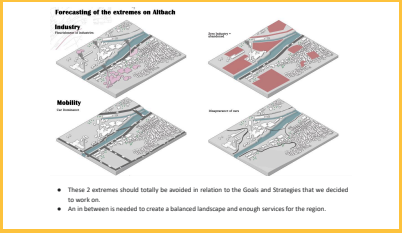
On that basis of evaluating alternative futures, the teams can then decide on their preferable future and develop this scenario into an integrated vision for their team. How to arrive at that vision, would then be explored in the following assignment. Given the interdisciplinary character of the landscape economy seminar, the strategic dimension of scenario building was very relevant in order to integrate the learners' varied knowledge fields into a collective process (Hopkins et al, 2007; van Notten et al, 2003).

The learners received the following guiding questions as part of their assignment template:

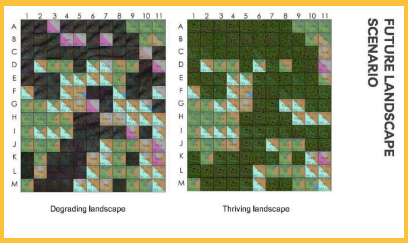
- Which developments might impact your landscape over the coming 50 years? Try to integrate local and global developments and multiple sectors, based on your knowledge from the previous thematic lectures.
- Reflect on the future cause-effect relationships: Which pressures on your landscape are plausible? Who and what in your landscape will be impacted in the future?
- Try to forecast different variants, ranging from extreme to plausible, and visualise them taking the specifics of your local landscape into account.
- Evaluate these futures, for example in relation to the UN Sustainable Development Goals. Which future needs to be avoided and why? And which future should we build and why?
- Synthesize your preferred future into an integrated vision
- Make sure that your assumptions are rooted in locally relevant landscape knowledge and plausible data gathered during your analysis.
- Make sure that you identify a sustainability challenge in your landscape that you want to address further in the next assignment.

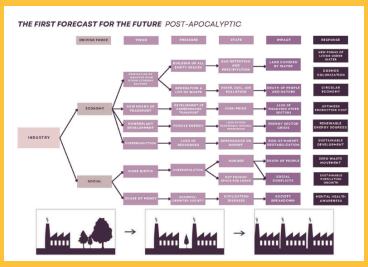
The following overview shows a few examples of how the learners have developed their alternative futures:



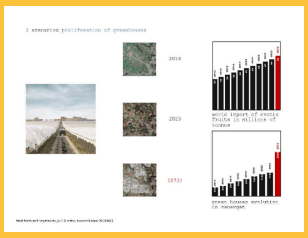


Scenario and visioning: left: *team Gdansk University of Technology,* right: *team Sapienza University of Rome*
First pilot programme October 2022 - January 2023





Scenario and visioning: left: team *Sapienza University of Rome*, right: team *Gdansk University of Technology*
First pilot programme October 2022 - January 2023



Scenario and visioning: left: team *Université Libre de Bruxelles,* right: team *Gdansk University of Technology*
Second pilot programme October 2023 - January 2024

Assignment 3: Landscape System Modeling

The third assignment builds directly on the previous one, focusing on the same landscape context. To complete this task, learners must use the following insights from their prior landscape system analysis:

- An understanding of the current sustainability challenges within the landscape
- An understanding of which sustainability values might face future challenges, based on scenario evaluation
- An integrated vision of a regenerative, alternative future for the landscape
- A set of development goals aligned with the landscape vision

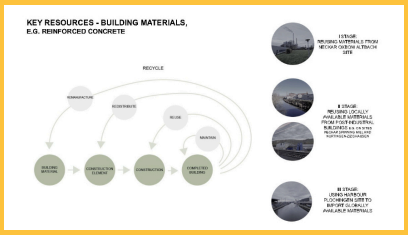
With these components in place, learners now enter a backcasting process, identifying the steps, strategies, and systemic innovations needed to achieve this desired future. This assignment approaches backcasting from two complementary dimensions:

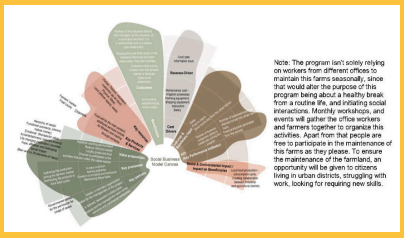
1. The spatial and territorial dimension: Here, learners translate the vision and development goals into a spatial representation. They consider questions such as: How will the landscape function in the future? What qualities will it embody? Which actors and communities will play roles in the transformation, and where will they be located? Teams are encouraged to use creative, exploratory techniques to illustrate how a regenerative landscape system will shape the territory.
2. The community and/or business dimension: This dimension asks how shifts in practices, consumption, or production patterns can be driven by social innovation. Innovations might include new forms of collaboration among existing initiatives, novel services and products, advanced technologies, or governance reforms. Regardless of the innovation type, all participants are required to represent their approach through a Social Business Model Canvas (SBMC). The SBMC encourages specificity in defining relationships among customer or beneficiary needs, value propositions, and key products or services.

Within the TELOS seminar framework, landscape economy models consistently incorporate both spatial and operational dimensions, making this curriculum innovative by combining sustainable landscape development with social innovation. This handbook does not provide an in-depth overview of the SBMC. This approach has been thoroughly covered in a previous open-access publication, *People, Landscape, Sustainability* (Funck, Fetzer, Dreksler, 2023), introduced to all TELOS seminar participants.

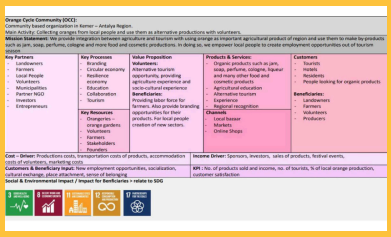
Throughout the seminar, learners engage with the SBMC over three sessions, working through integrated exercises on ideation, vision and mission development, and value proposition definition. Each team presents its results in a final presentation with feedback and discussion, followed by a written evaluation from the team of instructors. Additionally, a PowerPoint template supports the teams, guiding them through the main steps and questions for both the territorial vision and social business development.

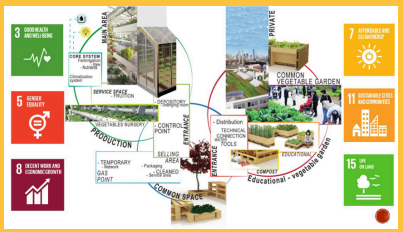
The following page shows some examples from the pilot courses:





Landscape System Models: left: team Gdansk University of Technology, right: team *Sapienza University of Rome*
First pilot programme October 2022 - January 2023





Landscape System Models: left: team Akdeniz University, right: *team La Sapienza University in Rome*
First pilot programme October 2022 - January 2023

Landscape System Models: Examples from the Mobility and Sulac Park Teams
Winter School Antalya, February 2024

Assignment 4: Field research and good practices

This individual assignment is designed for students who are not working with a local landscape context during the seminar period and, therefore, cannot fully engage with Assignments 2 and 3. It also serves as a suitable alternative for learners with limited time resources. Additionally, students who need to fulfill a higher semester workload may choose to complete this assignment in addition to the previous ones.
In this assignment, learners are invited to conduct desk research using secondary data sources to explore current efforts and best practices in innovative landscape economy approaches.

Specifically, they are asked to investigate existing practices, focusing on the following guiding questions:

- What types of innovative approaches exist, and how do they work?
- Which landscape sustainability challenges are these approaches addressing?
- Who are the individuals behind these initiatives, and what motivates them?
- What insights can you gain from the case?

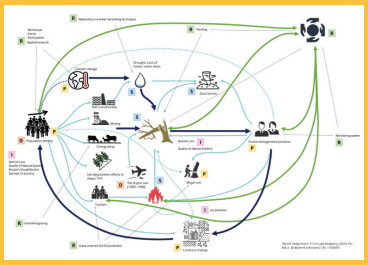
Examples of innovative approaches include new forms of cooperation across public, private, and social sectors; market-oriented approaches like social businesses; alternative organisational models (e.g., cooperatives, benefit corporations, foundations); and innovative landscape governance strategies. These approaches share a common goal: to create value propositions that address social and environmental needs rooted in the landscape and reduce negative impacts.

Learners are asked to use a case study template based on the social business model canvas. This template helps deepen their understanding of this model by allowing them to independently apply it to a real-world case of their choice, ensuring that all participants engage with this social innovation method.

The case studies are presented alongside the landscape system analysis and modeling presentations, allowing participants to gain inspiration from each other's case studies and to enrich the ideation processes of other teams. In addition to these presentations, learners submit a five-page report along with the completed case study template. The report includes a personal reflection on the assignment.

The following page shows a few examples from the pilot programme. The case study template is also available for download and further use.

Examples from the case study assignment: left: Danish Cycline Federation presented by Caroline de Vries, Right: Nürtingen Cooperative presented by Amin Alirezai, Second pilot programme October 2023 - January 2024



Examples from the case study assignment: left: Zagros Forests Initiative presented by Delaram Kouhestani, Right: Metropublicnet by Ana Cristina G. Garcia, Maria B. Guedes Quintella, pilot programme October 23 - January 24

Examples from the case study assignment: Energy Communities presented by Fabrizio Albion (left) and, Maximiliano García Aviazzi (right), Second pilot programme October 2023 - January 2024

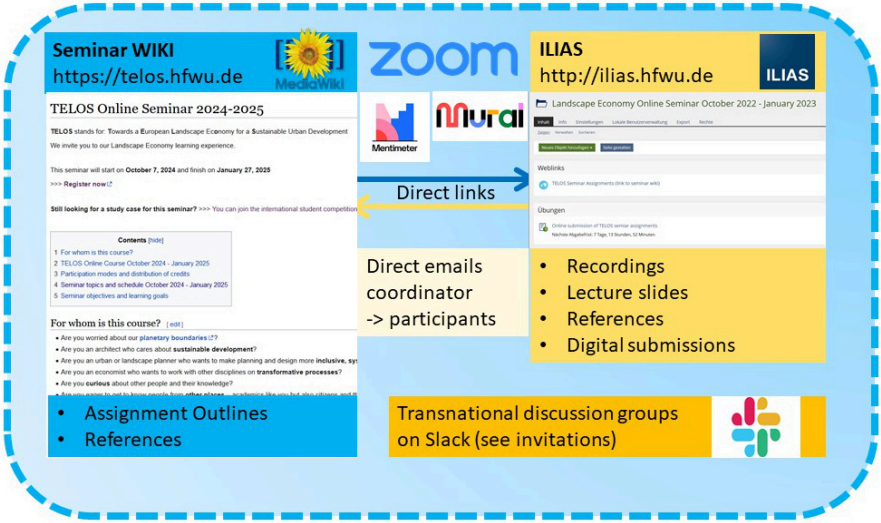
Digital infrastructure

The graphic below shows how the landscape economy learning environment has been implemented with regard to the digital infrastructure and tools. It was necessary to combine various tools in order to meet the following requirements:

- Easy accessibility for all participants no matter if they are enrolled in one of the partner universities or not
- Easy opportunity to make learning materials and recordings accessible for everyone
- Ensure opportunities for collaboration and active learning during synchronous online sessions.
- Sustainability and long-term availability of the platform
- Avoid running costs for licences, hosting or web development that cannot be sustained beyond the lifetime of the project.

The course therefore used the following combination of different tools and existing institutional infrastructure:

- Course WIKI as an open source MediaWiki installation on NGU's internal servers
- Digital submissions and publication of lecture recordings via NGU's open source Learning Management System ILIAS
- Synchronous sessions via NGUs institutional ZOOM licence
- Interactive polls and playful elements via NGU's institutional Mentimeter licence
- Interactive whiteboard excercises with instructors' own MURAL licences
- E-Mailing via regular channels
- Free *SLACK* license for easy day-to-day team communication. This was eventually only used for the TELOS team, not for the learning groups.



The TELOS learning environment from a technical perspective: linking services and tools to allow for maximum flexibility, creativity and sustainability of the transnational learning process

Onsite landscape economy intensive study programmes

Within the framework of the TELOS project our team has been able to implement two intensive study programmes of 10 days duration with participation of staff and students from all project partners. Successful participation in the online programme (with at least 5 ECTS) was the general prerequisite for all participating students.

Since the participation numbers were limited compared to the online programme, we introduced additional selection criteria: motivation statement, overall study performance and English language competence. On that basis, on average eight students per partner university were able to participate in the onsite events. The interest in participating was always high and the programme coordinators had to select the final attendants based on the above-mentioned criteria.

The first workshop was done from June 24 – July 3, 2023 at Nürtingen-Geislingen University. The participants applied a multi-scale and systemic approach to the urban landscape of Nürtingen in Germany. Nürtingen is a middle-sized commune of 42.000 inhabitants. It is part of the urban agglomeration of Stuttgart. This area is home to 2.7 million people distributing across the 179 communes of Stuttgart Greater Region.

The teams focused on four design challenges:

1. *The housing challenge:* Nürtingen is facing the challenge of relatively low housing density and dispersed structures. Access to affordable housing is getting more and more difficult, which is why urban green spaces are often the first choice for densification. Design question: How might we generate new housing opportunities without consuming more open and green spaces?
2. *The energy challenge:* Based on the case of a new district development, Bahnstadt Nürtingen, we explored the concept of 'Positive Energy Districts'. How might this concept be transferred to the new district development? What would be the role of the neighboring district in this?
3. *The urban open space challenge:* Nürtingen has limited access to public urban green spaces which is a challenge to social and environmental quality and limiting its climate resilience capacity. We will explore the territory of the Wörth district. How might we develop this area into a relevant urban green blue infrastructure? Which design would be suitable? Which benefits could we derive and quantify?
4. *The financing and management challenge:* If we imagine the Wörth district as a community-based public park, deep social and organisational innovation is needed. How would a community park work? How would it be organized? What are the financing mechanisms? Which innovative forms of collaboration do we need?

Over the eight working days, the teams were guided through an intensive process that also included local stakeholder and community engagement, and public presentations.

The so-called TELOS Winter School was hosted by Akdeniz University in Antalya, Turkey. The 10-days learning event took place from February 16 - 25, 2024. Manavgat is located to the east of the vacation metropolis of Antalya on the river of the same name and at the foot of the Taurus.

The landscape is exemplary of the problems in many Mediterranean coastal towns: intensive tourism, highly productive agriculture, enormous settlement pressure, massive threats to ecosystems, water crisis, loss of cultural identity, high traffic congestion and all this in the context of climate change with higher temperatures, increased heavy rainfall events and rising sea levels.

Eight TELOS student teams applied different thematic approaches. The topics included: A landscape observatory for the Antalya Bay, governance models for a regional park, sustainable food and mobility systems, new regional tourism offerings and innovative approaches to safeguarding biodiversity in peri-urban coastal areas. The Winter School ended on Saturday, February 24th with a final presentation for the local community.

For both events, all results have been document in great detail on the project website, see links in the box at the end of this chapter.

On the example of the Antalya TELOS Winter School, we are presenting now the curriculum design of an intensive 8 days project week on landscape economy, including the steps we have taken. This model worked well and we can certainly recommend it as a basis for future educational events.

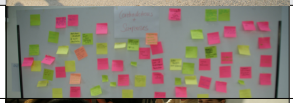
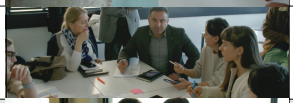
TELOS Winter School Antalya - Manavgat, 16.-25.02.2024

16.02.	17.02.	18.02.	19.02.	20.02.	21.02.	22.02.	23.02.	24.02.	25.02.
Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
all day	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	09:00 - 12:30	all day
arrival to Antalya	**Morning session:** Welcome and getting to know each other, mapping expectations, pre-evaluation 11 00:Introduction to the Antalya Bay (Antalya team et al.), Introduction to campus facilities	Excursion to Manavgat (designed by Akdeniz team)	09 00 - 11 00: Landscape challenges mapping and team building & collective brainstorming on the landscape system context. Identifying root causes. 11 00 - 12 30: Further developing the system model, define the challenge	09 00 - 11 00: Ideation session 11 00 - 12 30: Prioritize ideas and quick group presentation	09 00 - 11 00: Introduction to the business model canvas (specifying final presentation needs) 11 00 - 12 30: Teams prepare for a field testing session	Group work continues, including field testing in Manavgat or with local community / stakeholders (possibly not all team members)	working on SBMC, landscape system model and final presentation	Final presentations, possibly a mix of prototypes expo & presentations	return travel
	12:30 - 14:00 Lunch	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	**12:30 - 14:00 Lunch**	
	Invited experts: Agriculture, tourism, agricultural land market, real estate **Group exercise:** Collective Landscape System Mapping (Cause-effect relationships)	Excursion continues	Roundtable with local community & local experts, use empathy map **Group exercise:** Reflect findings from round tables	Prototyping session and presentation of prototypes	Group work continues, including field testing in Manavgat or with local community / stakeholders	Pitching Session 5 minutes Team members who are not in the field: Further development of the business model & specification of the spatial transformation / spatial implications on the landscape system	working on SBMC, landscape system model and final presentation, 17 pm rehearsal	Final presentations continu e, Feedback and post-evaluation session with all participants Farewell event	
	18:00 Free evening	**18:00 Free evening**	**18:00 Free evening**	**18:00 Free evening**	**18:00 Free evening**	**18:00 Free evening**	**18:00 Free evening**	**Farewell Event**	
	Outcome of the day Team building, initial landscape system knowledge, first hypothesises	**Outcome of the day** Advanced landscape system knowledge	**Outcome of the day** groups, deeper understanding, system model development	**Outcome of the day** Idea & prototype	**Outcome of the day** prepard to develop SBMC	**Outcome of the day** Advanced business model & spatial model	**Outcome of the day** preparation of final presentation	**Outcome of the day** Community presentation and post-evaluation	

Schedule of the Landscape Economy - TELOS – Winter School Intensive Programme at Akdeniz University.

The schedule can be adjusted to different places and settings. The process includes all key elements of the landscape economy systems design learning process.

Impressions of the TELOS Intensive Programme Main Ühases

Day	Process Step	Impression	Notes
1	Team Building and Mapping Expectations		We applied an ice-breaker exercise followed up by a reflection on expectations and learning goals. The reflection was done individually, in pairs and then joining two pairs. This reflection was repeated at the end of the seminar.
	Framing the landscape system		All seminar participants listen to a set of lectures introducing them to the landscape context from a theoretical point of view. Introduction to landscape systems mapping.
2	Landscape experience		A one-day field trip with first hand experience and meeting stakeholders in the field
3	Harvesting collective knowledge and ideas		All participants share their observations in the following categories: themes, surprises, contradictions, wild ideas and 'How might we....? Questions.
	Team building		Based on the collective brainstorming, we cluster topics and build mixed teams
	Landscape system mapping		Teams develop a first representation of the landscape system
	Empathizing with the local community		Participants empathize with local community members and stakeholders during a roundtable session. Empathy mapping canvas is used for structuring this knowledge.
4	Ideation		Participants are led through an ideation session, generate a diversity of ideas.
	Prototyping		The teams generate a rapid representation of their idea in the form of a prototype. The prototypes are presented and discussed.
5	Social Business Model Canvas		Participants are introduced to the Social Business Model Canvas (repetition from online course) and work on the SBMC template.
	Field Testing		Participants gather additional community or stakeholder feedback on their idea and the emerging social business model.
6	Pitching		Delivering 5-minute presentations of the innovation idea, gathering feedback
7	Refinement and visualization		Participants further develop the elements of their innovation model, including the spatial representation
8	Presentation		Presenting the entire model and discussing the results
9	Reflection		Participants note down and reflect their learnings from the process

Results, reports and teaching material

Presenting all results and outcomes of the learning activities conducted during this three years ERASMUS project would go beyond the scope of this handbook. We therefore invite you to visit the TELOS wiki for more information. You find the results of the TELOS intensive study programmes in great details.

We also share the assignment templates and the evaluation forms open access. We hope that this material inspires you to start similar learning activities in your educational or community context.

Landscape Economy Summer School Nürtingen 2023

Scan QR code

Or click here

Landscape Economy Winter School Antalya 2024

Scan QR code

Or click here

Assignment Templates and Evaluation Forms

Scan QR code

Or click here

TELOS

Towards a European Landscape EconOmy for a Sustainable urban development

Flexible participation modes

The table below shows the variants learners were able to choose when participating in the landscape economy curriculum during the piloting phase. Based on this flexibility, it was possible to integrate a great variety of learners, not only from the partner universities but also from outside. The course also attracted interest from professionals with limited time resources. Many were grateful for the small variant with 5 credits, allowing them to easily integrate the programme into their professional schedules. The curriculum design builds on the assumption that one credit equals 25 working hours within the European Credit Transfer System (ECTS).

ID	Credits	Mode	Learning activities included:
1	**5**	Online	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 4: Field research and good practices
2	**10**	Online	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 2: Landscape System Analysis 3. Online Seminar Assignment 3: Landscape System Model
3	**15**	Online	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 2: Landscape System Analysis 3. Online Seminar Assignment 3: Landscape System Model 4. Online Seminar Assignment 4: Field research and good practices
4	**10**	Online & Onsite	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 4: Field research and good practices 3. Onsite Landscape Economy Intensive Study Programme
5	**15**	Online & Onsite	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 2: Landscape System Analysis 3. Online Seminar Assignment 3: Landscape System Model 4. Onsite Landscape Economy Intensive Study Programme
6	**20**	Online & Onsite	1. Online Seminar Assignment 1: Pre- and Post-Seminar Concept Mapping 2. Online Seminar Assignment 2: Landscape System Analysis 3. Online Seminar Assignment 3: Landscape System Model 4. Online Seminar Assignment 4: Field research and good practices 5. Onsite Landscape Economy Intensive Study Programme

Landscape economy curriculum development perspectives

In addition to this micro-level integration, our team also started to explore broader curriculum development perspectives. The following ideas evolve from the university partners' existing curriculum structures. Taking this into account, we can imagine the following possibilities:

Continue the current pathway: integrate the landscape economy course into existing curricula

- The landscape economy course is integrated into existing master programmes.
- Examples at the partner universities: Elective course in the programme 'International Master of Landscape Architecture' at Nürtingen-Geislingen University in Germany; Master in Architecture, Urban Regeneration, with the course 'Sustainable design for Greener Cities' (8 ECTS) at Sapienza University of Rome), integration into urban design or spatial planning project modules at Gdansk University of Technology, Akdeniz University and Université Libre de Bruxelles
- Online course, 1 semester, 5 - 15 ECTS
- Workshop formats, 5 - 10 ECTS (tested in Nürtingen & Antalya)
- Currently, the focus is mainly on master programmes.
- Doctoral students have already been partially involved as well.

Executive Masters or Diploma/Certificate Programmes with 30-60 ECTS

- ULB has developed such a model on the topic of 'carbon-neutral cities'
- Mainly online and addressed to professionals in need for new knowledge
- The model works well at ULB. Tuition fee is 2.600 Euro per semester and there are scholarship opportunities. The course triggers career promotion.
- Companies are supporting the programme and job opportunities are created
- This could be a development opportunity for the now existing TELOS course elements

MBA Models with 60 - 120 ECTS

- We discussed the idea of an MBA for planning professionals. This would be typically a 1,5 years, 'master by thesis' with part-time possibilities. This could be combined with additional courses, many of which are already existing in other master programmes.
- For example: ULB has a Real Estate MBA and also NGU has various MBA programmes
- The programme should be wide open to many disciplines and cultivate a diverse classroom to train the competence of integrating diversity
- There is a need to explore double/joint degree options and further funding opportunities (EU; DAAD)
- The theory inputs could be done online in the consortium in combination with blended intensive programmes and local studio work.
- We would then need additional and constant funding for providing intensive 1:1 consultation, to ensure the key value proposition of an MBA programme.

Long-term integration into OLA - the Open Landscape Academy

- This is an ongoing project in which Nürtingen-Geislingen University and the LE:NOTRE institute are involved.
- OLA, the Open Landscape Academy, aims to build capacity for democratic landscape transformation
- Landscape Economy could become a complementary OLA branding element, together with Landscape Democracy/Democratic Landscape Transformation
- OLA could serve as an entry point to the landscape economy open online course, leading audiences possibly further to an MBA qualification.
- Info: http://www.openlandscapeacademy.org

In the future, it will be necessary to reach out to a broader audience and further target groups. This also includes potential partners from politics, the industry and the NGO sector who could constantly contribute to the landscape economy curriculum from their practice experience.

References

- European Environment Agency (1999): Environmental Indicators: Typology and overview, technical report nr 25, https://www.eea.europa.eu/publications/TEC25
- Funck, Fetzer, Dreksler (2023): People, Landscape, Sustainability: A Handbook for Community Innovation Promoters, Cuvillier, https://cuvillier.de/en/shop/publications/8827-people-landscape-sustainability
- Hopkins, L. D., & Zapata, M. A. (Eds.). (2007). Engaging the Future: Forecasts, Scenarios, Plans, and Projects. Cambridge, MA: Lincoln Institute of Land Policy.
- Novak, Joseph Donald (2012). Learning, Creating, and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations. New York, NY: Routledge.
- Kersten Reich (2006): Konstruktivistische Didaktik. Lehr- und Studienbuch inklusive Methodenpool
- Van Notten, P. W. F., Rotmans, J., Van Asselt, M. B. A., & Rothman, D. S. (2003). An updated scenario typology. Futures, 35(5), 423-443.

Concept Mapping Tools:

1. Cmaps: https://cmap.ihmc.us (last accessed: 09.11.2024)
2. VUE: https://vue.tufts.edu (last accessed: 09.11.2024)

Reflection in Action

Learnings from continuous evaluation, feedback and reflection among all participants

Reflection in Action

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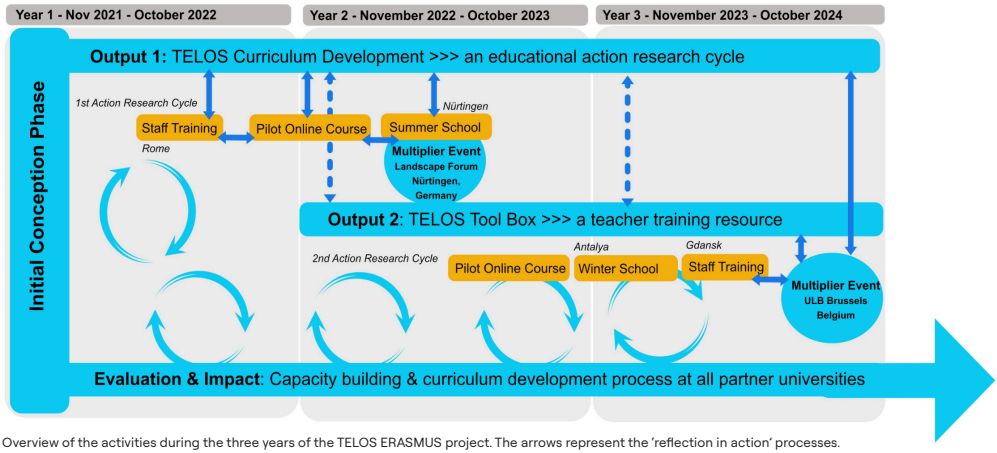
The following part of the handbook presents approaches and findings from our action research cycle. This practice-led approach was the methodical backbone of this landscape economy project.

A pedagogical action research cycle is a systematic process used by educators to improve teaching and learning practices through reflective, iterative cycles of planning, acting, observing, and reflecting. This process often repeats in multiple cycles to refine and improve the interventions further. Action research approaches help educators make informed changes to their teaching strategies. These processes promote professional growth by engaging teachers as active researchers in their own classrooms. A major factor is the collaboration among peers which this project emphasised very much, fostering shared learning and innovation. By engaging in this reflective process, educators can create a more adaptive and responsive learning environment.

During the first TELOS year, the landscape economy curriculum was rapidly drafted and developed into a course prototype. The first live testing phase with staff and students was done from October 2022 – January 2023, followed by the first TELOS Summer School in June 2023. This test was monitored, reflected and discussed, and developed into a second edition implemented from October 2023 - January 2024 and complemented by the TELOS winter school in Antalya in February 2024. The entire process further included two staff training events. In the following, we present findings from monitoring the learning progress of staff and students.



Overview of the activities during the three years of the TELOS ERASMUS project. The arrows represent the 'reflection in action' processes.

Observing the staff development during the TELOS project process

One important goal of this curriculum development project was to build capacity among higher education teachers and to develop their competence for implementing a landscape economy curriculum.

The monitoring of this process was done all through the project duration with the following mainstays:

- Co-creative processes and participatory action research all through the project with rapid prototyping of a model course and early testing in live settings
- First staff training before the first pilot activities in July 2022
- First staff survey at the end of the first pilot online seminar in February 2023
- Reflection session among staff members at the end of the TELOS Summer School in Nürtingen in June 2023
- Written survey before and after the TELOS Winter School in Antalya in February 2024
- Collaborative peer reflection session during the second staff training at Gdánsk University of Technology in July 2024
- Capturing reflections with videos and transcription at the Multiplier Event in Brussels in September 2024
- Consecutive staff survey at the end of the project in September 2024

In the following, we sum up the findings from the collaborative peer reflection session during the second staff training at Gdánsk University of Technology on July 24, 2024, that was attended by 18 staff members from all partner institutions. It represents a conclusion of their project experience. The group reflected on the following three questions:

1. What do you value about the TELOS project?
2. What have you learned during the TELOS project?
3. What will you keep as part of your future practice?
4. What do you still need to learn?

We collected all the answers from their individual post-its and conducted a content analysis with the following findings.

What do TELOS staff members appreciate about the project?

Diversity of the team:
TELOS staff appreciated the different academic backgrounds, different learning cultures, and the combination of the multiple disciplines working collectively to find the solutions for the future landscapes. The team appreciated the transfer of knowledge from different countries and the teaching and learning approaches and learned how to work in diverse teams.

Impressions from the TELOS team reflection workshop at Gdansk University of Technology, Poland, in July 2024

Interdisciplinary knowledge transfer:
The team appreciated the interdisciplinary approach of the project, which combined experts from multiple backgrounds, and universities, they also appreciated learning through different perspectives, and international understanding of the problems and learned how different problems are seen in different parts of the world.

Different methods of teaching and learning
The partners appreciated learning different teaching and learning methods, as the workshops bring together multiple education systems and styles from different countries, the participants appreciated learning the teaching and learning approach from the other countries.

*The Blended Learning approac*h
The teachers appreciated the blended learning format, where the combination of thematic online learning led to an onsite international learning environment. It helped the participants to get the idea of different themes associated before coming to the workshop and prepared them for what to expect in the onsite workshop.

What has the TELOS teaching team learnend during the project process?

The participants also shared what they appreciated learning throughout the TELOS process, and also the concepts that were new to them. The reviews show how many different concepts people learned and would like to take further into their everyday educational practice. The following aspects were repeatedly highlighted:

Landscape system approach
The TELOS team appreciates the landscape system approach in which landscape is further divided into themes like foodscapes, mobility, energy etc., which helped them learn the multidimensional approach of landscape, and how to combine them to form a feasible plan after studying the inputs from different layers of landscape.

Landscape economy as a framework
Many team members find the addition of the economic dimension to the landscape very useful, as it gives a more realistic approach to landscape development. They emphasised that learning about the landscape from the economic point of view mattered strongly to them and it also helped them learn how the inclusion of landscape economy makes the output better.

Hidden landscapes and value chains
The participants also learned about the hidden value chains in the landscape, which sometimes remain invisible in landscape education. The TELOS learning activities brought this important topic to the table and reminded people about this wicked sustainability challenge.

Stakeholder involvement
The TELOS teaching team also mentioned that they have learned about stakeholder involvement which is another main topic in the landscape transformation, as the landscape transformation should always follow the democratic process of taking multiple stakeholder perspectives into account.

The impacts of urban transformation on landscapes
The learning activities discussed multiple layers of landscapes and the team appreciated how they got to learn the impacts of urban development in multiple layers of landscape and how it transforms landscapes as a whole.

Methods of the landscape economy curriculum
The staff members appreciated learning different methods, and those were also mentioned in the reflections. Some methods were found to be more popular than others. The systems thinking approach was appreciated the most. The participants mentioned learning new and helpful techniques such as scenarios, social business model canvas, and the design thinking process.

What is the TELOS teaching staff going to keep in their daily practice?

This part of the report deals with what the participants would like to keep in particular for the next editions of the landscape economy course, and also for their regular educational practice. Here are the main aspects mentioned by the teachers:

Interdisiplinary approach
The teachers would like to keep the interdisciplinary cooperation between the universities as it helps enhance the learning process by bringing together different cultures, teaching methods, and different ideas from different parts of the world. This also made the learning experience better for the participants.

Student engagement
The TELOS team also liked the idea of students engaging in multiple themes and being active participants rather than just listeners, learning by doing approach was found to be popular, and they also suggested bringing up more challenging tasks to engage students on a higher level as the challenges often seem to bring out better and innovative ideas.

Context mapping
The team would like to keep the context mapping and also improve the focus on the contextual analysis of the area, where the problems are based on. This helps make the site-specific design better and not just follow the copy and paste of practices from the previous projects.

Landscape systems
The participants also want to keep the landscape system approach as dividing the landscape into multiple themes makes the understanding of the specific themes better and improves the overall learning of new landscape systems
.

Being visual
The participants also suggested keeping the focus on illustrations, system diagrams and mapping as it gives more clarity and understanding of the site and concepts.

Being reflective
The reflections play an important part in evaluating and reviewing the learnings and the progress of the programme and the participants also suggested that keeping them and putting more focus on them will make the experience better.

Which needs are still there?
Even if the three project years have triggered an intensive learning progress for the TELOS teaching team, there are still elements left to be further explored. To some extent, a new world has opened, requiring continuous further qualification, experience and development. Here are the main areas in which the TELOS team still sees further personal qualification needs:

Landscape economy
It seems that we have opened Pandora's Box by introducing landscape economy to this team. Starting to engage consciously within this new conceptual framework triggered many follow-up questions.

The team provided some specific topics they still would like to learn more about such as:

- Economic areas-based system with monetary planning and benefits
- How to evaluate the relationship between landscape and economy based on return on investment.
- Development of economic models for urban landscapes.
- Landscape economy in an anthropogenic society.
- The role of the economy in multidimensional landscapes and associated themes.

Landscape Democracy
Landscape democracy is another very popular theme among the team members, and it is good to see it getting more traction as the theme is being developed in recent times with the Open Landscape Academy initiative (OLA). While some of the participants just wrote the theme, a few reviews also had ideas on what more to add:

- Taking considerations from the socio-cultural context
- Including multiple actors in the process
- Finding ways to include unheard voices
- Visualising landscape democracy
- Methods for democratic landscape transformation

KPIs and their analysis
The TELOS team still would like to learn more ways to formulate the key performance indexes and also learn the ways how to analyse the KPIs in different contexts and themes of the landscape system. The inputs from

the team includes multiple points they would like to focus more on.

The points are as follows.

- How to teach KPIs-based systems?
- How to formulate relevant KPIs in different contexts?
- How to add more exercises with KPIs?

Systems thinking approach
Another popular method among the participants was the systems thinking model. The team would like to learn more about the application of the method and also how to teach it further. Along with that, participants would also like to add systemic leadership to the same.

International cooperation
The team also put emphasis on having more international cooperation and coordination between the participating universities, they also put some recommendations such as summer schools, online seminars, and incorporation of the learnings from the workshops in the classroom curriculum.

Cross-cutting multiple themes
The teachers appreciated having multiple themes of landscapes in one learning activity, further recommending more cooperation and cross-cutting seminars to integrate the learnings from the different themes to create a more vivid picture of the landscapes and related understanding.

Hidden value chains in the landscape
The team also showed interest in learning more about the hidden value chains in the landscapes, which will also put more emphasis on a deeper understanding of the landscape services and the ecological benefit, moving more towards the perspective of designing with sustainability, resilience, nature conservation and preserving the values of the landscapes while framing policies.

Social Business Model Canvas
In some reviews, the participants asked for more knowledge on social business models in capitalistic societies, which is another great idea to add to the curriculum where the participants can learn about how social businesses run and also, what can be done to explore the businesses supported by the society and the social context. It would be great to include knowledge about creating social infrastructure that supports local businesses.

Ecosystem services and local value chains
As the new European strategies are based more on regional development, the participants would also like to see more content on the importance of local value chains and more awareness of the hidden ecosystem services in the landscapes which are usually not very visible in the current education model but can greatly benefit the future of sustainable and resilient development.




TELOS in situ reflections: at the top during the Antalya Intensive Study Programme in February 2024,
at the bottom during the Nürtingen Intensive Programme in June 2023

The reviews proved to be very beneficial in understanding the participant's mindset and the level of acceptance of the concepts and methods used in the TELOS project. They also provided great insight into what can be done to enhance the quality and content of the curriculum in the future. The reviews also indicate the levels of understanding and learning among the participants, and what are the best practices to lead future landscape economy learning activities.

We complemented this staff reflection workshop with an online survey. One survey was done after completion of the first pilot online seminar in February 2023. A second and final one in September 2024. We asked the staff members another time specifically what they have learned during the TELOS project process. The results from the final survey are complementing well with the previous observations. The following eight clusters summarise the key learnings of the TELOS team:

1. Integration of Landscape and Economy

- Understanding relationships between landscape and economy in urban and rural contexts.
- Insights into how different sectors (agriculture, forestry, tourism, housing, mobility) shape landscapes and their economies.
- Recognizing the economic value of landscapes beyond monetary terms, incorporating social and cultural benefits.

2. Interdisciplinary and Systems Thinking

- The value of interdisciplinary collaboration and how to integrate perspectives from diverse fields.
- Understanding landscapes as interconnected systems, emphasizing systemic and critical approaches.
- Applying system mapping and value chain evaluation for landscape economy studies.

3. Pedagogical Methods and Tools

- Effective teaching approaches, including spatial scenarios, design thinking, DPSIR, and Social Business Model Canvas.
- Learning methods for organizing interdisciplinary teaching and intensive programmes efficiently.
- Active pedagogies like scenario-based exercises and using concept mapping for teaching landscape economy.

4. Social and Business Models in Landscape Contexts

- Development of social business models tailored to landscapes.
- Using tools like Social Business Model Canvas for engaging stakeholders and addressing economic challenges.
- Combining value chains with social and ecological benefits for better integration in planning.

5. Global and Local Perspectives

- Gaining awareness of diverse economic realities across Europe and their connection to

landscapes.
- Exploring the impact of climate change and the importance of integrating sustainability into economic models.
- Emphasizing the role of landscapes in enhancing the quality of life and fostering social connections

6. Personal and professional development
- Building networks with experts across disciplines and broadening perspectives on landscape-related issues.
- Gaining experience in managing interdisciplinary projects, including working in diverse teams.
- Strengthening competencies in supporting students during design and planning processes.

7. Conceptual and analytical growth
- Conceptualizing landscape economy and applying innovative frameworks like "cheap nature" and hidden landscapes.
- Recognizing and addressing challenges in explaining relationships between landscapes and economies.
- Broadening the understanding of ecosystem services beyond agricultural provisioning to include cultural and regulatory aspects.

8. Practical Insights
- Applying methods to analyze and envision landscapes within different sectors and contexts.
- Using system design and modeling approaches to create practical solutions for sustainable development.
- Understanding the importance of landscapes in economic frameworks as well as their environmental and social value.

The following pages present results of the online surveys that were conducted in February 2023 and 2024. and September 2024 (staff only). The focus is on the self-assessment of both groups with regard to the development of their subject-specific and methodical competences.

Impressions from the seminar sequence and structure

Statements *Evaluate at a scale from 1 (min) to 6 (max), mean average*	2023 *N=32*	2024 *N=55*
• There was a logical sequence with well-balanced contents:	4,69	4,53
• The lecturers engaged well with the audience:	4,25	4,38
• The lectures were clearly understandable:	4,75	4,33
• The lecture materials were good:	4,91	4,87
• The seminar sequence /assignments were clearly presented:	5,19	4,85
• The interactive polls were helpful	4,78	4,61
• The overall session lenght was just right	4,44	4,31
• My chat contribution were taken up by the moderator	4,75	4,55
• I would have liked to engage more with the lecturers	3,5	3,96
• I would have liked to engage more with the audience	3,72	3,7
• I received sufficient and helpful feedback online	4,7	4,7

Table 1: Evaluation from 2023 and 2024 online seminar student participants (pilot 1 & 2). Overall, the instructional design of TELOS was already well received in the first pilot with not much development compared to the second pilot. Sequence and materials get a lot of support. Some, but not all, respondents expect more engagement.

Perceived knowledge development in %

Mobility			
	...has remained the same	**....has increased**	**....has increased significantly**
Student 2023 (N = 32)	12,5	68,75	18,75
Student 2024 (N = 55)	10,9	76,36	12,73
Staff 2023 (N = 17)	29,41	58,82	11,76
Staff 2024 (N = 19)	21,05	63,16	15,79
Energy			
	...has remained the same	**....has increased**	**....has increased significantly**
Student 2023 (N = 32)	12,5	56,25	31,25
Student 2024 (N = 55)	9,09	67,27	23,64
Staff 2023 (N = 17)	35,29	64,7	0
Staff 2024 (N = 19)	26,32	52,63	21,05
Commons			
	...has remained the same	**....has increased**	**....has increased significantly**
Student 2023 (N = 32)	9,38	53,12	37,5
Student 2024 (N = 55)	14,55	54,55	30,91
Staff 2023 (N = 17)	11,7	58,82	29,41
Staff 2024 (N = 19)	10,53	63,16	26,32
Health			
	...has remained the same	**....has increased**	**....has increased significantly**
Student 2023 (N = 32)	18,75	59,38	21,88
Student 2024 (N = 55)	21,82	49,09	29,09
Staff 2023 (N = 17)	35,29	58,82	5,88
Staff 2024 (N = 19)	21,05	73,68	5,26

Table 2 presents a self-evaluation of staff and students with regard to the development of the sectoral landscape economy knowledge. Both staff and students had a significant knowledge development with regard to the concept of the commons. Overall, there is progress in all relevant fields, with staff and students showing partially different starting points. Students had also a strong learnig curve with regard to energy. Both themes, the commons and energy, are not so regularly taught in spatial planning programmes.

Perceived knowledge development in %

Agriculture			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	18,75	34,38	46,88
Student 2024 (N = 55)	9,09	54,55	36,36
Staff 2023 (N = 17)	17,65	70,59	11,76
Staff 2024 (N = 19)	15,79	57,89	26,32
Urban Forestry			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	15,62	59,38	25
Student 2024 (N = 55)	10,91	52,73	36,36
Staff 2023 (N = 17)	35,29	41,18	23,53
Staff 2024 (N = 19)	26,32	52,63	21,05
Housing and Dwelling			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	15,62	46,88	37,5
Student 2024 (N = 55)	9,09	78,18	12,73
Staff 2023 (N = 17)	29,41	64,71	5,88
Staff 2024 (N = 19)	0	78,95	21,05
Production and Logistics			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	9,38	50	40,62
Student 2024 (N = 55)	9,09	65,45	25,45
Staff 2023 (N = 17)	17,65	64,71	17,65
Staff 2024 (N = 19)	10,53	47,37	42,11
Trade and Retail			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	21,88	43,75	34,38
Student 2024 (N = 55)	9,09	58,18	32,73
Staff 2023 (N = 17)	11,76	76,47	11,76
Staff 2024 (N = 19)	21,05	52,63	26,32
Tourism			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	31,25	43,75	25
Student 2024 (N = 55)	14,55	49,09	36,36
Staff 2023 (N = 17)	29,41	52,94	17,65
Staff 2024 (N = 19)	26,32	52,63	21,05

Table 3 presents the remaining themes of the self-evaluation of staff and students with regard to the development of the sectoral landscape economy knowledge. Again, subjects that are not part of the general education in planning and design show visible development for both staff and students. Agriculture shows a high impact among students. It seems that students have been not so much aware of this very relevant economic dimension of landscape before. The student participants of cohort 2023 and 2024 were all different. The staff groups were largely identical.

Perceived knowledge development in %

My ability to explain conceptual connections between landscape and economy			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	3,12	56,25	40,62
Student 2024 (N = 55)	5,45	53,73	41,82
Staff 2023 (N = 17)	5,88	64,71	29,41
Staff 2024 (N = 19)	5,26	68,42	26,32

Table 4: A great finding is that both groups see a significant development of a core learning goal of the seminar, which is the development of conceptual and systemic knowledge about the interconnection of landscape and economy. Interestingly, the staff group shows a continuous development all through the project.

Perceived methodical development in %

Ability to guide an analysis of a landscape system from multiple perspectives			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	11,76	64,71	23,53
Staff 2024 (N = 19)	5,26	68,42	26,32
Ability to analyse a landscape from multiple perspectives			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	12,5	40,62	46,88
Student 2024 (N = 55)	3,64	60,00	36,36
My ability to advise students on DPSIR method			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	23,53	35,29	41,18
Staff 2024 (N = 19)	21,05	42,11	36,84
My ability to apply DPSIR analysis			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	9,38	46,88	43,75
Student 2024 (N = 55)	7,27	50,91	41,82

My ability to guide students in scenario and visioning method			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	17,65	70,59	11,76
Staff 2024 (N = 19)	21,05	47,37	31,37
My ability to apply to apply the scenario method			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	9,38	40,62	50
Student 2024 (N = 55)	9,09	56,36	34,55
My ability to support an ideation process on an alternative landscape system			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	35,29	58,82	5,88
Staff 2024 (N = 19)	15,79	68,42	15,79
My ability to ideate an alternative landscape system			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	12,5	56,25	31,25
Student 2024 (N = 55)	7,27	60	32,73

Table 5: Student and staff answers are shown together, the first relating to the perceived development of own teaching competence, and the second to the development of the learner when applying the new method. Staff members saw a lot of development with regard to the scenario and DPSIR methods.

Perceived methodical development in %

My ability to develop an alternative value proposition with students			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	29,41	47,06	23,53
Staff 2024 (N = 19)	21,05	68,42	10,53
My ability to design an alternative business model			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	6,25	40,62	53,12
Student 2024 (N = 55)	7,27	61,82	30,91
My ability to tutor the process of designing an alternative business model			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	17,65	47,06	35,29
Staff 2024 (N = 19)	15,79	47,37	36,84

My ability to evaluate the social and environmental impact of my alternative system			
	...has remained the same	....has increased	....has increased significantly
Student 2023 (N = 32)	9,38	40,62	50
Student 2024 (N = 55)	5,45	76,36	18,18
My ability to guide students on how to evaluate the social and environmental impact..			
	...has remained the same	....has increased	....has increased significantly
Staff 2023 (N = 17)	41,18	52,94	5,88
Staff 2024 (N = 19)	15,79	63,16	21,05

Table 6: Methodical developments that are more related to the busniness dimension of the learning process. Students confirm a strong development, but also the staff competence to guide the development of a business model shows a strong progress.

Overall evaluation of the TELOS seminar (in %)

Group	Poor	Average	Good	Excellent
Students 2023 (N= 32)	3,1	15,6	40,6	40,6
Students 2024 (N= 55)	0	1,8	63,64	34,55

Would you recommend the seminar to a friend? (in %)

Group	yes	no
Students 2023 (N= 32)	84,3	15,6
Students 2024 (N= 55)	90,9	9,1

Table 7: Overall, more participants rate the seminar overall als 'good' compared to the first edition. The vast majority would recommend the seminar to a friend.

How did the learners perceive the landscape economy pilot programmes?

All pilot learning activities of the TELOS programme have been very well attended, even if the topic was rather new for everyone. For some, the international constellation and the opportunity to learn within a European cooperation was inspiring. Others were attracted by the interdisciplinary concept and the opportunity to develop economic approaches to environmental challenges. While the majority of the students was enrolled at one of the TELOS partner universities, there was also an increasing number of external participants, especially in the second pilot programme. A third edition has also started recently and international interest continues to increase. This shows the relevance of online, open access course delivery, as it reduces barriers to education.

Registration numbers for the TELOS programmes have been as follows:

Pilot 1, started October 2022:	142
Pilot 2, started October 2023:	171
Pilot 3, started October 2024:	188

In total, over 500 learners have been actively involved in the online activities. Out of those, around 60 have also participated in the two on-site intensive study programmes in Nürtingen (2023) and Antalya (2024). Like in many open online settings, not all participate engaged actively in all activities until the end. Some participants preferred a 'passive' mode, which allowed them to listen to the lectures and participate in classroom talks without having to submit and present assignments. Overall, 50% of the registered participants also engaged in the assignments.

After the second pilot programme, we asked the participants with an online survey which seminar contents have contributed best to their knowledge development. We analysed 55 individual answers and the following cluster themes could be identified.

Cluster 1: Specific Lecture Topics

Social Business Model Canvas:
Many participants highlighted this as a key contributor to their knowledge development. It was described as descriptive, practical, and impactful for projects and assignments.

Mobility:
Frequently mentioned as a lecture that provided significant insights, especially in connecting land use and economic conditions.

Tourism and Agriculture:
Participants appreciated lectures covering tourism, its economic implications, and agriculture's role in sustainability. Self-assessment also showed a strong development in these fields.

Circular Economy:
Recognised for providing insights into sustainability and practical applications.

The Commons and Urban Forestry:
Discussions about shared resources and their management, as well as urban forestry, were noted as valuable.

Other Topics:
Hidden landscapes of the global value-added chains, global megatrends, housing, health, and recreation were also highlighted as beneficial.

Cluster 2: Methodologies and Tools

DPSIR Analysis (Driving forces, Pressures, States, Impacts, Responses):
Valued for its descriptive and structured approach to understanding complex system relationships.

Scenario and Visioning
Noted as helpful in understanding planning and future trends.

Concept Maps and Online Q&A Sessions:
Praised for enhancing understanding and increasing engagement.

Interactive polls and tools:
Participants valued real-time feedback and engagement activities like polls.

Cluster 3: Group work and dollaborative activities

Group projects and exercises:
Activities requiring collaboration were appreciated for being fun, challenging, and impactful on their learning.

Assignments and case studies:
Practical assignments and case studies were emphasized as effective ways to apply and deepen knowledge.

Cluster 4: General appreciation

All lectures:
Some participants expressed general appreciation for all sessions, highlighting their contribution to a well-rounded understanding.

Practical applicability and diverse perspectives:
Sessions showcasing different points of view and practical problem-solving approaches were highly valued.

In sum, top-rated lectures and topics were: Social Business Model Canvas, Mobility, Tourism, Circular Economy, and DPSIR.

We also asked the same cohort of participants to give us their three most important recommendations for improving the landscape economy seminar. Again, we did a text analysis of the 55 answers and structured the results into five clusters as follows:

Cluster 1: Session content and structure

- Suggestions to make sessions more concise or include more breaks between intensive lectures.
- Desire for more detailed explanations, examples, or recordings with accessible formats (e.g., subtitles or segmented videos).
- Comments on improving the presentation quality and avoiding repetitive content.

Cluster 2: Overall satisfaction and accessibility

- Feedback expressing overall satisfaction with minimal or no suggestions for improvement.
- Issues related to accessibility, including platform navigation difficulties (e.g., ILIAS) and adapting to international participation challenges.
- Requests for platform improvements and better time management during Q&A sessions.

Cluster 3: Interaction and Collaboration

- Calls for more interaction between participants and teamwork opportunities.
- Suggestions for group-based case studies or collaborative projects using participants' ideas.
- Greater focus on specific themes such as circular economy and land policies, tied to participants' contexts.

Cluster 4: Timing and Focus

- Many requests to shorten session durations or focus lectures more tightly.
- Desire for more targeted seminars on specific topics and interactive elements like brainstorming or themed discussions.
- Emphasis on engaging students in focused and meaningful ways.

Cluster 5: Interactive Methods and Practical Exercises

- Strong interest in using interactive tools and workshops to enhance engagement (e.g., Menti).
- Requests for better access to practical exercises with clear instructions and examples.
- Suggestions for integrating interactive and participatory elements into the course structure.

Overall, the participants appreciated practical applications, diverse perspectives, and engaging formats. The TELOS team tries to continuously further develop the instructional design of the programme, to better address these needs with every new course edition.

Reflection session at Université Libre de Bruxelles after final TELOS multiplier event and team meeting, September 11, 2024

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Landscape Economy Glossary

Landscape Economy Glossary

15-Minute City

The 15-minute city means people can get around without having to travel far for housing, offices, hospitals, parks, restaurants or cultural venues. Each neighbourhood typically has six main social functions: living, working, supplying, caring, learning and enjoying.

Circular Economy

A circular economy is an economic system aimed at minimising waste and making the most of resources. This model contrasts with the traditional linear economy, which follows a "take, make, dispose" approach. In a circular economy, products, materials, and resources are kept in use for as long as possible through strategies like recycling, repairing, reusing, refurbishing, and remanufacturing. The goal is to create a closed-loop system that reduces environmental impact, conserves natural resources, and supports sustainable development

Commons

A set of natural and societal resources collectively managed by communities and preserved for future generations.

Community

Group of people who take joint activities. They distinguish themselves from those who do not belong to it, they have a sense of belonging, a shared set of values and some kind of (virtual) space that is accessible to members for their interaction with each other (Forms of appearance: Communities of purpose, identity, interest or passion, practice, inquiry, support, circumstance.)

Creative Commons

An American non-profit organization and international network devoted to educational access and expanding the range of creative works available for others to build upon legally and to share. The organization has released several copyright licenses, known as Creative Commons licenses, free of charge to the public. These licenses allow authors of creative works to communicate which rights they reserve and which rights they waive for the benefit of recipients or other creators.

Daily Mobility

A form of spatial mobility characterised by movements within a settlement area over short periods of time. It is therefore different from residential mobility (movement within a residential area over a long period of time), migration (movement outside a residential area over a long period of time) and travel (movement outside a residential area over a short period of time).

Degrowth

An academic and social movement critical of the concept of growth in gross domestic product as a measure of human and economic development. The

idea of Degrowth is based on ideas and research from a multitude of disciplines such as economic anthropology, ecological economics, environmental sciences, and development studies. It argues that modern capitalism's unitary focus on growth causes widespread ecological damage and is unnecessary for the further increase of human living standards.

Design Thinking

A process to understand customers and/or beneficiaries wishes, needs and visions. It relies on observing, with empathy, how people interact with their environments, and employs an iterative, hands-on approach to create innovative solutions. It is a human-centred interdisciplinary approach to innovation that draws from the designer's toolkit to integrate the needs of people (desirability), the feasibility of technology, and the requirements (viability) for business success.

Ecosystem

A biological community of interactive organisms and their physical environment. Or in general use: a complex network or interconnected system.

Ecosystem Services

Services that nature provides for humans through habitats and living beings such as animals and plants. Social and physical processes are placed in the context of places and regions to show the connections between humans and nature and make them tangible. It should be noted that in addition to measurable relationships and outcomes, there is also a subjective component: Valuation depends in part on how beneficiaries see the world. Ecosystem services are divided into four categories: (1) Providing services generate products such as food or water (2) Regulating services regulate a natural process for our benefit, for example by reducing flooding or air quality. (3) Supporting services contribute to the functioning of other ecosystem services, such as photosynthesis and soil formation. (4) Cultural services provide non-material benefits that are important to our health and well-being, such as a sense of place, recreation, and aesthetic quality.

Food Security

A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Based on this definition, four food security dimensions can be identified: food availability, economic and physical access to food, food utilization, and stability over time.

Integrated Landscape Approach

An approach based on multifunctionality and driven by participatory transdisciplinary/cross-sectorial processes to determine change logic and/or clarify objectives. The approach can lead to an integrated landscape vision that forms an umbrella covering all

other themes such as foodscapes, cultural heritage, sustainable tourism, landscape democracy and landscape economy.

Key Performance Indicator (KPI)

A measurable value that reflects how effectively an individual, team, or organisation is achieving specific objectives.In the landscape economy we can apply the concept to wider dimensions of the landscape system such as environment, society, resilience and governance.

Typical landscape economy KPIs are: soil health, biodiversity indexes, cost saving from ecosystem services or diversity and intensity of stakeholder participation. Landscape economy thinking typically moves between this systemic dimension of the wider landscape (which we interpret as an economic system) and the concrete behavior of the actors within this system (business model).

KPIs can be applied to both: the business model and the landscape system.Both are highly dependent on each other. KPIs in (social) enterprises are those economic indicators that provide information about the stability of the business model. The focus is on profit, equity ratio and liquidity. Based on this, further KPIs can be identified at three levels in line with the impact logic of the business model: (1) resources & partners, (2) processes and (3) value proposition.

Landscape

According to the Council of Europe Landscape Convention (2000), landscape is "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Landscape represents the concrete spatial context in which communities exist. It is an integration of natural, social, economic and cultural systems. This integrated system knowledge is relevant for identifying and solving sustainability challenges.

Landscape Economy

An approach to economy in which the landscape acts as a platform for multiple functions and values which enables a cross-sectorial and multi-stakeholder analysis and visioning for the sustainable development of landscapes.

Local Climate Zones

A typology of the housing landscape based on different types of urban and peri-urban land use on the basis of variations in the type of development, i.e. the anthropogenic elements of the landscape, and land cover, i.e. the natural elements of the landscape.

Multi-level governance

A way of governance in which the power is spread vertically between levels of government and horizontally across multiple quasi-government and non-governmental organizations and actors. This situation develops because countries have multiple

levels of government including local, regional, state, national or federal, and many other organisations with interests in policy decisions and outcomes.

Natural Capital

Also sometimes referred to as environmental or ecological capital, the natural resources (energy and matter) and processes needed by organisations to produce their products and deliver their services.

This includes sinks that absorb, neutralise or recycle wastes (e.g. forests, oceans); resources, some of which are renewable (timber, grain, fish and water), whilst others are not (fossil fuels); and processes, such as climate regulation and the carbon cycle, that enable life to continue in a balanced way.

Planetary Boundaries

The concept of planetary boundaries refers to a framework defining the safe operating limits for humanity within Earth's biophysical systems.

These boundaries outline thresholds in critical environmental processes—such as climate change, biodiversity loss, and freshwater use—that, if crossed, could lead to catastrophic and irreversible environmental changes. The framework emphasizes staying within these limits to ensure the planet remains stable and hospitable for human development.

Right to Landscape

As defined by Egoz, Makhzoumi and Pungetti, Right to Landscape refers to the recognition and protection of the cultural, social, and ecological values of landscapes and the rights of communities to access, shape, and sustain them. It emphasizes landscapes as dynamic entities tied to identity, heritage, and well-being, advocating for the equitable participation of all stakeholders in their stewardship and decision-making. This challenges traditional land management paradigms by integrating ecological sustainability with cultural and social justice, highlighting the intrinsic link between landscapes and human rights.

Right to the City

The entitlement of all urban inhabitants to shape and influence the development, spaces, and governance of their cities, ensuring equitable access and democratic participation in the urban environment.

Social Business Model Canvas

A business model maps the central elements of a successful organization (value position, target groups, channels, processes, resources, partners, costs, and revenues). It provides an analytical framework for identifying the requirements of the business model as well as its strengths and weaknesses and deriving appropriate further developments and innovations. A social business model canvas supplements the classic purely market-oriented view with the society-oriented dimension.

Social Capital

Any value added to the activities and economic outputs of an organisation (or process) by human relationships, partnerships and cooperation: networks, communication channels, families, communities, businesses, trade unions, schools and voluntary organisations, also social norms, values, trust.

Systems Thinking

Systems thinking is a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviors, and devising modifications to them in order to produce desired effects. These skills work together as a system. (Arnold and Wade, 2025, p 675).

Tradeoff

In the context of the landscape economy, a trade-off refers to a situation where achieving certain objectives or benefits—such as agricultural productivity, urban development, or resource extraction—comes at the expense of other goals, such as biodiversity conservation, ecosystem services, or cultural values. These trade-offs often arise when land cannot simultaneously support competing demands, requiring stakeholders to prioritize certain uses over others, balancing economic, environmental, and social considerations.

Transit-Oriented Development (TOD)

A concept that encompasses integrated urban areas designed to facilitate the convergence of people, activities, buildings and public spaces, with convenient pedestrian and bicycle connections between them and reliable transit service to the wider city. It is based on 8 principles, making inclusive cities and completing neighbourhoods around walking, cycling, and public transit: Walk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift.

Value Chain

All activities in the life cycle of a product or service. This includes the conception, the extraction of raw materials, the various phases of pre-production, intermediate and final production, wholesale, and retail as well as final consumption and disposal. Between these individual stages, connecting logistical activities (storage, sorting, repackaging, order picking, transportation) are required. For sustainable value chains, key elements include: *Environmental responsibility*: Minimising resource use, emissions, and waste through sustainable practices. *Social equity:* Ensuring fair labour conditions, community benefits, and respect for human rights. *Economic viability:* Maintaining profitability while fostering long-term resilience and innovation. *Transparency*: Tracing and disclosing environmental and social impacts across the chain. *Circularity:* Promoting recycling, reuse, and efficient resource utilisation.

Value Proposition

A value proposition is a clear statement of the unique benefits or value a product, service, or solution offers to customers, addressing their needs or problems effectively. In the landscape economy, a value proposition can also be formulated in relation to environmental needs, creating benefits for both humans and nature.

The TELOS Team

Team Nürtingen-Geislingen University – HfWU

Germany

Dr. Ellen Fetzer, *TELOS project coordinator*

Ellen Fetzer holds an engineering diploma and a doctoral degree in landscape architecture from Kassel University in Germany. The focus of her work at Nürtingen-Geislingen University is on computer-supported collaborative learning and education for sustainable development in various contexts and transdisciplinary settings. She is course director of the international master programme in landscape architecture (IMLA) and immediate past-president of ECLAS, the European Council of Landscape Architecture Schools. Ellen has been coordinating the TELOS ERASMUS cooperation project with NGU as the grant holder. Her motivation for TELOS project: *Enhancing systems thinking, critical thinking and creative imagination for turning conflicts into opportunities.*

Prof. Dr. Dirk Funck teachers Multichannel Retailing, Sales, Social Innovation and Reserach Methods at Nürtingen-Geislingen University. His interests in research and transfer lie in the topics of Medium-Sized Retail, Sustainable Community Development and Social Innovation. He was leading the DAAD-funded projecs MESIL and MeProLand. After his studies, doctorate, and research activities at the University of Göttingen, Dirk spent eight years in leading positions in a medium-sized retail cooperation. In 2011, he was appointed professor at the University in Worms. In 2014, he moved to NGU. Dirk was elected Chairman of the Advisory Board of the Rid Foundation for Medium-Sized Bavarian Retailers in 2011. He works for this foundation as trainer and is also a board member of the Nürtingen Citizen's Cooperative. His motivation for TELOS project: T*eaching means touching someone's life.*

Dr. Dorothee Apfel was a research associate at NGU and switched recently back to the professional energy sector. Her research focuses on sustainable energy transitions from a social science perspective, particularly multi-level governance, power relations, regional development and agency. She also investigates concepts of sustainable development in higher education with a focus on interdisciplinary approaches. She holds a masters in geography, and recently completed her dissertation at the Institute of Geography at the University of Tübingen. Before she started working at NGU in 2017, she worked for the city of Kornwestheim, RWTH University Aachen and Prognos AG in the fields of adaptation to climate change, climate mitigation, and energy in urban development. Her motivation for TELOS project: *Dorothee is convinced that sustainable development can only succeed if the given challenges are approached in an interdisciplinary way. In addition, the project offers intercultural perspectives, which adds further value and makes it unique. Dorothee brings her expertise in the field of energy.*

Dr. Anna Szilágyi-Nagy: Anna is a Hungarian landscape architect who did her Masters in landscape architecture at NGU. During the TELOS project, she worked at the Competence Center for University Didactics at the NGU in the methodical field of game-based participation. She recently completed here dissertation on participatory landscape processes supported by games at the University of Tübingen. As the president of the Hungarian kultúrAktív Egyesület, she supports the involvement of young people in urban planning and open space design projects. As General Secretary of the LE: NOTRE Institute, she supports the meeting and exchange of experiences of practicing European landscape architects, instructors and students. Her motivation for the TELOS project: *What motivates me to participate in the project is that I can learn business thinking, which can help in the realization of the landscape visions created with the community. In addition, I would like to use playful methods to support the toolbox of business development and make meetings and programmes cheerful.*

Stefanie Schur is a visiting assistant professor and lecturer at Nürtingen-Geislingen University, and a Professional Landscape Architect. She has also been in the Faculty of Landscape Architecture at Syracuse University and University of Nevada Las Vegas. Her areas of research interest include the influence of culture on sustainability in community and landscape form, renaturalization of degraded landscape systems, and the urban activation zones where public space and building space meet. As a landscape architect she has created natural resource management plans for several National Parks and Forests in the United States, co-wrote national conservation laws to protect large tracts of wilderness lands, and developed strategic frameworks with strong stakeholder engagement to support sustainable economies in natural resource protection mobility corridors in several U.S. States, among many other successful projects. Motivation for TELOS project: changing the community/landscape design paradigm to focus on sustainability and nature restoration requires creative thinking about economic concerns as well as environmental ones. Integrating diverse mobility choices and urban foodscapes provides exciting opportunities to create circular economies in the local or regional context. The challenges inherent in creating ecologically sustainable and economically viable land design is an area of keen interest for Stefanie.

Shashank Yadav is an architect from India, currently pursuing a Master's degree in Landscape Architecture at the University of Nürtingen-Geislingen. His academic focus centers on foodscapes, regional food chains, sustainable landscape development, and promoting sustainable education for all. He actively collaborates with various organizations dedicated to advancing the future of regional and sustainable food systems. He has participated in multiple TELOS Workshops, where he has worked closely with the thematic group on Foodscapes, contributing valuable insights and innovative solutions. His motivation for TELOS is driven by the rich diversity and interdisciplinary nature of landscape education. The TELOS programme enriches this experience by integrating an economic perspective into various landscape themes, all while maintaining a strong emphasis on sustainable development.

Team Université Libre de Bruxelles – ULB

Belgium

Didier Vancutsem, *Team coordinator at ULB*

Didier Vancutsem holds bachelor and master's degrees in landscape architecture, city and regional planning and regional management. He is Assoc. Prof. at the ULB Free University of Brussels – Faculty of Architecture La Cambre Horta since 2009, involved in Landscape Architecture and Urban Planning Master programmes as well as research. As director of the planning office "urban scape" Munich since 1992, Didier has gained professional experience worldwide in urban innovation, landscape management, elaboration of national and regional strategies for integrated urban development in Europe, the Middle East, Africa, Russia and Asia. He is active as registered expert for the European Commission and URBACT, UN-Habitat and involved in European and international research projects. He was IFLA Europe delegate for Belgium (1994-1998) (2013-2021), Secretary General (2013-2019) of ISOCARP the International Society of City and Regional Planners, and is currently director of the ISOCARP Institute, its research branch. Since October 2021, he is Vice-President Professional Practice of the International Federation of Landscape Architects Europe. His motivation for TELOS project: *Every human activity interacts with the landscape and aims at concrete results, which are connected to economy. Consequently, every human intervention is motivated by achieving economic results in transforming everyday landscape. Didier is very happy to be able to contribute to the outcomes of TELOS, as this project will demonstrate this interaction and how added-values, trends and impacts become tangible in humanity's landscape.*

Claire Pelgrims (PhD), project researcher: Claire is a researcher in Urbanism and mobility studies at the Gustave Eiffel University, France and teaching at the Université Paris Cité, France and at the Université libre de Bruxelles, Belgium. Her PhD thesis focused on imaginaries of fast and slow mobilities in the evolution of Brussels mobility infrastructure since the middle of the 20th century. Her postdoctoral research now focuses on expanded understanding of mobility infrastructure in relation to gender, aestheticism and functionality. She is working with an European Marie Skłodowska-Curie postdoctoral fellowship on a research project about gender and bicycling aesthetics, looking at gender construction processes across cycling practices, equipment and infrastructure (H2020, SENCyclo 2022-2023).

Claire is also involved at ULB in the PDR FNRS "Gender and Bicycling Aesthetics" (2021-2024). She has been involved in researches on Brussels metropolitan cultural and mobility infrastructures (18th-21st century) (micm-ARC) and on sustainable transition of company mobility (BSI chair). She has been associate researcher at the Laboratory on Urban Sociology [LaSUR], EPFL and the University Observatory of Cycling and Active Mobility (OUVEMA), UNIL, Switzerland. She is the Executive *Secretary of the International Association for the History of Traffic, Transport and Mobility [T2M], and is involved as member in other international networks such as P2M, the International Ambiances Network, ICSA and EAUH.*

Team Gdańsk University of Technology (GUT)

Poland

Karolina Krośnicka, *team coordinator at GUT*: Karolina A. Krośnicka, (Ph.D., D.Sc., Eng., Arch.) is a professor at the Department of Urban Design and Regional Planning, Faculty of Architecture, Gdańsk University of Technology (Poland). Karolina's research interests focus on port-city spatial relations, Integrated Coastal Zone Management, theory of urban dynamics, and evolution of landscapes. While she was employed at the Faculty of Navigation at Gdynia Maritime University (Poland) she concentrated on seaport and terminal planning. She collaborates with local authorities and companies and has rich educational experience. She is a member of the Society of Polish Town Planners, the International Society of City and Regional Planners, and the World Institute for Engineering and Technology Education. *Her motivation for TELOS project* : Within the last 30 years, along with the socio-economic transformation, some of the cultural landscapes disappeared, and some new emerged. However, not all of these changes were heading towards the sustainable transition of ecosystems. TELOS project and in-depth understanding of landscape transformation costs could enable the planning of urban developments in a holistic and resilient way.

Dorota Jankowska, *team member*: Dorota Wojtowicz-Jankowska is a Professor at the Faculty of Architecture of the Gdańsk University of Technology. She is employed at the Department of Environmental Design. She is a promoter of many diplomas on bachelor's and master's levels. In her research work, she is concerned about the problems related to exposition spaces and shaping the city's landscape. Among her research interests are problems of creating cultural spaces such as museums, galleries, and urban areas used for various forms of presentation. She popularizes scientific experience in cooperation with local governments and public institutions. Her motivation for TELOS project : *Dorota was motivated to be part of the TELOS project by her curiosity of understanding the landscape through different scientific disciplines and their representatives. Being a part of TELOS team helped to build her knowledge, and consciousness of the complex concept of the landscape.*

Magdalena Rembeza, *team member*: Magdalena Rembeza is a tenured assistant professor at Gdańsk University of Technology where she completed her doctorate. She is also a member of the Board of the Revitalization Forum Association. She gained her professional experience in Poland, England, Germany and the United States. She is also a scholarship holder of the Kosciuszko Foundation in 2014. In years 2014–15, she has completed the SPURS Program at the Massachusetts Institute of Technology (MIT), USA. Her research interests and practice focus on widely understood revitalization of contemporary cities and its public space, also with the use of art and culture.

Katarzyna Zielonko-Jung, *team member*: Katarzyna Zielonko-Jung – an architect, academic lecturer, scientist, professor at Gdańsk University of Technology at the Department of Environmental Design. She has co-created the programme for postgraduate studies in Ecological Architecture and Construction and is a lecturer there. She has authored numerous Polish and foreign publications related to ecological architecture issues, in particular their relationship with microclimatic phenomena in the urban environment. She participated in research projects focused on sustainable architecture and improving the quality of city climate. She is a member of Gdańsk Architecture Council, UN Global Poland Climate Council, Mazovian District Chamber of Architects, and Association of Polish Architects.

Her motivation for TELOS project: *Katarzyna is motivated to be part of the TELOS because it is a great opportunity to combine her experience and competencies with the knowledge of specialists from other disciplines. This will allow her to better understand the phenomenon of landscape and participate in discussions about its economic value*.

Gabriela Rembarz, *team member*: Gabriela Rembarz PhD, is adjunct at the Gdańsk University of Technology. She studied architecture, urban planning and environmental protection in Gdańsk (GUT), Warsaw (WUT) and at the University Stuttgart (as a DAAD-scholar). She is also MIT_DUSP_SPURS Fellow 2012, recently cooperating with the Fulbright Poland. She is a member of the Society of Polish Town Planners (TUP) and the German Academy for Urban Development and Regional Planning (DASL). Gabriela explores landscape urbanism, combining an academic approach with her practical planning experience, related to the large-scale urban street-network development. Such understanding of the contemporary planning challenges characterizes also her original programs of design studios, offered both to the Polish and international students at the GUT. Her motivation for TELOS project: *The need to complete interdisciplinary knowledge in field of urban landscape architecture and planning and interest in other teaching methods concerning no-technical issues in urban landscape planning are what motivate Gabriela to be part of TELOS project.*

Team Akdeniz University

Türkiye

Veli Ortacesme, *team coordinator:* Veli Ortacesme has been trained as a landscape architect. His specialty and research interests include landscape planning, protected areas and urban green spaces. After having worked in private sector for two years, he moved to academia where he has been studying for more than 30 years. Currently, he has been teaching and conducting research at Akdeniz University, Faculty of Architecture, Department of Landscape Architecture in Antalya, Turkey. Veli has 35 years of experience in professional practice, education and research and published more than 200 articles, conference papers, research reports, book chapters and books. His motivation for TELOS project: *The economic aspect of landscape receives little consideration in research as well as in the programmes and actions. The TELOS Project deals with this issue in urban environments. What makes Veli also excited is the fact that the project aims to empower new generation of visionary professionals and decision-makers to address sustainability challenges.*

Meryem Atik, *team member*: Meryem Atik is a full-time lecturer and researcher at the Department of Landscape Architecture, Faculty of Architecture, University of Akdeniz, Antalya Turkey. Her work focuses on the natural and cultural aspects of the landscape, on special topics of cultural landscapes, landscape character analysis, rural landscapes, as well as landscape conservation, native plants, tourism and environment relations, planting design. She is the co-author of 10 English book chapters and recently the editor of Akdeniz University Journal of the Faculty of Architecture. Her motivation for TELOS project : *Human effort to benefit from nature is motivated by an economic purpose and resulted in multiple relationship between culture and landscape. What motivates Meryem to be part of the TELOS project is to understand the intact relation between economy and landscape and to learn how such relation can be transferred in sustainable models.*

Ibrahim Yilmaz, team member: Ibrahim Yilmaz is specialized in agricultural economics. His specialty and research interests include farm management and farm economics, agricultural cooperatives, rural development and agricultural marketing. After graduations he started to academia where he has been studying for more than 35 years. Currently, he has been teaching and conducting research at Akdeniz University, Faculty of Agriculture, Department of Agricultural Economics in Antalya, Turkey. Ibrahim has 37 years of experience in professional practice, education and research and published more than 150 articles, conference papers, research reports and book chapters. His motivation for TELOS project: *As agricultural economists, Ibrahim works towards solving the problems encountered in agriculture by combining agricultural and economic sciences. With a similar approach, the TELOS Project is also concerned with the economic aspect of landscape in urban environments. What motivates Ibrahim is that the project allows him to apply his experience in a new field and aims to empower the next generation of decision makers to address sustainability challenges.*

Elif Palak Bektas, *team assistant*: Elif graduated from the Department of Urban Design and Landscape Architecture in 2017. After her master degree with a focus on landscape planning, she continues her education as a PhD student at Akdeniz University, Department of Landscape Architecture. Currently, she has been working as a Research Assistant since 2019. Her research interests include ecological landscape planning, urban blue and green infrastructure and urban design. Her motivation for the TELOS project: The TELOS Project has been a very detailed and clear demonstration of the complex relationships in the landscape with different disciplines. What makes Elif more excited is the potential of this multi-layered structure that connects many disciplines, strengthening the inter-sectoral dialogue and broadening the perspective of each field of expertise.

Emrah Yildirim, *supporting faculty*: Emrah is a landscape architect. He started to work as a Research Assistant at Akdeniz University, Faculty of Architecture Department of Landscape Architecture in 2000. He is still working as a Doctoral Lecturer in the same department. His specialty and research interests include landscape planning, landscape ecology and Geographic Information Systems in landscape architecture. Motivation for the TELOS project: The impact of landscape economy on the structure of the landscape is worth investigating. In addition, considering economic activities and the system cycle together in landscape planning will bring new solutions.

Team Sapienza University of Rome

Italy

Maria Beatrice Andreucci, *team coordinator:* Architect, landscape architect and economist. She holds a Ph.D. Doctor Europaeus in Environmental Design and works as Research Professor at the Department of Planning, Design, Technology of Architecture, "Sapienza" University of Rome. She has published more than 100 scientific products, including 5 books, and has delivered more than 80 oral presentations and keynotes in international conferences and workshops. She is leading several Eu funded projects, and her work continues to engage environmental technological design, landscape ecology, and economic valuation as an evolving integrated framework, linking nature-based solutions' performance assessment, economic valuation of ecosystem services, climate mitigation, and urban resilience capacity building. Her motivation for the TELOS project: *Through active participation in TELOS, Maria Beatrice expected to contribute – leveraging her background and experiences in the field of the Landscape Economy – to the dissemination, at an international level, of the relevance of the multiple social and economic benefits provided by nature-based solutions towards climate neutral, resilient, healthy, inclusive, and equitable neighborhoods and cities.*

Marco Delli Paoli, *Team Member 2023-2024*: Architect, PhD in Environmental Technology Design. He is currently a postdoctoral researcher at Sapienza University of Rome (Italy), where he is carrying out research activities on Positive Energy Districts (PEDs) and climate-adaptive design strategies, combining them through a holistic approach to cope with the energy transition scenario. Expert in the field of Technology of Architecture from 2023 and member of the Italian Society of Technology of Architecture (SITdA). He is an active member of Working Group 4 of the COST Action "Positive Energy Districts European Network", for which he holds the role of Grant Holder Manager. Additionally, he is involved in many international research groups, collaborating with researchers and professionals, including IEA Annex83, with the objective of elucidating the interrelated challenges associated with the PED model in urban areas.

Giulia Marredda, *Team Member 2021-2022:* Giulia Marredda is a Landscape Architect graduated at "La Sapienza" University of Rome. Her thesis in environmental design concerned the implementation of several solutions with different naturality gradients within the complex context of Port Island, in Gdansk. Thanks to that she was able to approach and be interested in concepts such as climate mitigation, nature-based soutions, blue-green infrastructure and ecosystem services. Motivation for TELOS project: Giulia is thrilled to be part of TELOS, as the project allows her to expand her knowledge of the landscape and its impact in economic terms, through a multidisciplinary and transnational approach.

Team LE:NOTRE Institute

The Netherlands

Jeroen de Vries, *team coordinator*: Jeroen de Vries, landscape architect, is a researcher at the LE:NOTRE Institute. His research focuses on food governance, the design of foodscapes in metropolitan areas, the productivity of different typologies of UA, and strategies to integrate these in the spatial design of urban and peri-urban areas. Jeroen combines work as a professional practitioner, lecturer, and researcher. He coordinated the theme of foodscapes in the LE:NOTRE Landscape Forums in Rome, Zagreb, Bratislava, and Rimini. Jeroen is active in a number of European educational and research projects that foster the quality in landscape education, research and practice. His mission is to support the academic community and the profession of landscape architecture on a European level. His motivation for TELOS project: *The TELOS project offers a unique possibility to contribute to an often neglected aspect of landscape planning. Jeroen is motivated to include various dimensions of economy to develop landscapes with the lens of a common good – the landscape belongs to all*.

Juan Jose Galan Vivas, *team member*: Juanjo Galan-Vivas is an Associate Professor in the Urban Planning Department of the Polytechnic University of Valencia (Spain). From 2015 to 2020, he served in a similar position at Aalto University (Finland). His teaching and research focus on landscape planning, landscape design, sustainable development, regional and urban planning, and, on a more general level, on the intersections between social and ecological systems. He coordinated the Sierra Calderona Strategic Plan (2013-2014) and the AELCLIC project for the Adaptation of European Landscapes to Climate Change (2018-2020). From 2017 to 2020 he was the promoter and chair of the Landscape Observatory of Finland. His motivation for TELOS project: *The configuration and evolution of the landscape are highly influenced by economic processes framing the interactions between people and the environment. The TELOS project gives an opportunity, in landscape architecture education, to align those processes with the generation of more sustainable, inclusive, resilient, and democratic landscape.*

Roxana Maria Triboi is an PhD architect and urban planner that specialised on sustainable food planning. Currently, she is coordinating the food thematic evaluation of the European Urban Agenda and AESOP4food ERASMUS+, a transdisciplinary and participatory program on sustainable food planning and involved in different programs for LE:NOTRE Institute, French Territorial Food Strategies consultancy and managing a community garden.

Beata Dreksler is an Assistant Professor of Landscape Architecture at the American University of Beirut. She holds a Ph.D. in landscape architecture from Warsaw University of Life Sciences—SGGW, Poland, and has over 30 years of experience across Europe, Central America, and the Middle East. Beata has contributed to projects ranging from urban revitalization to community-focused green spaces. Her current research explores landscape democracy and digital transformation, including Virtual Reality applications in design. Her motivation for TELOS project: *Participating in the TELOS project was an exciting opportunity to address the critical intersection of landscape and economy, a perspective increasingly vital in our field. This project offered a unique platform for contributing to the development of landscape architecture education, redefining the profession, and integrating economic frameworks into landscape architecture for long-term community benefits.*