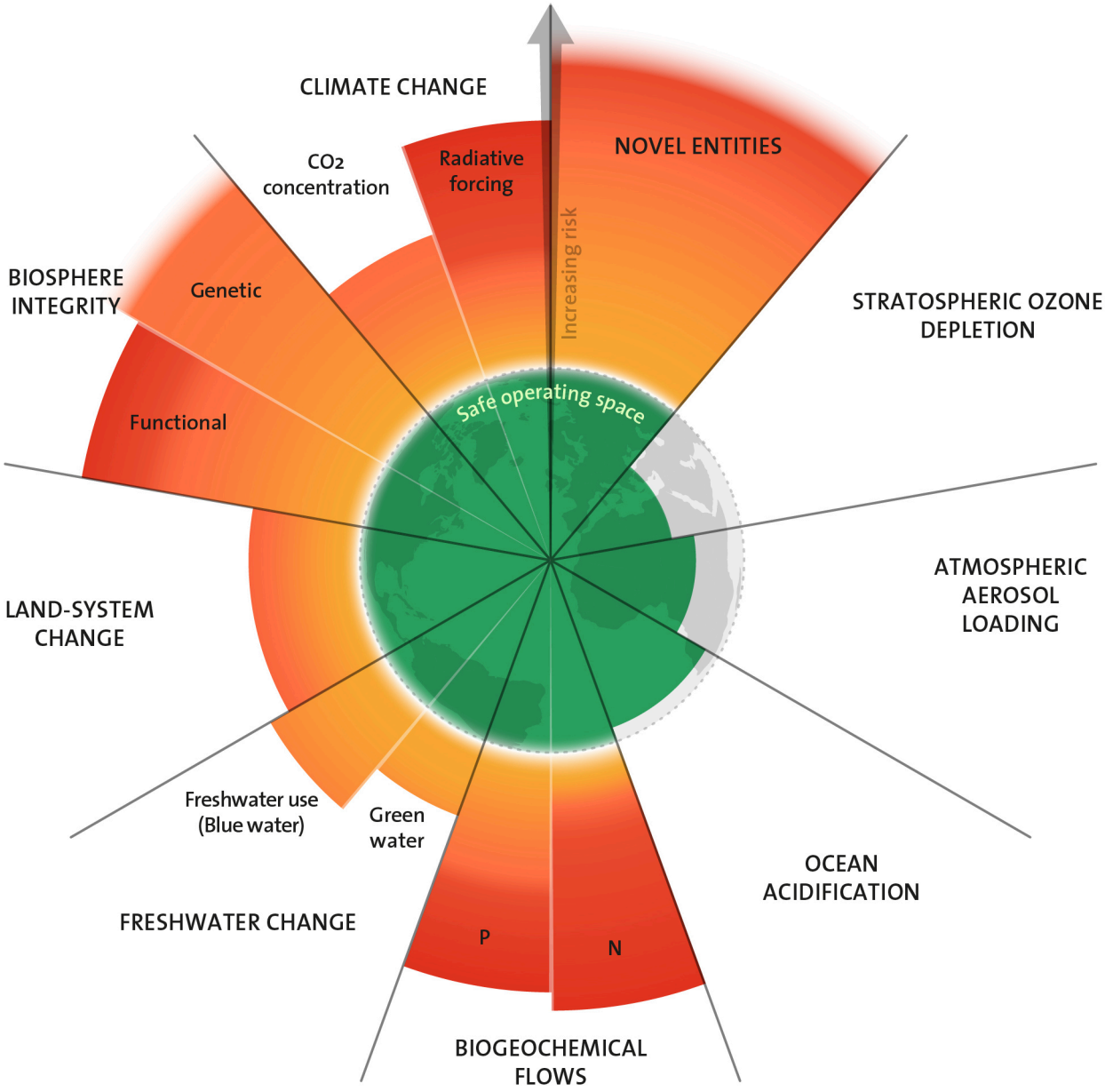
Mapping the Terrain

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.

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The Concept of Landscape

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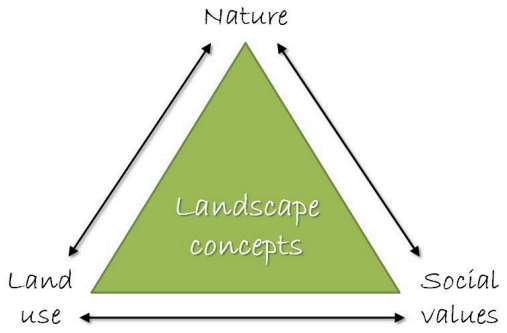
The term landscape is used in many different contexts and can therefore be understood in various directions. TELOS follows the definition of the Council of Europe Landscape Convention. *„Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural 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.

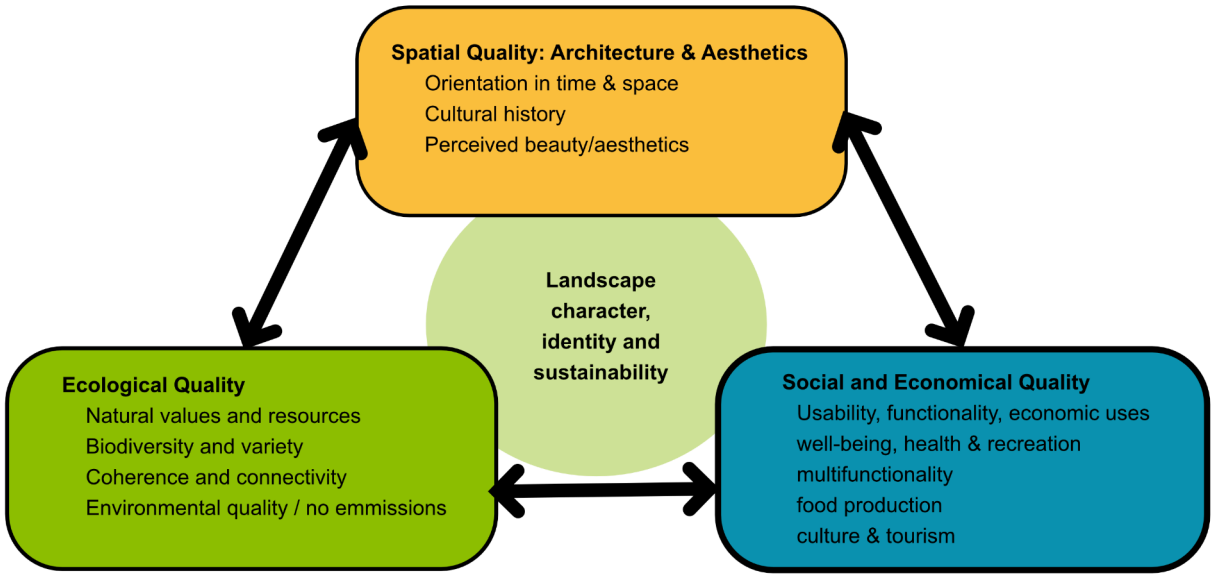
The concept therefore includes the city as a whole. In fact, a city is only a special type of landscape. It is important to recognize that landscape implies an understanding of how elements are interconnected. Landscape is a system in which natural and human elements are constantly present and systemically 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.

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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*

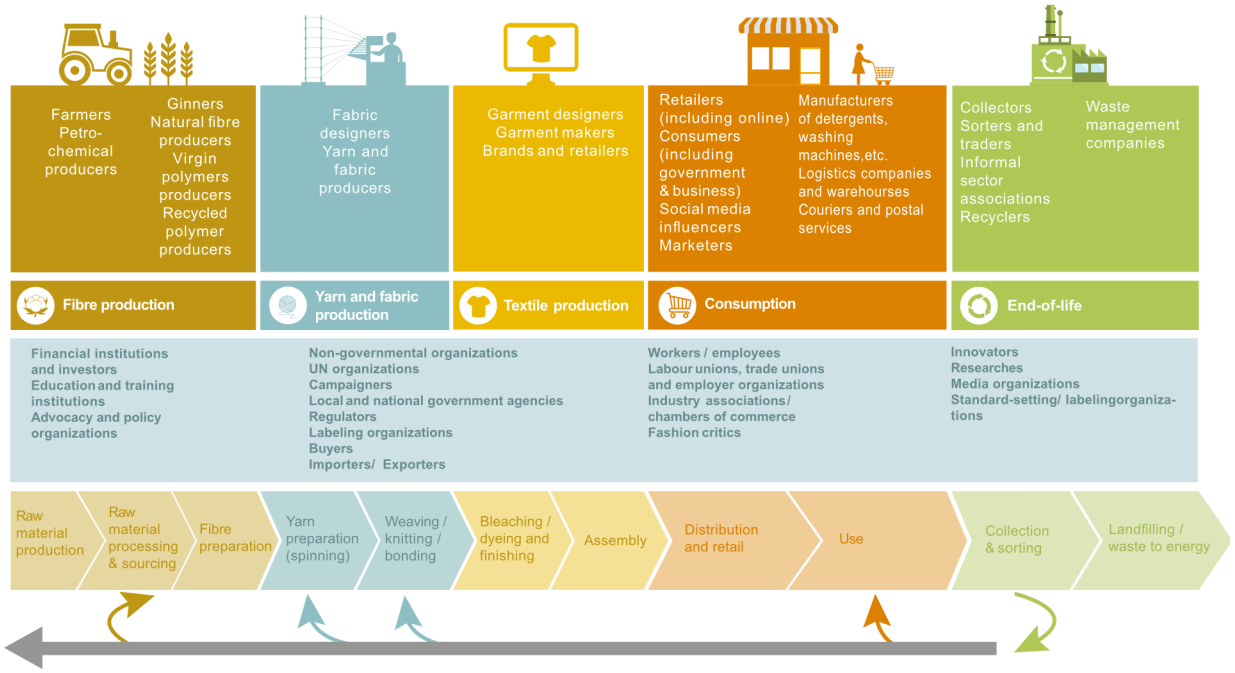
Value chains and the concept of *hidden landscapes:* illustrated by the textile industry

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.

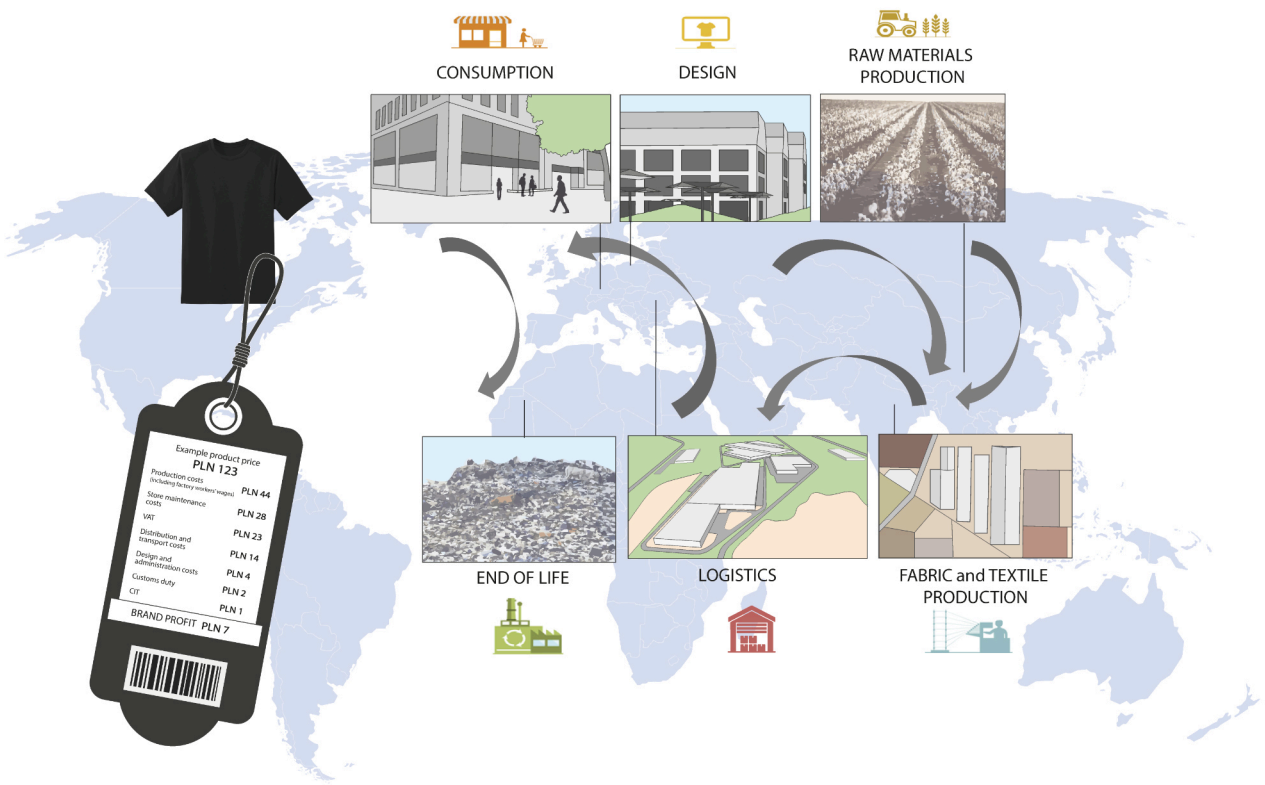
Second: LPP does not own any textile production facilities. It buys textiles from 1238 suppliers in Asia and Europe. Therefore, the factories where textiles and clothing are produced are industrial landscapes in Asia or Poland, Italy, Portugal, Romania, Bulgaria and Turkey. (Chatham, 2020). *"Fashion 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.

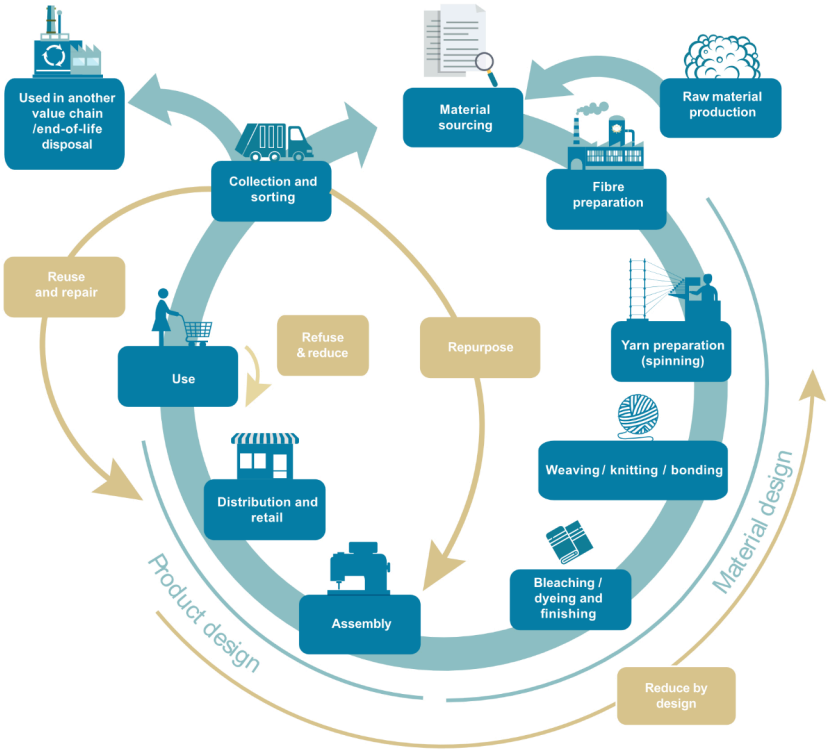
If we want to meet the increasingly recognizable limits to growth in a sustainable way, we ultimately need the **sufficiency strategy.** This is aimed at more conscious consumption and, in some cases, even the renunciation of consumption (less, slower, more regional). It is difficult to communicate this 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)

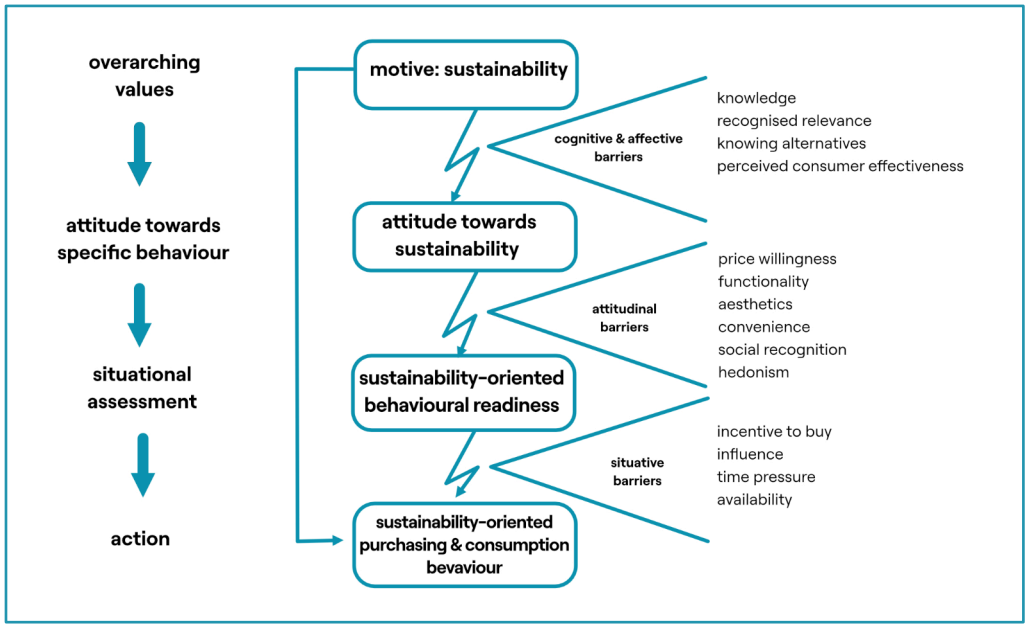
the change begins with the design of the products and the materials used (reduced by design). The corresponding raw materials are obtained or produced on this basis. A further challenge here is the question of how these new value chains can be organized regionally to reduce global transport routes. Finally, 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.

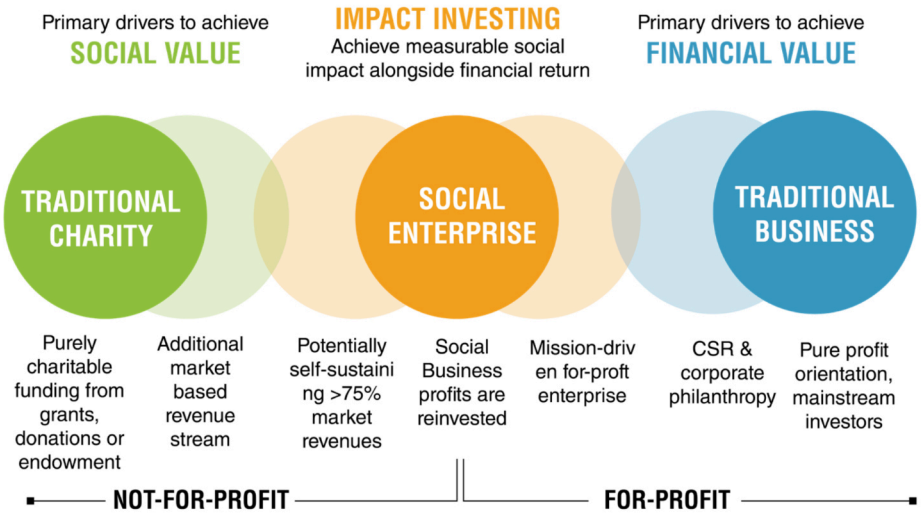
Organisations
The formative organisations in a value chain are companies. Depending on the country, these are framed by an economic system that, in most cases, moves along a continuum between a more social and a more capitalist market economy. China follows a particular path, with a system known as a 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.

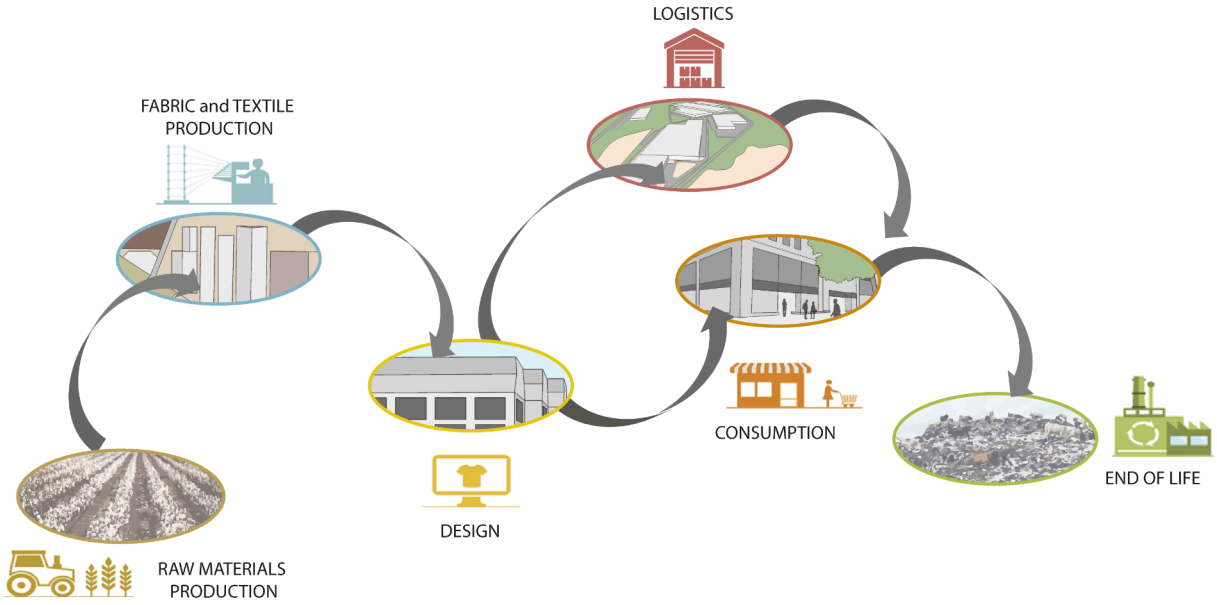
Impact evaluation

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

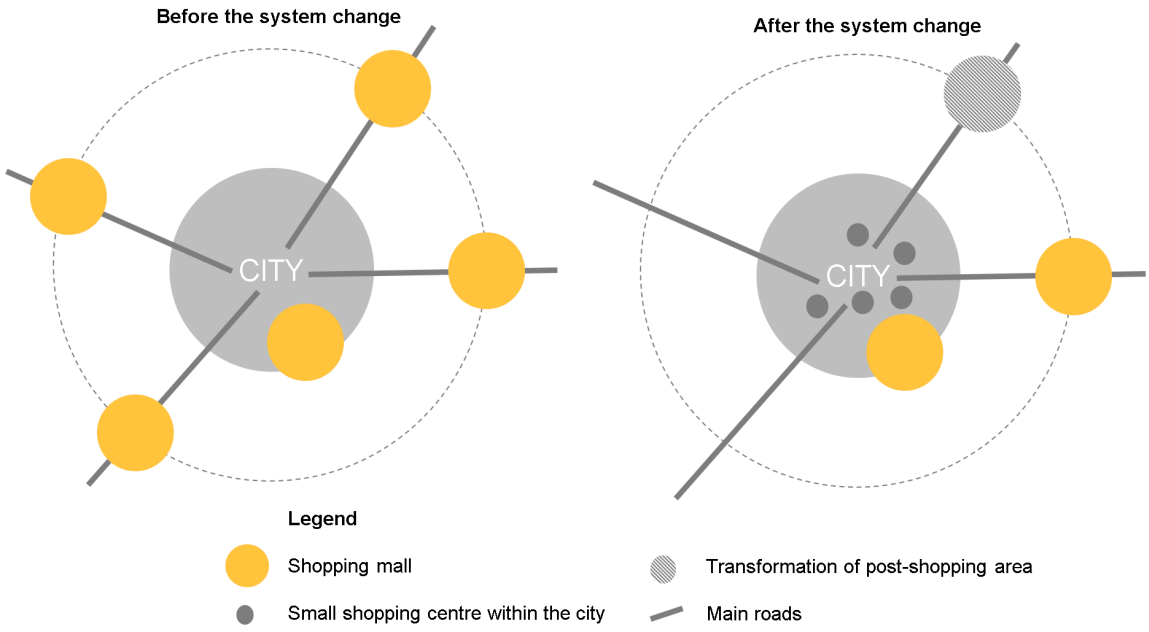
In order to consider possible improvements in the textile value chain and the reduction of its negative impact on landscapes at certain stages of the chain, let us consider a scenario of possible future. This scenario is speculative, based on a „What if?" approach, and should be treated as an intellectual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

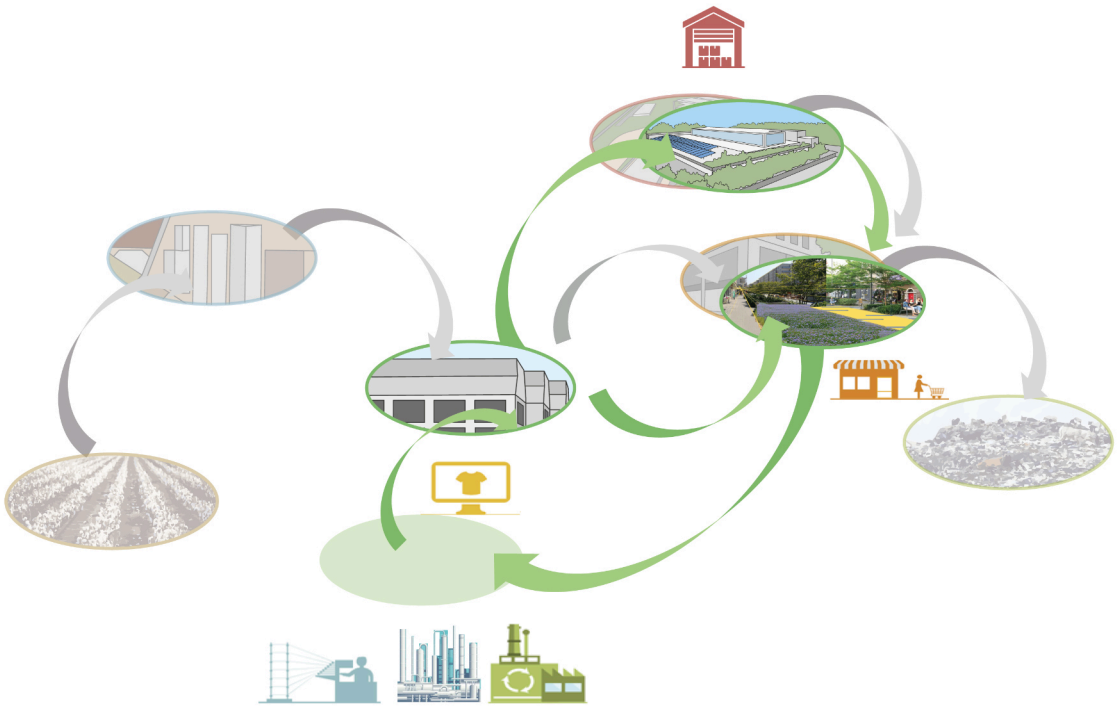
Analysis of the above scenario shows that most human activities expressed spatially in the form of landscapes are interconnected, like a system of interconnected vessels. A change in one landscape leads to changes in subsequent, seemingly independent landscapes in distant parts of the world. Therefore, 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*

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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

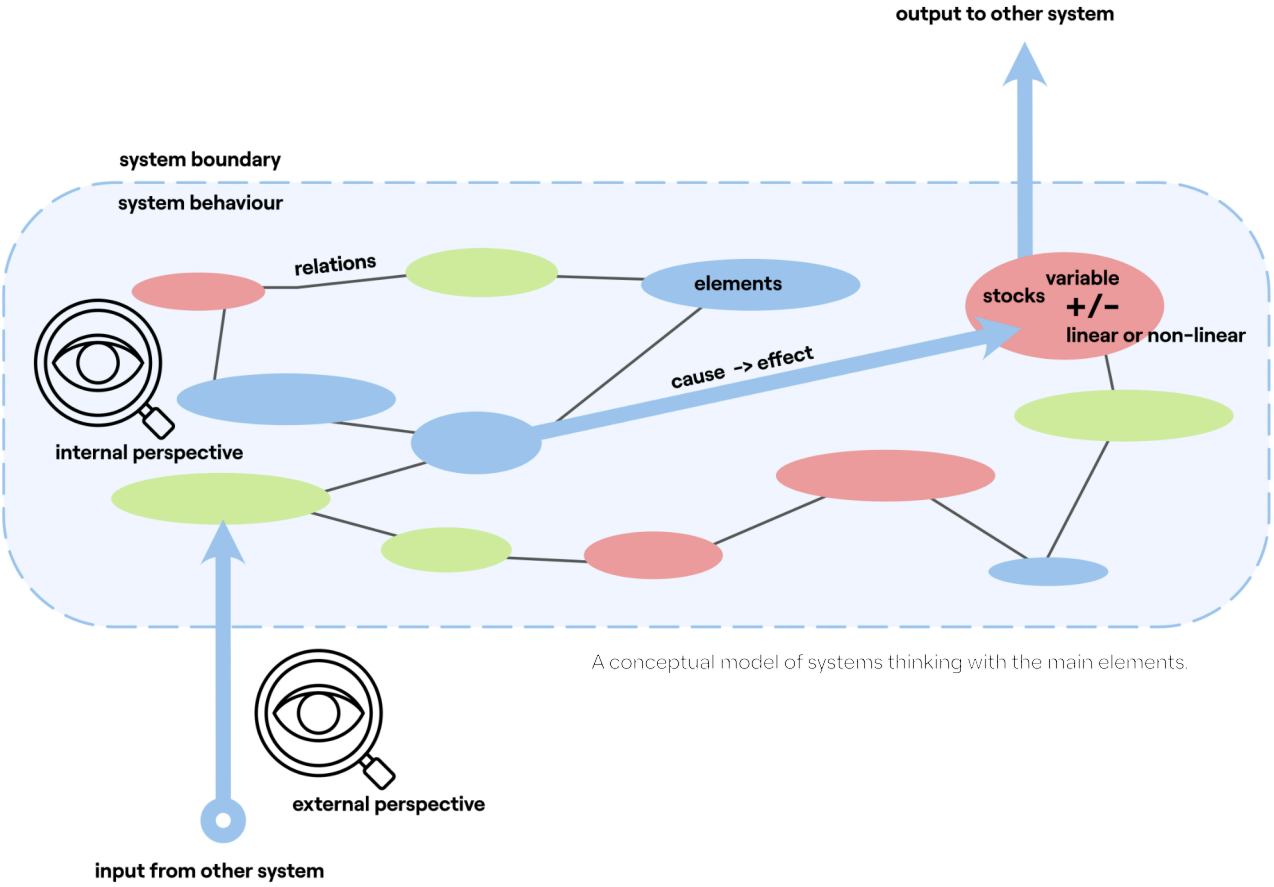
This element is the ability to conceptually model different parts of a system and to view a system in a different way. This ability is very relevant if we want to communicate about systems (and landscapes) across disciplinary and sectoral divides, and to local communities. This includes intuitive simplification, 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 with the main elements.

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Why is Landscape an Economic Framework?

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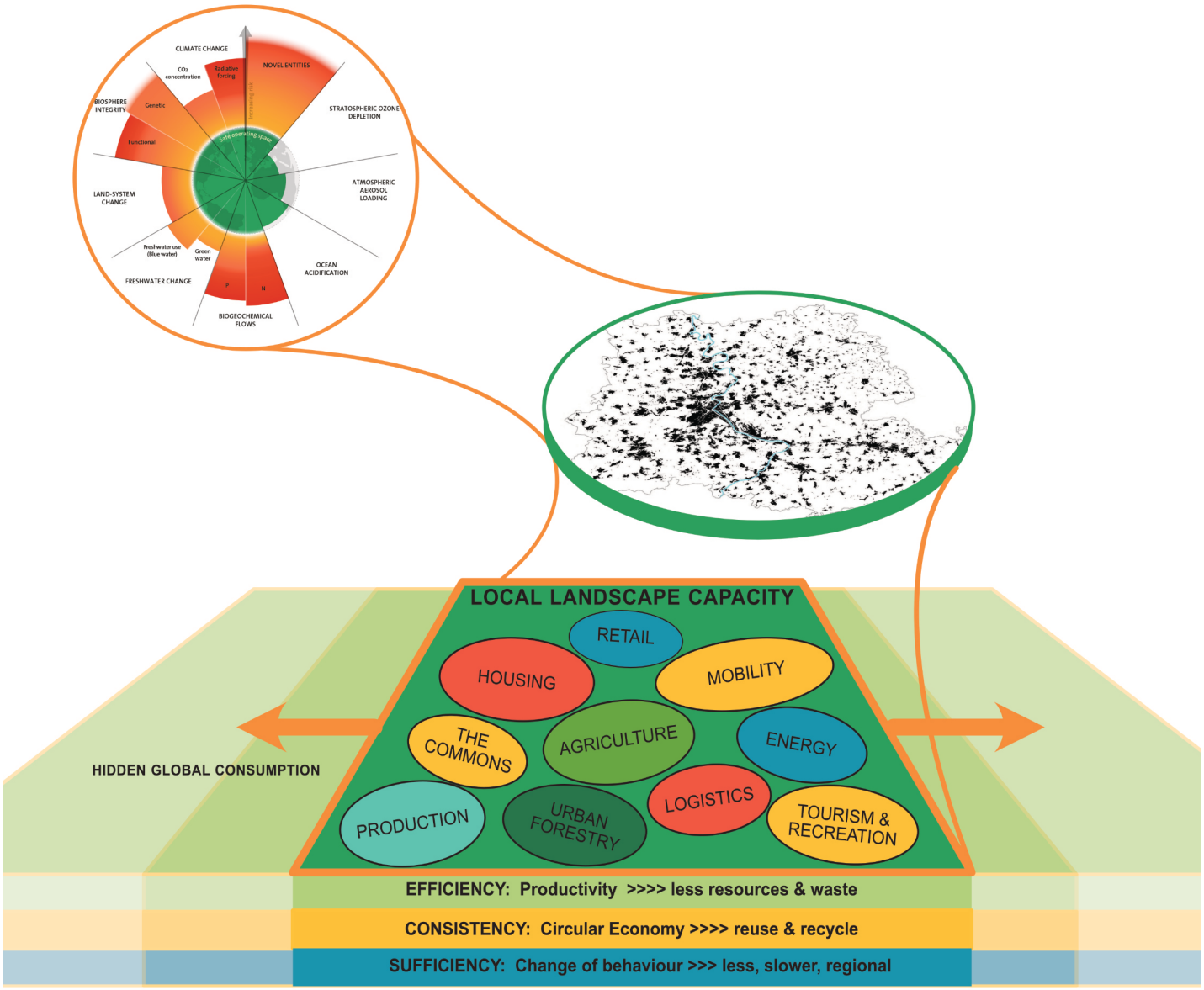
Landscape carrying capacity is the key reference of a regenerative economy

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