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Long-Term Processes as Obstacles Against the Fourth Ecological Transformation. Ecological Sustainability and the Spatial Arrangements of Food Markets

*Nina Baur**

Abstract: »Die Behinderung der vierten ökologischen Transformation durch langfristige soziale Prozesse. Ökologische Nachhaltigkeit und die Raumanordnung von Lebensmittelmärkten«. Human social life is deeply embedded in ecological processes, and as Johan Goudsblom has stressed, the interdependencies between humans and their “natural” environment have changed in the course of history. According to Goudsblom, three great ecological transformations can be observed in the course of the civilising process: the control of fire, the transition from gathering and hunting to producing food by agriculture and animal husbandry, and industrialisation. In recent years, both scientists and the public of Western societies have become increasingly aware that a fourth ecological transformation (towards more sustainable consumption and lifestyles) is necessary in order to minimise the effects of climate change. However, although most people are aware of the need for more sustainable consumption, very little seems to change, and even consumers desperately struggling to change their lifestyle, seem to fail in their efforts. Using the example of the Berlin food market, I argue that the causes for this lack of change cannot be understood without understanding the structure and power balances in global value chains which are deeply rooted in history, which have evolved in the course of centuries, and which in the course of the third ecological transformation (industrialisation and urbanisation) not only became the keystone of modern capitalism but since then are also deeply engrained in material urban, transport routes and production infrastructures. These spatial arrangements not only stabilise a specific mode

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of production by forcing social processes into path-dependence. They also hide power balances and drive human social life to an unsustainable lifestyle. Knowledge plays a key role in maintaining both circulation along the commodity chain and the existing power balances.

Keywords: Johan Goudsblom, figural sociology, historical sociology, economic sociology, food markets, agriculture, consumers, climate change, ecological sustainability, space, objectifications, materiality, spatial arrangements, translocation, polycontexturalisation, knowledge.

1. Climate Change, the Fourth Ecological Transformation, and the *Longue Durée* – Learning from Johan Goudsblom

In recent years, in the course of the debate about climate change, the awareness has resurged both in the general public and in academic debates that since the beginning of the geological epoch of the Anthropocene, human social life has been both deeply embedded in ecological processes and human societies have significantly impacted on ecosystems (De Vries and Goudsblom 2002). In this context, debates in *Historical Social Research* and elsewhere have circled around topics such as climate cultures (Heimann et al. 2022), climate change (Dörries 2015; Rosol 2015), and disasters (Schenk 2007; Meier 2007; Kusenbach and Christmann 2021) such as floods (e.g., Mauelshagen 2007; Rumsey 2015) or earthquakes (Smith 2015). Scholars have discussed the social causes of climate change and disasters (Dörries 2015; Rosol 2015), their effects on social life (Mauelshagen 2007), and how they can be governed (Westermann and Rohr 2015). One of the earliest sociologists underlining the importance of analysing the interaction between social processes and ecological processes was Johan Goudsblom (1989a) who was a proponent of the historical-sociological approach of figural sociology in the tradition of Norbert Elias (2012 [1971], 1977, 1986a, 1986b).

Goudsblom (1989a) stressed that the interdependencies between humans and their “natural” environment have changed in the course of history. Therefore, in order to understand the causes and the effects of climate change as well as possible ways of handling climate change, it does not suffice to analyse the recent past, but it is also necessary to move sociological analysis to the *longue durée* (Goudsblom 1989a; Dörries 2015; Rosol 2015; De Vries and Goudsblom 2002). In his empirical work, Goudsblom took this call for analysing the *longue durée* (Braudel 1958; Mennell 1989; Koselleck 2018; Norkus and Baur 2020; Bogner and Mennell 2022) more seriously than most historical sociologists. Beyond considering timespans of several centuries, Goudsblom (2022 [1987], 1992a, 1992b, 2013 [2004]; see also De Vries and

Goudsblom 2002) investigated the human domestication of fire that started hundreds of thousands of years ago.

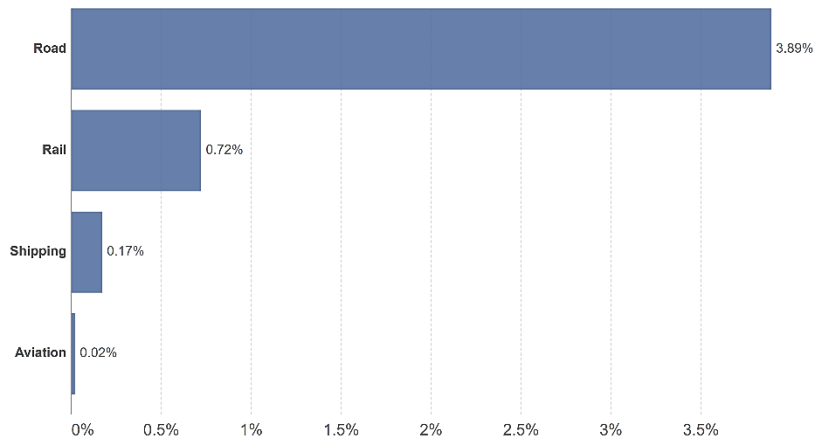
2. Food, Agriculture, and Climate Change – The Challenge of Complexity

One major result of Goudsblom's (1989a, 1989b, 1989c, 2012; De Vries and Goudsblom 2002, 21-45) analyses was that in the course of the civilising process (Elias 2012 [1939]), three great ecological transformations can be observed: (1) the control of fire, (2) the transition from gathering and hunting to producing food by agriculture and animal husbandry, and (3) industrialisation. In the course of each ecological transformation, humans' control of their environment increased, but also – as an unintended effect – their dependence on the social arrangements with which they exercised this control.

In recent years, both scientists and the public of Western societies have become increasingly aware that a fourth ecological transformation is necessary in order to minimise the effects of climate change (De Vries and Goudsblom 2002, 411). However, despite societies' and individuals' increasing awareness of the need for sustainable consumption and lifestyles, very little seems to change – humanity seems to resemble lemmings knowingly running straight into their own demise. For example, even consumers who desperately struggle to change their lifestyle, typically seem to fail in their efforts of leading a sustainable life. One of the obstacles to the fourth ecological transition is that we do not properly understand why the often-expressed need for fundamental change does not occur. Therefore, in this paper I will try to answer the question why it is so difficult for individuals and societies to move towards a more sustainable lifestyle.

In public debates on humans' impact on the ecological system, there is a tendency to focus on greenhouse gases, in particular CO₂ emissions. The two big sources of greenhouse gas emissions are energy and food production. When discussing the ecological crisis, most academic debates have been focussing on energy (Goudsblom 2012; Bösch and Graf 2014; Besio, Arnold, and Ametowobla 2022) – which include Goudsblom's (1992a, 1992b, 2013 [2004], 2022 [1987]) studies on fire. In this paper and in contrast to these debates but also in line with Goudsblom (1989a, 1989b, 1989c), I will focus on *food consumption and food production – that is, agriculture*. Food has been largely neglected in debates about climate change, though food production accounts for more than a quarter (26%) of global greenhouse gas emissions (Ritchie and Roser 2022). In order to address climate change, it is therefore not enough to solely tackle issues of energy.

Graph 1 Transport’s Share of Global Greenhouse Gas Emissions from Food (2015)



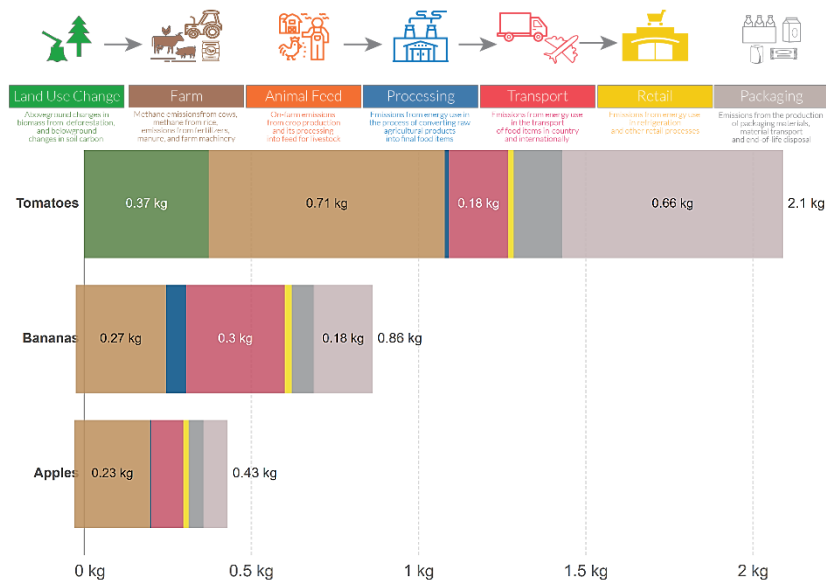
Source: Crippa et al. 2021, visualised in OurWorldInData.org 2022 [CC-BY-SA-4.0] <https://our-worldindata.org/grapher/food-transport-emissions> (Accessed December 30, 2022).

Focussing on food also reveals some of the *complexities of human impact on the environment*. Firstly, when addressing the challenge of climate change, one cannot focus on either “energy” or “food production.” *Food and energy are linked* as energy is needed not only for production of food but also for *transporting food* from farms to consumers. While public debates tend to circle around individual air travel, the same debates forget that not only people move in space, but goods do so as well. Of all goods, food has one of the largest impacts as we eat several times our body weight each year. For example, each German eats about 330kg per year (DGE 2020), and this food has to be transported to the consumer. Consequently, transport is responsible for 4.8% of global greenhouse gas emissions from the food system (Graph 1). When thinking about transport of food, it becomes evident that the debate should focus much more on how to reduce emissions from cars and trucks, as – when it comes to food – only 0.2% of food miles come from air travel. Rather, nearly 60% of food is transported by boats (which cause almost no emissions). Another 30% are transported by trucks and cars on the road, which do create emission (Ritchie 2020b). As a result, transport of food via roads has a large impact on CO₂ emissions from food (Graph 1). During the COVID-19 pandemic, greenhouse emissions caused by transport even increased: Because many countries had closed their borders for many months (Gülzau, Mau, and Korte 2021, 17-8) and transnational transport by ship had been disrupted due to border closure and a lack of containers, transport shifted from ships to cars and planes, thus increasing greenhouse gas emissions. This reveals a first complexity when thinking about climate change: In many cases, even the

problems and their causes are not as straightforward as they seem at first sight.

Secondly, when thinking about food, it also becomes clear that *greenhouse gas emissions are not the only challenge to be addressed*. In addition to food production accounting for 26% of global greenhouse gas emissions, half of the world’s habitable land and 70% of global freshwater withdrawals are used for agriculture. Approximately 78% of global ocean and freshwater pollution with nutrient-rich water (eutrophication) is caused by agriculture. Agriculture and food production, furthermore, reduce biodiversity, as 94% of non-human mammal biomass is livestock (Ritchie and Roser 2022). For most foods, emissions result mostly from land use change, and from farming processes, such as the application of fertilisers. Combined, land use and farm-stage emissions account for more than 80% of the footprint for most foods (Ritchie 2020a). Having to address several issues at once further increases the complexity when it comes to climate change. Note that in the following, I will only focus on one of these challenges: greenhouse emissions.

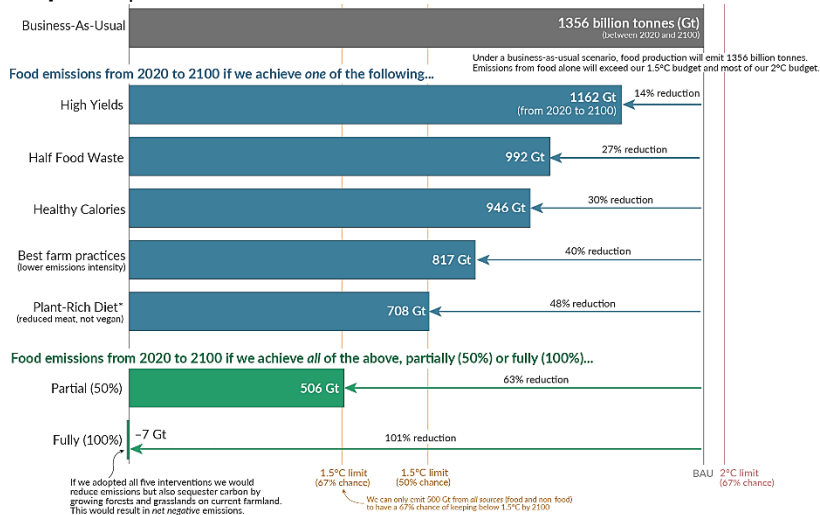
Graph 2 Greenhouse Gas Emissions of Selected Vegetables Across the Supply Chain



Note: Greenhouse gas emissions are measured in carbon dioxide equivalents (CO₂ eq) per kg of food. Source: Ritchie 2020a; modified to focus on vegetables [CC-BY-SA-4.0], via OurWorldInData.org <https://ourworldindata.org/food-choice-vs-eating-local> and <https://ourworldindata.org/grapher/food-emissions-supply-chain?country=Bananas~Tomatoes~Apples> (accessed December 30, 2022).

Thirdly, the complexity of the problem increases further when reflecting about the stage of the commodity chain in which greenhouse gas emissions occur, as there is *huge variation between food types*. While land use is most extensive for producing meat and dairy products, it is much more limited for most fruit and vegetables. In the following, I will focus on *fruit and vegetables*, as in public debates, fruit and vegetables seem to be “ecologically better food” in contrast to meat and dairy products. However, when scrutinised in more detail, it becomes evident that the production and consumption of fruit and vegetables also leave an ecological footprint which cannot be neglected when wanting to decrease humans’ ecological impact. In addition, this closer look reveals more complexity, as even within the range of fruit and vegetables, it depends on which types of fruit and vegetables are eaten. For example, tomatoes use up a lot of land, but bananas and apples do not (Graph 2).

Graph 3 Options to Reduce Global Greenhouse Gas Emissions from Food



Note: Shown are estimates of cumulative greenhouse gas emissions from food production from 2020 to 2100 under business-as-usual scenario and five interventions to reduce emissions. Source: Ritchie 2021 [CC-BY-SA-4.0].

Fourthly, *knowledge about how to reduce food-related greenhouse gas emissions* has been available for some time. As Graph 3 reveals, there is a range of options all of which would contribute successfully to decrease emissions:

1. *Food Production (Farmers and Processors)*
 - a. *Best Farm Practices*: Food emissions vary widely not only by what is produced but also in terms of how it is produced. The average emissions per unit of food could fall by 40% through improved practices (e.g.,

fertiliser management) and technology improvements (e.g., targeted fertilisers or additives to cattle feed) (Ritchie 2021).

b. *High Yields*: In addition, countries could close existing yield gaps, but also extend the yields that we can currently achieve through improved crop genetics and resource management practices. In order for this strategy to work, this would require significant progress in bioengineering and crop genetics (Ritchie 2021).

2. *Consumers*

a. *Healthy Body Weight*: While there are still people starving, many people eat more than they need. As a result, on a world scale, about 13% of adults are obese, 39% are overweight. If these adults decreased their weight to a “healthy” body mass index (BMI between 20 and 25), this would have a huge environmental impact, even if all people who are currently undernourished would eat more, in line with a calorie-sufficient diet (Ritchie 2021).

b. *Plant-Rich Diet*: One does not have to become a vegan to contribute to the reduction of carbon emission; eating less meat and dairy – especially beef and lamb – could reduce the carbon footprint significantly. This does not and should not mean that everyone should eat the same things. Instead, a nutritionally balanced diet in accordance with local cultures is recommended (Ritchie 2021) – which in turn means that local eating cultures and practices have to be considered when thinking about climate change.

Table 1 Food Waste in Different Countries (kg/capita/year in 2021)

World Region	Europe	Southeast Asia	Southern Africa	Eastern Africa	Latin America
Exemplary Country	Germany	Singapore	Botswana	Kenya	Chile
Retailers	6	13	91	11	13
Other Intermediaries	21	26	28	31	26
Consumers	75	80	16	99	74
Total	102	119	135	141	113

Source: UNEP 2021b.

3. *Whole Commodity Chain (including Logistics and Intermediaries)*

a. *Eating Local*: As can be seen from Graph 2, for most foods, compared to other stages of the commodity chain, transport accounts for less than 10% of emissions. Eating locally or regionally produced food can decrease these emissions even further (Ritchie 2020a, 2020b).

b. *Reduce Food Loss and Food Waste*: One of the most important factors in reducing humans’ food-related impact on the environment is reducing food loss and food waste (Ritchie 2021). Although the indicators for food

loss and food waste cannot be combined, as they are measured differently, existing data show that in the last decade, around 14% of food produced globally was lost in all stages of the commodity chain up to, but not including, retailers, e.g., due to spoilage by lack of refrigeration (FAO 2019). Approximately 17% of the food reaching retailing was wasted at the end of the value chain: 11% of this food was wasted in the consumers' households, 2% by retailers, and 5% by other intermediaries, such as canteens, restaurants, and hawkers (UNEP 2021a, 71). All in all, in Germany (one of the few countries where data for the whole commodity chain exist), in 2015 almost 12 million tonnes of food were lost and wasted – that is 75 kg per capita – with food production accounting for 12%, food processing for 18%, retailing for 4%, other intermediaries (that is food services such as canteens, restaurants, and hawkers) for 14%, and consumers for 52% of food loss and food waste (Schmidt et al. 2019). Note that there is huge variation between countries in how much food is lost or wasted at different stages of the supply chain (Table 1).

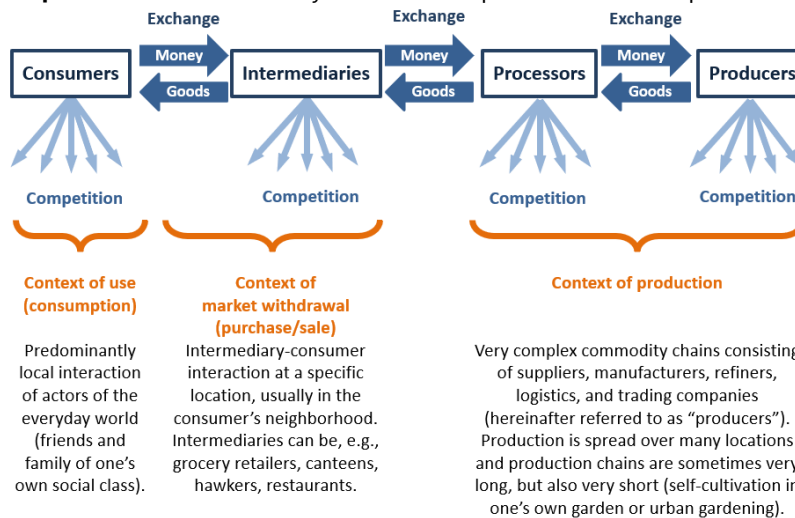
All in all, the challenge is how to handle complexity. More specifically, food is produced, distributed, and consumed in global commodity chains which – in an a figurational sociological framework – can be conceived as *complex chains of interdependence* (Elias 2012 [1971]). Using the example of commodity chains for fruits and vegetables – namely apples, bananas, and tomatoes – providing for the Berlin food market, I will show how figurational sociology in general and Johan Goudsblom's work in particular can help to understand not only the figuration's (Elias 1986a) structure and spatial arrangements but also explain why it is so hard to move the figuration towards more ecological sustainability. I will show that the causes for this lack of change cannot be understood without understanding the structure and power balances in global value chains which are deeply rooted in history, which have evolved in the course of centuries, and which in the course of the third ecological transformation (industrialisation and urbanisation) not only became the keystone of modern capitalism but since then have also been deeply engrained in material urban, transport, and production infrastructures. I will argue that these spatial arrangements do not only stabilise a specific mode of production by forcing social processes into path-dependency but also hide power balances and force individuals into an unsustainable lifestyle. Finally, I will demonstrate that knowledge plays a key role in maintaining both circulation along the commodity chain and the existing power balances.

3. A Figurational Sociological Conception of Food Markets

3.1 Food Markets as Complex Chains of Interdependence

Goudsblom (1989a) already pointed to the reason why it is so hard to decrease human societies' environmental impact as early as the 1980s by stating that with each ecological transformation, the chains of interdependence extend and get more strongly linked. Of the three ecological transformations Goudsblom identified – the control of fire, agrarianisation, and industrialisation – agrarianisation is the most important when it comes to food. In the same paper, Goudsblom identified three results of agrarianisation, namely (1) an increase of people and population due to more and better food and a greater concentration of people and food at different places, resulting in urbanisation; (2) an increasing specialisation in the production of food and consumption by people and an increase in the numbers in organisations allocating food and coordinating people over longer distances, resulting in growing chains of interdependence; and (3) an increasing differentiation of power among people (“social stratification”). While Goudsblom (1989b, 1989c), when analysing the effects of agrarianisation, focused on stratification, when reflecting on the fourth ecological transformation, urbanisation and especially growing chains of global interdependence are more important.

Graph 4 The Food Commodity Chain as a Complex Chain of Interdependence



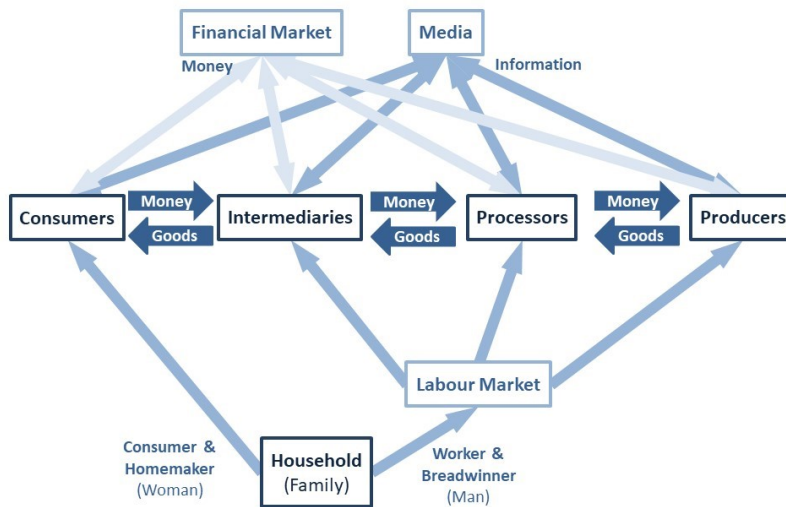
Source: Own representation.

In other words, since agrarianisation, food commodity chains (Gereffi, Humphrey, and Sturgeon 2005) increasingly consist of dynamic, very long, and complex *chains of interdependence* (Elias 2012 [1971]). In the present age they comprise literally hundreds of thousands of individual actors ranging from suppliers, producers (farmers), processors, intermediaries (retailers and food services such as canteens, restaurants, and hawkers) to consumers. Typically, and as Graph 4 illustrates, these commodity chains (also “value chains” or “supply chains”) have specific properties. Firstly, within a commodity chain, most actors *cannot interact directly*. Secondly, markets are characterised by a *tension between cooperation/exchange and competition*, and goods and services are produced, distributed, and exchanged for money. Within each group of actors – producers, intermediaries, consumers – there is competition, whereby the mechanisms of competition are different for each group. While producers compete for survival on the market and aim at gaining market power, consumers aim for social distinction and recognition (Baur 2013a). Thirdly, commodity chains can be subdivided into three *sub-contexts*: the contexts of production, market withdrawal (purchase/sale), and consumption (Kulke et al. 2020; Baur et al. 2021). When using this figurational sociological model of food markets, it immediately becomes obvious how complex these commodity chains are, that it is impossible for an individual actor to know about all processes along the whole chain, and that actors – as they are acting simultaneously – face unintended side-effects of their actions.

3.2 Interdependence of Chains of Interdependence

As if the food commodity chain itself was not complex enough, complexity increases even further as this chain of interdependence is not isolated but interdependent with other chains of interdependence – the most important ones being the financial sector, the media, and the labour market (Graph 5). Each of these markets both follows its own internal logic and at the same time provides a key function which is necessary to uphold interactions in food commodity chains.

Graph 5 The Interlinkage between Chains of Interdependence



Source: Own representation.

In order to be able to coordinate their actions with others in the commodity chain, actors need a minimum of knowledge (Fülling 2020, 2022) about the chain. In complex chains, individual actors neither have the ability to grasp the whole complexity of the chain, nor can they personally interact with all actors as they are often spread around the world. Therefore, *media* (Baur 2013b) play a key role in the upkeep of commodity chains by enabling communication between consumers, retailers, producers, and suppliers. For example, communication between companies and consumers is traditionally organised via advertising, market research, and marketing, and since the 2010s increasingly via social media. However, as media are not only a means of communication but also markets in their own right (Baur 2013c) which are sensitive to scandals, they also contribute significantly to the production of risk in these markets (Baur 2013d). As a result of increasing mediatisation, consumers are increasingly forced to reflect on the commodity chain and distant places of production, which increases consumers' awareness of ecologically questionable methods of food production as well as poor working conditions of farm workers in the Global South (Hering and Fülling 2021a, 2021b; Hering 2021). At the same time, mediatisation suggests that consumers can access a larger global range of goods (Baur et al. 2021).

As in modern markets, goods are traded for money along the commodity chains; they cannot function without the *financial market* (Baur 2013e, 2013f, 2013g). As the financial market is – like the media – also a market in its own

right with its own internal logics, it can backlash on consumer good markets like food markets (Simmel 1996 [1901]).

Food does not produce, transport, and cook itself. Rather, human beings perform these tasks which can be conducted either within the household or by paid labour on the market. Therefore, the *labour market*, too, is essential for the upkeeping of commodity chains, as it supplies companies with labour.

Commodity chains are linked to society via the *private household (family)* in two ways: Firstly, employed *workers* exchange their labour power for money (income) via the labour market and in this role, produce services and goods such as food. In the role of *consumers*, household members can exchange this money again for services and goods, e.g., by shopping for food and later cooking it or by going to a restaurant. Buying and preparing food are only a small part of the tasks household members engage in. Modern urban families – consisting, e.g., of two adult partners with small children living in a household – typically conduct unpaid work (care work and housework such as cooking) as well as some leisure activities (e.g., watching TV, playing, receiving visitors) at home. If the household's adults conduct their paid work outside their homes, they commute to and from the place where they work. They also have to organise transporting children from/to (nursery) schools. Additional journeys will be caused by diverse leisure activities (e.g., sports, day trips, meeting friends, eating out, visiting concerts) as well as housework and care work (e.g., shopping, seeing a doctor).

As people's overall time budget is limited and in order to save time, there typically is a *household division of labour* between the adult family members which can take different forms, but which is typically gendered – in other words, family's members' daily routines are linked (Kulke and Baur 2021). In Germany, from the 19th century until the 1950s, the “male breadwinner/female homemaker model” (in which the man concentrates on paid work and the woman on housework and care work) was commonly practiced. Since the 1970s, due to changes both in the welfare state and in social norms, the “dual career model” (in which partners share the above tasks evenly) has increasingly become more common (Baur 2007; Baur et al. 2019; Grunow 2019).

What can be learned from this model is that – in order to upkeep social interactions in everyday life – in current societies, each individual person is and needs to be part of multiple chains of interdependence which are entwined with each other and each of them is extremely complex. The food market is only one of those chains. In consequence, each single change in one link in one of these chains of interdependence will likely affect *all* other chains of interdependence and have *unintended side-effects*. This alone already partly explains why it is so difficult to govern these chains. However, the real puzzle is *how these complex chains of interdependence can be coordinated at all* (Beckert 2009), as individuals' actions need to be spatially and temporally synchronised (Maurer 1992; Baur 2005).

A partial answer is that coordination is achieved by inscribing rules for coordination into social institutions (Knoblauch 2020 [2017]; Diaz-Bone 2018). In other words, in practice, individual persons do not have much choice about which chains of interdependence they want to be part of, or how to organise their everyday lives: Individuals' spatio-temporal knowledge and their spatio-temporal pathways (micro-level) are embedded in *spatio-temporal regimes* (macro-level) (Kulke and Baur 2021). In this context, sociological research has shown that cities develop their own temporal social orders (*Zeitordnungen*). As there are different ways of collectively and socially organising space and time (Baur, Hering, et al. 2014; Bauer, Löw, et al. 2014), each city has its own rhythm (Rinderspacher 1988; Promberger et al. 1997). In the course of the civilising process, cities develop path-dependently, transforming in line with their specific temporal social orders (Baur and Hering 2017; Hering and Baur 2019). This is important to upkeep the chains of interdependence but also makes any deviation from these social assumptions difficult to achieve.

3.3 Space and Materiality

While Elias's and Goudsblom's conceptualisations of chains of interdependence already help a lot in order to understand food markets and their impact on climate, they also have some missing links. More specifically, recent debates on climate change, among others in *Historical Social Research*, have shown that *infrastructures* are crucial for upholding the spatio-temporal regimes needed for coordinating chains of interdependencies (Degens, Hilbrich, and Lenz 2022; Besio, Arnold, and Ametowobla 2022). However, these debates also reveal that social scientists usually focus on the social – especially organisational – and temporal aspects of infrastructures and chains of interdependence but – despite acknowledging their importance – neglect their material and spatial aspects. This gap can be closed within the framework of figurational sociology by integrating classical figurational-sociological analysis in the tradition of Elias and Goudsblom and the new figurational-sociological approach on the “refiguration of spaces” (Knoblauch 2020 [2017], 273-4; Knoblauch, and Löw 2020) which stresses the role of space (Löw 2001; Christmann 2016, 2022; Knoblauch 2020 [2017], 207-32, 273-4; Frehse 2020; Knoblauch and Steets 2022) and materiality (Christmann 2014; Knoblauch 2020 [2017], 110-22; Hering and Fülling 2021a, 2021b; Hering 2021) in upholding chains of interdependence. In the following, I will illustrate what a figurational-sociological analysis of food markets' impact on the environment combining both perspectives could look like.

4. Space and Chains of Interdependence

4.1 The Refiguration of Spaces

Even without having explicitly pointed this out, the above discussion on food already revealed that societies and their economy in general and food markets in particular are always spatial. Space is not only socially constructed (Löw 2001; Christmann 2016; Knoblauch 2020 [2017], 207-32; Frehse 2020; Knoblauch and Steets 2022), but physical space is also an important factor of production, because the economy always takes place in space. On the one hand, different economic regions can be distinguished. This is especially true for agriculture, as not all foods can be produced everywhere in the world. For example, while apples typically grow in temperate climates and bananas in hot climates, tomatoes can be grown (in greenhouses) in most world regions. On the other hand, today, production is globalised, which requires the bridging of large distances and the crossing of borders between nations and economic regions. In the context of complex chains of interdependence such as food markets, two sub-processes are central in driving the refiguration of spaces: translocalisation and polycontextualisation.

4.2 Translocalisation and Global Commodity Chains

With the separation of production and consumption during agrarianisation, processes of translocation (Knoblauch 2020 [2017], 258-61; Knoblauch and Löw 2020, 281f) started, as goods now had to be transported from one location to another. Over time, these chains of interdependence have grown longer and longer – not only concerning the number of actors involved but also in the physical distance bridged between production and consumption. Accordingly, rare goods have been traded over long distances for millennia. For example, as early as 3,000 BC, goods were transported by boat on great rivers such as the Nile, the Tigris and Euphrates, the Indus, and the Yellow River. Around 1,000 BC, with the domestication of the camel, long-distance caravan trade via land routes became possible, which linked India with Egypt, Phoenicia, and Mesopotamia and extended to the silk road around 200 BC. Translocalised trade of food and other agricultural products speeded up during colonisation from the 16th century.

The maximum length of a commodity chain is defined by transport costs (which are partly defined by the weight of food) and the speed at which food can be transported along it before it spoils. Hence, while light and durable foods (such as spices and tea) have been traded over extremely long distances for millennia, for a long time, heavy and perishable foods (such as fresh produce) were only traded in local market systems, and trade was first locally organised between cities (e.g., Berlin) and their urban hinterlands (e.g.,

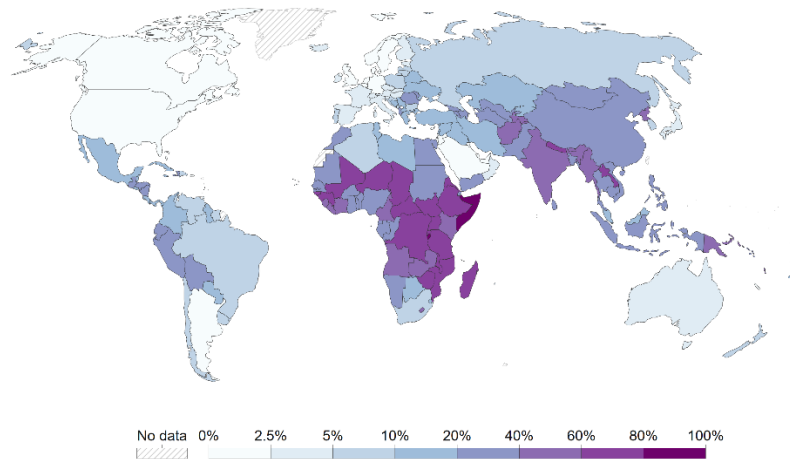
Brandenburg). In comparison to other types of food, trade in fresh produce translocalised relatively late, that is only in the course of industrialisation (which took off in Germany between the 1830s and 1873 and in the course of which Berlin became one of Germany's industrial centres). Around the 1890s, the first transcontinental commodity chains for fresh produce were implemented in order to transport tropical fruits considered as luxury goods (such as pineapples and bananas) in refrigerated ships. From the 1970s onwards, European integration and reduced transport costs induced a Europeanisation of trade in cheaper fruits and vegetables. From around 1985 onwards, policies of national and international institutions (such as the WTO, IMF, and the World Bank) as well as new technologies and, from the 2000s onwards, the logistics revolution (involving the use of container technology and aircrafts for transporting goods) gave translocalisation a new impetus and a new quality (Kulke 2017, 64f; Hering 2021; Hering and Fülling 2021a, 2021b).

As a result, even for fresh produce, global commodity chains (GCC) (Gereffi 1996) – also called global value chains (GVC) (Gereffi, Humphrey, and Sturgeon 2005; Coe et al. 2004) or global production networks (GPN) (Coe, Dicken, and Hess 2008; Yeung and Coe 2015) – have evolved, linking different steps of production, transportation/logistics, retailing, and consumption at different places all over the world (Dannenberg 2020; Gemählich 2020). Since then, commodity chains as depicted in Graph 4 have emerged, which reinforce the centre-periphery structure (Wallerstein 2004, 2022) of global inequality (Boatcă 2015). From a positive angle, these translocalised chains of interdependence have increased the variety of available foods and food security over the whole year for a large number of consumers. From a negative angle, translocalisation makes food production more vulnerable for both producers and consumers.

Concerning *production*, while agriculture is only a minor economic sector in highly industrialised countries like Germany (0.8% of the GDP), in the *Global South*, agriculture remains an important sector, accounting for 5% of Latin America's GDP, 15% of Sub-Saharan Africa's GDP, and even going up to 34% of the GDP in countries like Kenya (World Bank 2020a). As Graph 6 depicts, this is reflected in the distribution of jobs. While employment in agriculture accounts for less than 2% of total employment in highly industrialised countries like Germany, it accounts for 14% of all employment in Latin America and 53% in Sub-Saharan Africa (World Bank 2020b). Agriculture thus remains an important source of livelihood for large parts of the world population (Cheong, Jansen, and Peters 2013). Export-oriented farming has provided many farmers not only with reliable incomes and enabled them to invest in improving the production, but it has also provided them with the ability to adapt to the Global North's social and ecological standards (Dannenberg and Nduru 2012; Rao, Brümmer, and Qaim 2013). However, the system also makes farmers vulnerable, e.g., to fluctuating prices on the world market or

if they face sudden changes through competition with new developing production clusters in other countries (Ouma 2015).

Graph 6 Share of Labour Force in Agriculture, 2019



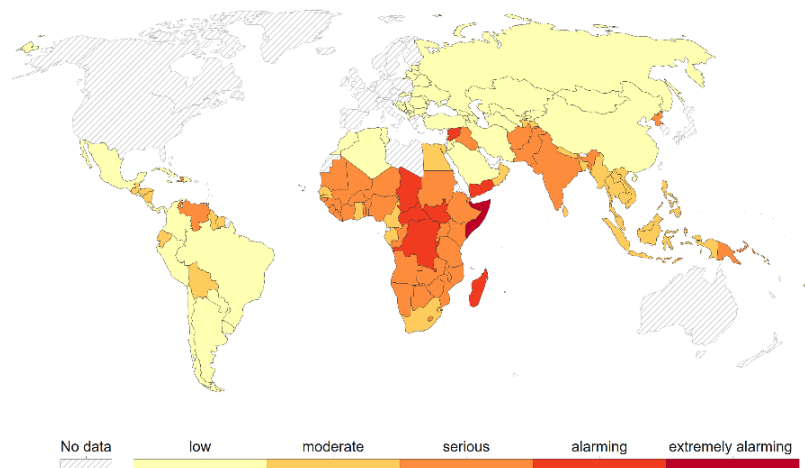
Source: Our World in Data based on International Labor Organization (via the World Bank) and historical sources
OurWorldInData.org/employment-in-agriculture • CC BY

Note: Agriculture includes the cultivation of crops and livestock production, as well as forestry, hunting and fishing. Employment includes anyone engaged in any activity to produce goods or services for pay or profit. Source: Ritchie 2022 [CC-BY-SA-4.0].

For high-income consumers in the *Global North*, fresh produce such as exotic fresh fruit served out of season have been a source of distinction for a long time. More importantly, for not-so-well-off consumers, food is especially sensitive because eating is a basic necessity, and in many parts of the world poverty is still linked to lack of food (Cheong et al. 2013). Even in Europe, the experience and fear of starvation is deeply engrained in cultural memory, as for long periods of European history, everyday lives of the majority of the population were characterised by shortages of food and recurrent famines. This is especially true for Germany, where even in the 1950s, people experienced hunger and starvation. As a result of translocation, this seems now a thing of the past: Contemporary consumers in the *Global North* experience food and other fresh produce as a commodity like any other – to be bought securely and on a regular basis in the local stores without having to worry about their origins and availability. As a result, consumers have adapted their tastes and diets to the available foods. Both have resulted in a dependence of consumers on these translocalised commodity chains. In other words – even if consumers in the *Global North* would like to consume more localised foods

in order to decrease the impact of transport costs, this would not be immediately possible.

Graph 7 Global Hunger Index (GHI), 2021



Note: The GHI comprises of four key indicators: (1) undernourishment: the proportion of undernourished people as a percentage of the population (reflecting the share of the population with insufficient caloric intake); (2) child wasting: the proportion of children under the age of five who suffer from wasting (low weight for their height, reflecting acute undernutrition); (3) child stunting: the proportion of children under the age of five who suffer from stunting (low height for their age, reflecting chronic undernutrition); (4) child mortality: the mortality rate of children under the age of five (partially reflecting the fatal synergy of inadequate nutrition and unhealthy environments). Index scores: 0 = no hunger; 100 = severe hunger. Source: Concern Worldwide and Welthungerhilfe, visualised by Roser and Ritchie 2019 [CC-BY-SA-4.0].

At the same time, *consumers* in the *Global South* do not experience the same degree of food security – on the contrary. A dark side of export-oriented markets is that food is translocally transported and sold at markets with the highest revenue, which tend to be located in the Global North. This results in the chains of interdependence being even more intertwined than already stated above. For example, large parts of Africa depend on grain imports from Russia and Ukraine in order to provide staple foods for the local population as many of the best local soils are used for producing export-crops for countries in the Global North such as Germany. Due to their entanglement in global chains of interdependence, populations become vulnerable to disruptions in these chains. Therefore, as Graph 7 illustrates, the world regions in which most of global food is produced and where large parts of the labour force still work in agriculture are also those regions which are most affected by food insecurity and hunger.

4.3 Polycontexturalisation

The refiguration of spaces is not only driven by translocalisation but also by polycontexturalisation. In order to understand polycontexturalisation, one needs to keep in mind that – as discussed above – in the course of the civilising process, societies have been becoming increasingly differentiated (Luhmann 1997; Knoblauch 2021), resulting in individual and collective actors socially interacting in multiple contexts, each of which is characterised by its distinct historical development and specific spatial, economic, political, legal, and cultural framework (Christmann and Baur 2021). As depicted in Graph 4, commodity chains can be analytically subdivided into *sub-contexts* which in turn can be further divided into another set of sub-contexts and so on. For example, on a very general level, commodity chains consist of three main sub-contexts: the contexts of production, market withdrawal (purchase/sale), and consumption (Baur 2013a; Kulke et al. 2020; Baur et al. 2021).

As interactions always take place somewhere, each of these multiple contexts also has a specific extension in physical space – its *spatial arrangement* (*Raumanordnung*) which is organised according to a specific *spatial logic* (*Raumlogik*), creating a specific *spatial figure* (*Raumfigur*). In order to keep up the chain of interdependence, actors have to accommodate to these respective spatial logics (Löw 2020; Löw and Knoblauch 2021). For example, in the *context of production* of food commodity chains, producers, processors, logistics companies, and intermediaries follow a logic of transit (*Logik der Durchquerung*) in order to coordinate the exchange of fresh produce for money along the space of pathways (*Bahnenraum*). In the *context of consumption*, consumers either cook and eat food at home (*Wohnort*) or at a restaurant or canteen. These spaces of place (*Ortsraum*) follow a logic of intersection (*Logik der Überlappung*) and are embedded into territorial spaces (*Territorialraum*) characterised by a logic of demarcation (*Logik der Grenzziehung*), as consumers from different social milieus are segregated in residential neighbourhoods and move largely within their own neighbourhood for everyday activities. In the context of *market withdrawal*, Germans typically either purchase prepared food at a restaurant or canteen or fresh produce in a shop close to home (*Wohnort*) or work (*Arbeitsort*). Like the home, places of purchase (*Einkaufsort*) follow the logic of intersection within the territorial space of the neighbourhood. When going shopping, consumers link different shopping locations – baker, butcher, organic food shop, discounter, supermarket, etc. – and locations relevant for other activities – doctor’s office, registration office, dropping off children at the kindergarten, place of work – on their way from their place of residence through their neighbourhood and back to their place of residence and thus span a network space (*Netzwerkraum*) (Baur et al. 2021).

For chains of interdependence to function, contexts are never isolated (Luhmann 1997) but always linked to specific other contexts (Christmann and Baur 2021) in interactions. When in an interaction situation, different spatial logics occur simultaneously, *spatial conflicts* (*Raumkonflikte*) can arise (Knoblauch and Löw 2020). For example, at the shopping location, the logics of spaces of place, territorial space, and space of pathways collide (Baur et al. 2021). These spatial conflicts must be resolved in interaction situations – otherwise the chain of interdependence breaks down. Therefore, by necessity, any interaction is *polycontextural*, that is, actors have to simultaneously refer to multiple contexts and address their potentially contrasting logics (Knoblauch and Löw 2020, 279f; Knoblauch 2021). Polycontexturality not only refers to actors' knowledge but also to their actions (Knoblauch 2021). As contexts are spatial, so is polycontexturality (Knoblauch and Löw 2020, 281). Furthermore, actors have to manage the complexity of the commodity chain, which comes about (1) through the sheer length of the chain of interdependency, (2) interaction being distributed translocally, and (3) the large number of individual and collective actors who are either competing or need coordination. Translocalisation drives differentiation which in turn drives polycontexturalisation because both the number of contexts actors have to simultaneously refer to is continuously increasing and the way they handle polycontexturality is continuously changing. This complexity is further increased by (4) the sheer number of goods and (5) different criteria that have to be weighed against each other when selecting goods during shopping, such as price, individual taste, the available time budget, attitudes towards sustainability, and the social milieu's social norms (Hering and Fülling 2021a, 2021b; Hering 2021; Baur et al. 2021).

In consequence, for market actors, reducing complexity, linking the three contexts meaningfully, and resolving spatial conflicts is of utmost importance. Empirical studies from economic sociology – including my own research – reveal that market actors' *knowledge* (*Wissen*) plays a key role in coordinating commodity chains, directly influencing their interactions and thus decisively shaping the spatial organisation and social order of commodity chains. Note that from a sociology-of-knowledge perspective, it does not matter whether actors' knowledge is “objectively” true. As long as actors believe it to be true and act upon this conviction, it has consequences. For example, many consumers are convinced that “regional” products are organic foods that have a low impact on the environment, which is rarely objectively true (Fülling 2020, 2022). However, in so far as consumers base their purchasing decisions on this belief, it is relevant to the market, as it defines the logics of coordinating the chain of interdependence.

Furthermore, knowledge can be explicit (i.e., codified and formalised by means of numbers, writing, words, or labels), implicit (i.e., embedded in social routines and interpretation schemes), or non-existent (“non-knowledge”)

so that consumers have to base their purchasing decisions on uncertainty and/or find alternative means of orientation such as labels. Especially *non-knowledge* (*Nicht-Wissen*) plays a key role not only in upkeeping commodity chains but also for understanding the *power balances* within the chain. Knowledge can be embedded in everyday routines and so strongly habitualised that it guides interaction without people consciously engaging with it. In the case of strong habitualisation, knowledge may no longer be directly accessible to consciousness (Knoblauch 2014, 352) and thus become non-knowledge. This is especially true for knowledge that is both institutionally and materially engrained into a local spatial arrangement (Kulke and Baur 2021), internalised in the course of socialisation (Elias 2012 [1939]), and only changes in the *longue durée*. As a result, actors lack temporal or spatial categories of comparison, and everyday routines as well as the knowledge associated with them are perceived as static (Braudel 1958; Koselleck 2018).

Empirically, two *types of non-knowledge* can be identified (Fülling 2020, 2022): Due to the complexity of the chain of interdependence, non-knowledge can take the form of “*not-being-able-to-know*” (*Nicht-Wissen-Können*) and stem from actors’ inability to grasp commodity chains and their spatial arrangement in their entirety in the face of their ever-increasing complexity (Fülling 2020, 2022). Actors’ capacity for knowledge is unequally distributed along commodity chains in favour of Multinational Companies (MNCs) – which are typically either logistics, processing or retailing companies – and to the disadvantage of consumers and farmers (Callon and Muniesa 2005; Lawrence and Burch 2007; Legun 2017). This knowledge asymmetry both generates and is the result of unequal power balances within commodity chains (Kulke et al. 2020). It is reinforced where MNCs conceal information in order to disguise certain aspects of the commodity chain and its spatial arrangement in order to increase the commodity’s value (Ibert et al. 2019). They thereby also stabilise the spatial arrangement of, and power balances within, the commodity chain (Baur et al. 2021).

These strategies succeed vis-à-vis consumers, firstly because consumers only have limited time budgets and are overwhelmed by the chain’s complexity, and secondly because consumers enter into an implicit complicity with MNCs (Fülling 2020, 2022). In other words, not-knowing can also take the form of “*not-wanting-to-know*” (*Nicht-Wissen-Wollen*) as a conscious strategy for reducing complexity (Schulze 1996), maintaining social routines (Knoblauch 2014, 352), or dealing with uncertainty, fears, and avoidance of unpleasant and unwanted knowledge (Ibert et al. 2019). When it comes to food, consumers are confronted with a multitude of often conflicting demands, ranging from cost constraints and taste preferences to ethical and moral evaluations. For example, a German consumer might want to eat bananas because she likes them, save money because she is on a limited budget, and practice a socially and ecologically sustainable lifestyle at the same time.

However, these different goals cannot be actually realised at the same time because, firstly, bananas do not grow in Germany but have to be produced in countries which are physically distant from Germany, which means that in order to offer them to German consumers, they have to be transported to Germany and therefore create a higher ecological imprint than, e.g., apples (Graph 2) which grow in Germany. In addition, bananas are usually produced in exploitative export-oriented industries – eating them might possibly increase food insecurity in the countries where they are produced (Graph 7). So, there is no such thing as a socially and ecologically sustainable banana to be had in Germany. For a sustainable lifestyle, German consumers would not only have to eat less food but also eat more seasonal locally produced foods which in turn would mean that they would have to waive most of their favourite foods. This creates a cognitive dissonance (Inglis and Gimlin 2009). Fülling (2020, 2022) has shown that consumers resolve this cognitive dissonance by non-knowledge in the sense of “not-wanting-to-know” and consciously or unconsciously opting for “geographical ignorance” (Harvey 1990, 423) or “social forgetting” (Billig 1999, 315) – i.e., by not reflecting on certain aspects of the commodity chain or by not acting upon these aspects (Ibert et al. 2019, 50). In doing so, consumers may maintain their capacity for enjoyment and action by rejecting responsibility for social and ecological consequences (Fülling 2020, 2022). This in turn makes it possible to delink the commodity (chain) from the original context and relink it in other contexts with other bodies of knowledge and symbolically recharge it (Hering and Fülling 2021a, 2021b).

Since knowledge plays a key role in maintaining circulation along commodity chains, the follow-up question is *how actors coordinate themselves under conditions of non-knowledge*. Baur et al.’s (2021) data suggests that three interrelated mechanisms are primarily used for this purpose:

1. Both consumers and retailers use *symbols* which serve as judgement devices (Karpik 2010) for quality. Symbols can be certificates or persons (such as experts) but also special places: Consumers use the place of origin (e.g., “regional food,” “Dutch tomatoes”) or the place of purchase (e.g., “organic food shop”) to link the question of the “where” to the “how” of production (Fülling 2020; Schenk 2020).
2. The strategy of using judgement devices can only work because knowledge is inscribed in social institutions (Knoblauch 2020 [2017]; Diaz-Bone 2018) that determine, among other things, how interaction in everyday routines is coordinated – “coupled” – in time and space (Kulke and Baur 2021). As discussed in Section 3, this coordination is facilitated by *social institutions*.
3. These social institutions are materially solidified and thus *objectified* (Kulke and Baur 2021) in so-called form investments (Thévenot 1984) which stabilise the logics of evaluation actors share across individual situations in time and space (Hering and Baur 2019).

5. Materiality and Chains of Interdependence: Objectifying Social Assumptions in Spatial Arrangements

5.1 Objectifications as Carriers of Knowledge

The findings discussed in Section 4 point to the key role of materiality in objectifying social assumptions in spatial arrangements which in turn play a key role in upholding chains of interdependence. This is in line with recent debates in *Historical Social Research*. For example, Westermann and Rohr (2015) have stressed that social processes in general and humans' interaction with the environment can only be grasped if materiality is included into historical sociological analysis. As I already hinted at in Section 3.3, the approach of the "refiguration of spaces" not only stresses the role of space (Section 4) but also that of objectifications (Christmann 2014; Knoblauch 2020 [2017], 110-22; Hering and Fülling 2021a, 2021b; Hering 2021) for upholding chains of interdependence despite actors' non-knowledge.

The reason why objectifications play a key role in social processes is that not only do humans possess (spatial) knowledge, but (spatial) knowledge is also materially inscribed in objectifications – such as our bodies, the commodity (e.g., food, coins), technologies (e.g., knives, cooking pots, tables, fridges, stoves, farming utensils), buildings (e.g., farms, shops, restaurants, homes), the layout of neighbourhoods, and traffic routes. These objectifications can function as carriers of knowledge (*Wissensträger*) and compensate for non-knowledge.

While different objectifications serve different functions, they are typically linked to each other in socio-technological systems (Bijker, Hughes, and Pinch 1987) – for example, a cooking pot is useless without a stove or a fire place, and not all cooking pots can be used together with all cooking facilities. Therefore, objectifications can only be understood in their overall constellation in which they serve as infrastructures. In these constellations, objectifications stabilise certain spatial arrangements (Löw 2020; Löw and Knoblauch 2021; Kulke and Baur 2021) and decelerate the refiguration of spaces as well as steer it along certain paths. Different types of objectifications change at different speeds – as short-, medium-, and long-term processes (Braudel 1958; Koselleck 2018) – and each play different roles with regard to the resolution of spatial conflicts between different spatial figures.

In the following, I will exemplify this by focussing on a specific link in the food commodity chain – the consumer-retailer-interaction in Berlin neighbourhoods. In this specific context, the most important objectifications are the commodity itself, the shop, the neighbourhood, and transport routes.

5.2 Transport Routes as Spatial Arrangement

Food does not beam itself to the consumer – as a result of translocalisation, it has to be transported along the space of pathways by water, road, rail, or air from the farms where it is produced to the place where it is eaten, that is either the consumer’s home or to canteens, restaurants, and hawkers (Section 4.3). In order to transport food from somewhere to somewhere else, a huge transport infrastructure is needed which is a spatial arrangement in itself. Upkeeping this is a complex task. For example, in the case of roads, this does not only mean that the roads themselves have to be built and maintained by someone, but they also need to be compatible with the means of transport – if the food is transported by a normal car or truck, an asphalted road is needed; if the food is transported on gravel roads, one might need an off-road jeep, a camel, or a donkey. Whatever the means of transport, it needs to be refuelled at some point – cars need to be tanked, camels and donkeys need to be fed – and the drivers need to rest some time. This in turn means that there are refuelling points such as serving stations or trading towns. These trade nodes usually need a whole industry specialising just on the services needed for upkeeping the commodity chain, such as a camel feed or oil refining industry. Moreover, these trading nodes need to be coordinated with each other as it will not do if, e.g., one place provides for different types of gas or tyres than the other place. Something similar can be said for boats, trains, and airplanes. Transport routes, typically linking specific places to specific other places, cannot be easily changed and therefore not only have an ecological impact – such a CO₂ imprint when transporting goods (Graphs 1 and 2) – but this impact is hard to change. Despite their importance, there is little sociological research on the infrastructure of “transport routes” and the associated logistics along the space of pathways. Most consumers and producers, too, have hardly any (spatial) knowledge about transport routes. This invisibility of the space of pathways has even intensified in the course of the logistical revolution since the 1970s. Modern container technology in particular conceals the goods during transport, separating the place of production from the place of sale in spatial knowledge (Buss 2020).

5.3 The Commodities: Food and Money

One of the main reasons for the invisibility of transport routes is that – apart from logistics personnel (such as merchants or drivers) – most people are rather fixed to specific places. They either do not interact directly at all with any persons involved in the transport of food commodities (e.g., in self-service or online-shops), or only interact with the actors responsible for the links directly before and after them. In other words, due to the length of the chain of interdependence (Graph 4) and the invisibility of transport routes, most people do not know most of the actors of the chain. Therefore, goods are typically

the only things that move across all contexts from beginning to end of the commodity chain and are the only way to transfer knowledge between contexts (Simmel 1996 [1901], 165, 179, 212-32). While transport routes and the commodity's properties change only slowly, commodities pass different locations of the chain in a very short time – i.e., in days, weeks, or months – and in this function, mediate between the space of pathways and the space of place.

Commodities – even money – are physically tied to their materiality (Simmel 1901, 182-98). In the course of circulation, humans charge goods symbolically (Simmel 1996 [1901], 129-266; Knoblauch 2020 [2017], 110-22) and in turn, typically transform in their materiality. For example, food is transformed into biofacts: e.g., by means of selective breeding or bioengineering, many tomatoes are much more durable than those a hundred years ago. By using processing technology such as irradiation, they become even more durable. They are thus neither purely “natural” anymore nor built artefacts but some hybrid mixture (Hering 2021, 131-78).

Since actors are unknowledgeable about many aspects of the commodity chain, it is possible to link the commodity with different types of knowledge at different stages of the commodity chain (Füllung 2020). For example, for consumers, consumer goods – such as “fresh produce” – are not only valued for their functional properties – such as satisfying a hungry person – but also serve for displaying social distinction: through what one eats, one shows who one is (Elias 2012 [1939]). Consuming fresh produce does not only reflect social hierarchies but also contributes to their reproduction (Freidberg 2009, 7). In most European countries, the higher classes have always eaten richer and fresher food. They could afford it, owned the land, disposed of the necessary labour, and bought what they could not produce themselves. For example, French aristocrats cultivated pears and peaches in private orchards and built special cold storage rooms to keep the rare fruits in stock out of season. Until the 19th century, such fruits were special luxury goods and were used by nobles to impress guests with the splendour of their own orchards (Freidberg 2009, 127). The importance of symbolic values of goods – in comparison to their functional value – has increased even more since the 1950s and 1960s, when capitalist production led to a general abundance of goods. Since then, social milieus have increasingly defined their identity and demarcated themselves from other milieus by specific bodies of knowledge they act upon and specific meanings they ascribe to certain products (Schulze 1996), which is reflected in milieu-specific habitus and tastes (Bourdieu 1984 [1979]). Individual goods can thus symbolise “sustainable” modes of consumption, such as not eating strawberries in winter, never eating avocados, or only eating apples from one's own region.

If consumers know a lot about goods, they can evaluate the goods themselves taste-wise, haptically, or visually, and can also infer spatial

characteristics from the goods themselves because they know, for example, that a specific good cannot be produced in a particular place or at a certain time of year. In order to facilitate quality evaluations for consumers with less knowledge, in most shops' fruit and vegetable sections, the goods themselves are accompanied by other objectified judgement devices (Karpik 2010), that is, signs that symbolise something that is not physically present at the specific space of place, such as retailing classes, labels, quality seals (such as the EU organic seal), standards, indications of origin (such as "Dutch tomatoes," which in Germany are a symbol for industrialised production of tasteless tomatoes in greenhouses) or brands (such as "Chiquita," which symbolise MNCs mass-producing bananas of good taste in the Global South). Like the good itself, these judgement devices express spatial characteristics of goods, ranging from certain places of sale to "exotic" or regional places of cultivation or to certain forms of organisation of the commodity chain such as "organic," "fair trade," or "from the region" (Fülling 2020, 2022).

Judgement devices (Karpik 2010) refer to conditions, circumstances, special features, and thus arguments that cannot be seen in the goods themselves at first glance and help retailers and consumers to include aspects external to the interaction situation when examining the quality of the goods. They thus mediate and translate knowledge to check, evaluate and compare the quality of the goods to be purchased against other offers. In this sense, they create a sense of security and reduce complexity by functioning as quality-equivalent forms. Actors actively use them to enforce their expectations, claims and standards and to stabilise them beyond a situation. Labels, brands, standards, indications of origin, etc., can thus be understood as instances of judgement formation and are used by retailing companies to establish different market segments on the basis of classifications and to translate these into different price categories (Beckert and Musselin 2013).

5.4 Places of Purchase: Shops

Once the food has reached the context of market withdrawal (Section 3.1), consumers can buy it from intermediaries. Intermediaries can be grocery retailers (e.g., supermarkets, discounters, organic food shops) or food services (e.g., canteens, restaurants, hawkers). As most Germans cook and eat most of their meals at home, the typical place of purchase is a retailer. Although these retailers can be non-stationary (e.g., online shops) or semi-stationary (e.g., hawkers, weekly markets), at least in the case of groceries, the shop is still not only a symbolic, but usually also an objectified space – pointing to the role of buildings in stabilising chains of interdependence (Elias 2006 [1969]; Christmann 2006; Steets 2010, 2015) – with a specific architecture (Uttke 2009; Million 2020), a specific layout and an interior design (Hering 2021), and salespoints such as counters (Hausendorf 2022).

Like the commodity, shops function as judgement devices for product quality, and within shops, fruit and vegetables are profiling segments that can serve as judgement devices for the quality of the shop (Hering 2021). For retailers, the spatial conflict between space of place and space of pathways thus becomes tangible by the contradicting demands (a) to make a broad variety of goods always and reliably available – and thus symbolising high quality, authenticity, and individuality – and (b) to standardise, rationalise, and reduce the variety of goods – to facilitate the organisation of circulation in the space of pathways (Hering 2021). Retailers solve this spatial conflict through active spacing (Löw 2001). They symbolise and materialise the business concept and create certain atmospheres by coordinating interior and exterior design, business organisation, choice of goods (varieties, origin, labels), and presentation (of goods, shelves, etc.) (Hering 2021). Through their socio-material arrangement, places of purchase thus frame shopping: What (which goods and qualities) can be purchased where (supermarket, discounter) and how (at what price)? Shops thus filter and transform institutional expectations and specifications into locally specific assortments and are able to reduce the customer's uncertainty and complexity (Hering 2021). At the same time, shops visualise prevailing quality convention (Diaz-Bone 2018) of translocally organised commodity chains. They thus become a point of reference for identification processes and produce a sense of security when shopping for food. Being onsite helps to reduce complexity – consumers assume that, e.g., in organic supermarkets, they find organically-produced foods, in discounters low-priced produce (Hering 2021). In addition, judgement devices are offered – e.g., indications of origin or regional seals – to facilitate the use of on-the-spot knowledge during shopping (Fülling 2020, 2022). In doing so, shops not only (re)produce global evaluation standards, but also refer to local conditions in which they are embedded (Hering 2021).

5.5 Neighbourhood and Cities as Spatial Arrangement

Buildings such as shops are not like islands in themselves but embedded in the urban design of the city they are located in. Neighbourhoods are embedded in specific ways in the city, have specific functions – e.g., working vs. residential neighbourhood, peripheral vs. central neighbourhood – and are linked via traffic routes, resulting in an overall spatial arrangement of the city (Kulke and Baur 2021). In these neighbourhoods, shops are linked to other buildings, which include other shops; homes (*Wohnort*, *Haus*, *Heim*); workplaces (*Arbeitsort*) such as offices; administrative and public service buildings such as nurseries, schools, or hospitals; traffic routes such as rivers, roads, or subway stations; and public spaces such as parks, gardens, or squares.

However, these spatial arrangements are not just arbitrary or creative assemblages of buildings. Rather, when constructing the general layout of a city

with its transport routes and individual buildings, architects, urban designers, traffic planners, and civil engineers of cities imagine specific types of persons using these buildings and pathways in specific ways – and hindering other types of persons to use them. Objectifications become tools (*Werkzeuge*) for societies conducting specific tasks (Simmel 1996 [1901], 261-2). The built environment alone does therefore not constitute a “neighbourhood,” “city,” or “transport route” in itself – only in combination with people do they make sense. According to Löw (2001), humans construct spaces by placing, spacing, and synthesising people and things.

This means that specific spatial arrangements cannot be grasped without understanding the specific chains of interdependence they link and stabilise. For example, as discussed in Sections 3.1 and 3.2, in the context of market withdrawal, production and consumption interlink and, in this interlinkage, food commodity chains are entwined with everyday life in a household’s neighbourhood: From a consumer’s perspective, buying, preparing, and eating food is only one among many other daily activities – such as cleaning, shopping for other goods, paid work, dropping off children at school, visiting doctors, banks and public administrations – which are conducted by a family member in a household division of labour and take place at different places scattered around the city – the home, the shops, the office, childcare facilities and schools, administrations, etc. Hence, consumers do not only have to coordinate their own interaction with intermediaries of the food commodity chain but also with their family members and many other actors. In order to coordinate so many people interlinking in manifold contexts, cities are governed by specific spatio-temporal regimes (Kulke and Baur 2021) – they have an intrinsic logic (Löw 2012).

When reflecting upon the role of objectifications in chains of interdependence, it becomes clear that spatio-temporal regimes are not only engrained in social institutions (Section 3.2) but also material, as they are engrained in a city’s objectified physical structure (*Raumstruktur*) which facilitates actions in compliance with the city’s time regime and at the same time makes deviant actions more difficult (Elias 2006 [1969]; Simmel 1996 [1901], 254-70). Within the urban structures, temporal orders embedded in social institutions coordinate people’s everyday pathways in time, the spatial structure’s materiality coordinates their pathways in space. In other words, the objectified spatial arrangement seems to be an infrastructure solidifying “multiple spatialities” (Knoblauch and Löw 2021). This can be exemplified by a family’s household division of labour: While two different families might opt for different types of household division of labour, both a city’s rhythm and physical structure typically assume that every family practices the same household division of labour, and based on this assumption, the city’s spatiotemporal order is structured (Hering and Baur 2019).

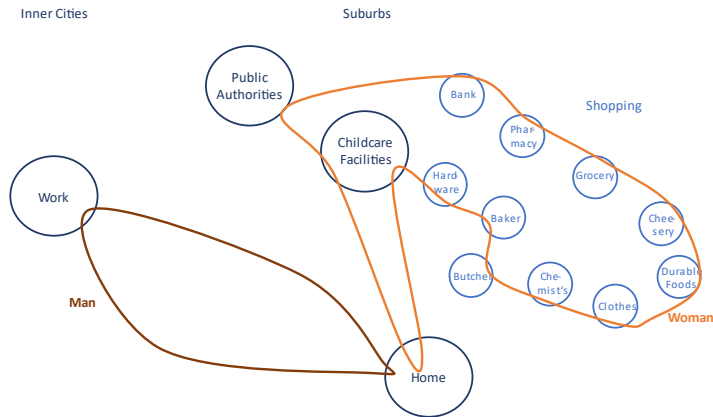
For example, since industrialisation in the 19th century, German spatio-temporal regimes were organised assuming the male breadwinner-female homemaker model (Section 3.2). “Working time” was separated from other activities, and the workspace (*Arbeitsort*) was physically separated from the home (*Wohnort*) (Maurer 1992). As a result, cities were designed in a way that the (male) workforce needed to commute with public transport to work either in the same or in a different quarter of the city (Hofmeister 2002) and women conducted all other tasks on foot, including shopping in their neighbourhood. Within their neighbourhood, women had to visit different shops for different kinds of food – a butcher, a baker, a cheesery, a grocery store, etc. – which were scattered at locations close to their homes (Graph 8a) (Kulke and Baur 2021).

As stated in Section 3.2, since the 1970s, Germans’ family ideals pluralised; more and more people wanted to practice a dual career model, and there were new technologies like cars. Accordingly, urban designers adapted the way they built cities to the new ways of life. Now the assumption was that both partners drove to work by car to other neighbourhoods than their neighbourhood of residence and went shopping on the way. Retailing reacted to the changes in consumer needs by coupling different retailing formats such as supermarkets, discounters, and, later, shopping centres, which allowed coupling of shopping with various services and leisure activities (Graph 8b) (Kulke and Baur 2021).

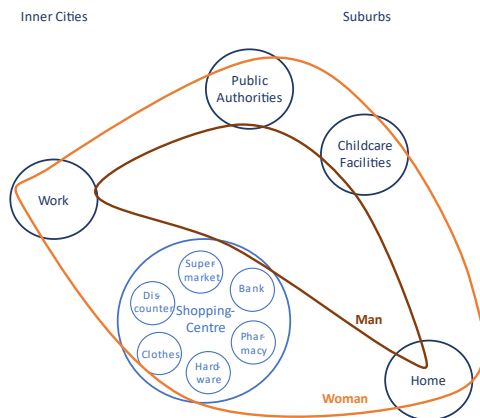
Concerning the question which types of social assumptions and institutions define a spatial arrangement, timing is key. In a city’s and neighbourhood’s formative phase (Berking and Schwenk 2011), architects, urban designers, traffic planners, and civil engineers materially objectify the subjective and institutional spatial knowledge of the respective time in the urban design of the neighbourhood and the traffic routes as well as the placement of buildings in the neighbourhood (Kulke and Baur 2021). While individual buildings might be torn down and replaced by other buildings, a city’s original grid – that is the general outline of the city, the layout of its streets and squares, the plot structure, and the location of key buildings – usually does not change at all (Mehlhorn 2012, 13).

Graph 8 Adapting Urban Structure to Social Institutions and Assumptions about “Normality” of a Family Life

(a) Male Breadwinner-Female Homemaker Model (19th century – 1950s)



(b) Dual Earner Family (since the 1960s)



Source: Own Graph.

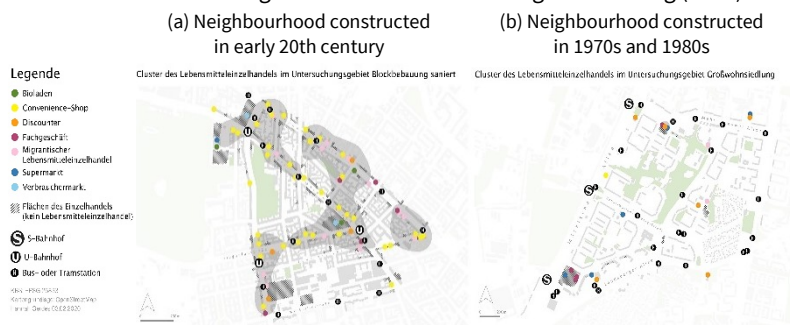
This objectified spatial knowledge in the form of the locality-specific spatial arrangement of buildings, traffic routes, and shop concepts henceforth decelerates and structures the refiguration into path-dependent trajectories in the *longue durée* (Kulke and Baur 2021). For example, in Berlin, the neighborhoods “Donaustraße/Flughafenstraße” in Neukölln and “Kollwitzplatz/Winsviertel” in Prenzlauer Berg were built between the 1890s and the 1940s, at a time when the male breadwinner-female homemaker model dominated and housewives were assumed to go shopping in the many small specialised grocery shops which were scattered throughout the neighbourhood. In

contrast, “Lichterfelde West/Schweizer Viertel” and “Marzahn Ost” were built between the 1950s and 1980s, a time when the place of work and the place of residence were functionally separated in different neighbourhoods and a dual career model was already assumed (Fülling and Hering 2020).

These spatial arrangements not only prevail in their basic structure today, but also have an effect on the spatial arrangements of the shopping locations in the neighbourhood, as retailers fit their shops into the neighbourhood structure. As Graph 9a shows, even in 2018, the quarter “Donaustraße/Flughafenstraße” still had a dense network of bus and underground stops but was hard to access by car and lacked parking facilities. Places of work and residence were still hardly separated, and the 33 stationary grocery shops were evenly distributed across the neighbourhood and coupled with food outlets and semi-stationary local markets.

The formative phase does not only effect how shops are arranged in the neighbourhood’s grid but also how they are fitted into the city. As Graph 10a illustrates, shops in older neighbourhoods are smaller and fitted like drawers into the ground floors of residential buildings because retailers had to fit the shops into existing built structures. Sidewalks are used as extended sales areas. This spatial arrangement creates a bustling atmosphere and a stronger presence of grocery retailing in the streetscape (Fülling and Hering 2020).

Graph 9 Embedding Social Assumptions about Shopping into Physical Structure of Neighbourhood via Urban Design of Retailing (2018)



Source: Fülling and Hering 2020.

Graph 10 Embedding Social Assumptions about Shopping into Physical Structure of Neighbourhood via Architecture of Retailing Outlets (2018)



Source: Fülling and Hering 2020.

In contrast, “Marzahn Ost” is a purely residential area. Fewer grocery shops – only 20 – cluster at the central transport hub, where the only tramway station intersects with major roads (Graph 9b). Large customer car parks make these shopping locations easily accessible for cars. As Graph 10b reveals, shops are typically designed as free standers, and shop design is more standardised. The overall visual impression of the neighbourhood is tidy and spacious (Fülling and Hering 2020).

6. The Challenge of the Fourth Ecological Transformation. Food, Climate Change, and Sustainability

Using the food market as an example, in this paper, I have followed up on a question Johan Goudsblom already asked in the 1980s: What are the obstacles towards a fourth ecological transition? In order to deal with this question, I have started with Elias and Goudsblom’s observation that since agrarianisation, chains of interdependence have become longer, more differentiated, and more complex. I have elaborated this thesis for food commodity chains. Complexity in these chains is further increased as each chain of interdependence (1) is divided into different social contexts following different spatial logics – e.g., the context of production, the context of market withdrawal, and the context of consumption – and (2) linked to other chains of interdependence – such as the media, financial markets, the labour market, or family life in private households. This entanglement in itself makes social processes fragile, as changes in one link in a chain of interdependence may have unintended side-effects on other links in the same chain or in other chains.

Complexity is further increased when it is taken into account that all social interactions are not only temporal but also spatial and that they entail materiality. Here, the approach of the refiguration of spaces helps closing theoretical and empirical gaps in figurational sociology. Concerning space, agrarianisation has induced processes of translocalisation and polycontextualisation which in turn result in a dominance of actors' non-knowledge about the commodity chain.

This in turn induces the questions how it is possible to keep up interactions along chains of interdependence, if actors have only very limited knowledge about the other actors in these chains. I have shown that there are three key devices for handling this problem: symbols, social institutions, and objectifications. While much has been written in the social sciences about symbols and social institutions, in comparison, the role of materiality in social interactions has been neglected. Here, the approach of the refiguration of spaces provides valuable insights, too.

In order to be able to keep up continuous interaction along the chain of interdependence and coordinate the exchange of money for goods along commodity chains, (spatial) knowledge is materially inscribed in objectifications. Examples for such objectifications are our bodies, commodities, technologies, buildings, the layout of neighbourhoods, or traffic routes. Objectifications function as carriers of knowledge, compensate for non-knowledge, and in doing so, allow for handling complexity in everyday life.

However, objectifications are at the same time the reason why it is so hard to (quickly) change chains of interdependence and (quickly) reduce humans' environmental impact. Firstly, they allow for non-knowledge, which means that actors remain ignorant, either because the chains of interdependence are too complex for individuals to conceive ("not-being-able-to-know") or because individuals resolve cognitive dissonances by not wanting to know.

Secondly, objectifications are not isolated but typically linked to each other in socio-technological systems and therefore can only be understood in their overall constellation in which they serve as infrastructures. By doing exactly what they are supposed to do – stabilising certain spatial arrangements and ensuring that the chains of interdependence become less fragile – objectifications stabilise these spatial arrangements and decelerate the refiguration of spaces as well as steer it along certain paths. This is especially true for urban designs of cities and for transport routes. Especially the latter are crucial for understanding humans' ecological impact, but they remain under-reflected in social science research. In other words, in order to better understand obstacles to the fourth ecological transformation, we will have to better understand the role of space and materiality in social processes.

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