

Zbornik

OVERCOMING THE INEQUALITIES OF GREEN TRANSITION

Scientific Texts of Students
Participating in the Summer School of
Political Ecology 2023



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UREDNIKI ZBORNIKA: dr. Andrej A. Lukšič, Sultana Jovanovska, Karla Tepež, Boštjan Remić

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Introduction

In recent decades, the world has experienced a series of global crises – ecological, health and financial crises, as well as a crisis of increasingly precarious living conditions. We are therefore increasingly confronted with a multifaceted crisis situation, which, in addition to the crises of financial markets, climate change and resource depletion, also encompasses crises of political representation, of the very conditions of life and of social reproduction. Although the current multifaceted crisis has different manifestations – both in terms of local specificities and in terms of intensity itself – it is necessary to speak of its global dimension, which goes along with the model of global capitalist development, whereby countermeasures remain inadequate or trapped in the paradigm of growth and austerity, despite the great awareness of the existence of crises.

The consequences of climate change, mass extinction of species, loss of habitats and pollution lead to general environmental and ecological issues that are appearing more than ever on the political agenda, as they affect and influence us all, albeit in a very unequal way. They have distinctly negative impacts on different regions in the world, societies, classes, groups of people and other living beings. The most vulnerable are the least responsible for the environmental crisis, but are usually the most affected. Policy measures for protecting the environment and climate that have been or are yet to be adopted are likely to lead to more inequalities and other undesirable social consequences: undermining social cohesion and reducing social welfare, as well as preventing just solutions to environmental issues.

The times of multiple environmental and social crises thus encourage us to look for alternative solutions. The International Summer School of Political Ecology 2023 explored growing inequalities and addressed the question why concepts such as en-

vironmental justice or just transition are increasingly important in discussions on how to tackle the environmental crisis without deepening inequalities. The main focus of the Summer School was on the growing inequalities within and between countries, and how our societies and economy can be organised in ways that do not exacerbate these inequalities, but also to not further harm our planet.

The students who actively participated in The International Summer School of Political Ecology 2023 addressed the issue of justice at different levels and spheres of human existence; 13 students at Master's level and 17 students at PhD level actively participated and submitted their texts as a requirement for credits in accredited programmes. In the following proceedings are only published texts written by students with consent of their mentors, according to the rules of scientific writing; some students' texts are not published in the following proceedings at their request; some of them being in the initial stages of their research and others that have finalized their work are waiting for publication of their research results in scientific journals. Moreover, this collection also does not include texts written in a more essayistic manner.

The following collection consists of 12 texts structured in three thematic sections. The first part deals with the question of how to think about existing realities in a new ways in order to resist growing inequalities: Miklič (Chapter 1) introduces novel concepts that could prove useful for political ecology and political economy, Katzer (Chapter 2) explores the single-level lifecycle optimization framework and shows its potential to address the complex task of sustainable development and the management of the global climate crisis, Saglietti (Chapter 3) explores collaborative approaches to just sustainability transitions, Malm (Chapter 4) focuses on how a just transition could be understood in the local context of the City of Gothenburg, Prusak (Chapter 5) provides valuable insights into attitudes toward climate change across political orientations, offering a basis for shaping effective climate policies, Žveplan (Chapter 6) inquires into the nature of

green political parties and sets out to uncover the underlying components of their (un)favorable election performance within a specific parliamentary democracy.

The second part contains texts dealing with the issue of energy transition and housing, or energy policy in specific countries such as Slovenia, Austria, Bosnia and Herzegovina, etc.: Hasić (Chapter 7) in her case-oriented comparative study focuses on the examining the role of science-based expertise and public policy-making in environmental governance, Kočman (Chapter 8) deals with the connection of environmental effects of energy production in the Republic of Slovenia and its relation to the European Union (EU) regulation, Žnidarič (Chapter 9) reflects on past and present use of fossil fuels and offers solutions towards greater environmental justice, Gerdes (Chapter 10) investigates the question of how to achieve a socially just energy transition in the residential building sector with focus on the Austrian context, van Heek (Chapter 11) contributes to the debate on inequalities in the energy transition in the global north, by exploring the role of rent and its uneven distribution.

The third part includes a text written by Streit (Chapter 12) which analyses ways the inequalities of Indigenous peoples in Brazil are the product of historical and contemporary processes of colonialism, marginalization, nation-state formation, and neoliberal politics, all of which heavily intervene in the natural environment.

Andrej Lukšič, Sultana Jovanovska

Part I:
**AGAINST
INEQUALITIES**

We Need to Talk About Prices: New Tools for Political Ecology and Political Economy

Abstract: The objective of this article is to introduce some novel concepts that could prove useful for political ecology and political economy. Old concepts are revisited, recombined in a novel way and upgraded with technologies that did not exist then, such as the internet, blockchain, and information and communications technology in general. The most important authors for our discussion are Robert Owen and Josiah Warren, where Warren's Cincinnati Time Store experiment serves as an important example. Karl Marx, Frederick Winslow Taylor and Émile Durkheim are the secondary point of reference, Friedrich Hayek is the main antagonist. The concepts of The Encyclopedia of Work, 2nd Price, and Parallel Global Cooperative System are proposed. Within these concepts, other ideas are presented: internet planning, ask and askonomy, and a list of rare resources. Furthermore, the life exchange rate is brought to the fore as the core question for societies that utilize a division of labor.

Keywords: practical utopia, second price, market price, time price, time-based currency, blockchain, cooperative, Josiah Warren, Robert Owen, Taylorism, life exchange rate.

¹ Sašo Miklič wrote this article under the mentorship of prof. dr. Andrej Lukšič.

Introduction

Fredric Jameson wrote that “it seems to be easier for us today to imagine the thoroughgoing deterioration of the earth and of nature than the breakdown of late capitalism; perhaps that is due to some weakness in our imaginations” (Jameson, 1994: xii). Deducing from this, perhaps our imagination is the way out of our ecological crisis. Perhaps we should focus on utopias. Not totally imaginary utopias. Utopias that can be actually applied but are deemed impossible for the majority of people from their current way of thinking. Slavoj Žižek said in the documentary film *Slavoj Žižek: The Reality of the Virtual* (Wright, 2004) that:

The main task today is to reinvent utopia, a space of utopia. What do you mean by this? It is not, of course, the old-fashioned utopia, which is the utopia of imagining an ideal world which we know in advance that will never be realized. The big models here are, of course, Plato’s Republic, Thomas More’s Utopia, and, we should not forget, Marquis de Sade’s Philosophy in the Boudoir. That is the classic utopia.

Later he went on:

We should dare to enact the impossible. We should rediscover how to, not imagine, but enact utopia. The point is not again about planning utopias, the point is about practicing them. And I think this is not a question of should we do it or should we simply persist in the existing order. It is much more radical. It is a matter of survival. The future will be utopian or there will be none.

On this note, let us first look at some experience from the past.

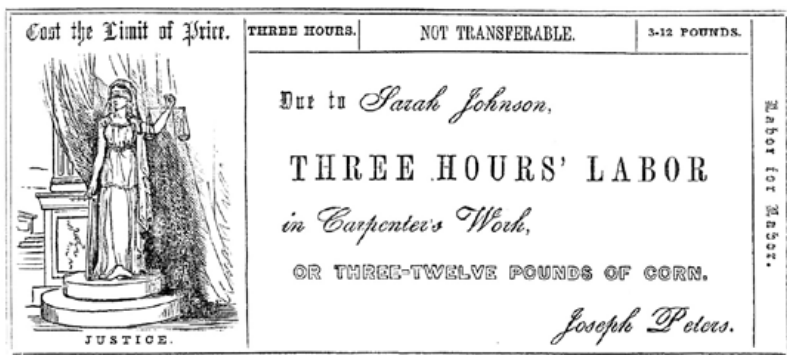
A long time ago on a continent far, far away...

Lived Josiah Warren. He was an American anarchist and a utopian socialist. Of the people described as utopian, only Warren actually founded a place called Utopia, a town in Ohio that still exists by this name. Hence, he is also known as the practical anarchist. His core principle was: „cost the limit of price“ as he

was against a profit-oriented economy (Sartwell, 2011: 5, 14). As early as in 1852, he questioned globalization and its costs in his book *Equitable Commerce* (Warren, 1852: 72, 73):

Why is every thing imported, even shoes, tools, woolen and cotton cloths? For profit. It is because things are not sold for their cost, but for whatever the holder can get. Were cost made the limit of price, the vender of goods would have no particular motive to purchase them at the very lowest prices that he could grind out from manufacturers; and they would, therefore, have no motive to under-work and destroy each other. There would be no more of each than enough to supply the demand—no motive to import what could be made with equal advantage at home...

Warren did many interesting things, but most relevant is his Cincinnati Time Store experiment that he undertook during the period from 1827 to 1830 to prove his concept of “labor for labor exchange” based on the labor theory of value. This experiment was influenced by Robert Owen as Warren and his family lived in Owen’s New Harmony utopian community in Indiana for a while until it failed (Sartwell, 2011: 4).



Labor note

At the Time Store(s) he established, one would pay for goods usually in legal tender, repaying the storekeeper for his time in purchasing, stocking, weighing, selling, and so on with a labor note, calculated by a large clock, hence the name “Time Store”.

Eventually, if the cooperative became large enough, the labor notes of a variety of people would be desirable; goods could then be purchased with labor notes, or labor notes could be exchanged as people made their needs known to one another by posting them on a notice board at the Time Store. Thus the Time Store would eventually mutate into a labor bank that would be the basis of a local cooperative economy (Sartwell, 2011: 18). The Time Store experiment was a success and one user, Mr. Cubberley, wrote about labor notes (Sartwell, 2011: 208):

These put us here into a reciprocating society. The result was, in two years, twelve families found themselves with homes, who never owned them before. Labor capital did it. I built a brick cottage one and a half stories high, and all the money I paid out was \$9.81. All the rest was effected by exchanging labor for labor. Money prices, with no principle to guide, have always deceived us.

Despite promising results early on, Time Stores and also generally other utopian communities at that time ultimately failed for various reasons (problems of scale, conflict between members, greed, economic crises, etc.).

Modern times

In his book *The Fatal Conceit: The Errors of Socialism*, Friedrich Hayek – the quintessential market fundamentalist – wrote the following (Hayek, 1988: 6, 7):

Socialists take a different view of these matters. They not only differ in their conclusions, they see the facts differently. That socialists are wrong about the *facts* is crucial to my argument, as it will unfold in the pages that follow. I am prepared to admit that if socialist analyses of the operation of the existing economic order, and of possible alternatives, were factually correct, we might be obliged to ensure that the distribution of incomes conform to certain moral principles, and that this distribution might be possible only by giving a central authority the power to direct the use of available resources, and might presuppose the abolition of indi-

vidual ownership of means of production. If it were for instance true that central direction of the means of production could affect a collective product of at least the same magnitude as that which we now produce, it would indeed prove a grave moral problem how this could be done justly. This, however, is not the position in which we find ourselves. *For there is no known way*, other than by the distribution of products in a competitive market, *to inform* individuals in what direction their several efforts must aim so as to contribute as much as possible to the total product. The main point of my argument is, then, that the conflict between, on the one hand, advocates of the spontaneous extended human order created by a competitive market, and on the other hand those who demand a deliberate arrangement of human interaction by central authority based on collective command over available resources is due to a factual error by the latter about how *knowledge* of these resources is and can be generated and utilised. As a matter of fact, this conflict must be settled by scientific study. Such study shows that, by following the spontaneously generated moral traditions underlying the competitive market order (traditions which do not satisfy the canons or norms of rationality embraced by most socialists), we generate and garner greater *knowledge* and wealth than could ever be obtained or utilised in a centrally-directed economy whose adherents claim to proceed strictly in accordance with 'reason'. Thus socialist aims and programmes are *factually impossible* to achieve or execute; and they also happen, into the bargain as it were, to be *logically impossible*.

As Hayek's writings have shown, the problem of efficiently organizing the economy is to a great extent a problem of knowledge and information. But the invention of the internet has enabled radical new ways of collecting information and preferences from individuals that were not possible beforehand. It is a tool for democratic input which has far greater information and knowledge potential that is possible by utilizing classical market or plan mechanisms. In other words, we should regard the internet as the most powerful democratic tool available to humanity.

We find many instances in human history that demonstrate how social progress was not possible until certain technological inventions came along. For example, the invention of the aqueduct enabled cities to grow beyond a certain limit (Barbier, 2019: 49). The same is true with the invention of the internet that opens up vast new possibilities for organizing society and allows new types of political and economic systems to emerge. It is a tool for direct democratic decentralization (as opposed to the capitalist market and its indirect democratic decentralization). In 2005 I wrote my diploma thesis at The Faculty of Social Sciences, University of Ljubljana on this topic with the title: *The Market as an Inegalitarian and Chaotic Model of Economy and Internet Planning as an Alternative- Politological Reflection* (Miklič, 2005). Internet planning started as a utopia, but the intent is, as Žižek said, to put it into practice, or we can also look through the lens of designs for the pluriverse and apply novel ideas of design to think about a transition to a truly sustainable planet (Escobar, 2011: 137-140). Intermittently I have been trying to develop (or design) and implement this idea ever since and have devised three phases of doing so:

- Phase 1: The Encyclopedia of Work (information level)
- Phase 2: 2nd Price (simulation level)
- Phase 3: Parallel Global Cooperative System (practice level)

Phase 1: The encyclopedia of work

There are certain simple questions we do not have easily available answers to. Such as how much human time is approximately needed to produce one apple? How much human time is approximately needed to produce one chair? How much human time is approximately needed to produce one table? I tried to answer these questions in an attempt in 2019 and 2020, but I failed in the end, as I could not get the required data from the private sector (inverse productivity). They were uncooperative, as capitalists instinctively feel that we want to talk about their profit and clam up. It became obvious that state intervention would be needed,

and that individual gathering of such data is quite ineffective. I wrote down the gist of my experience and elaborated on my ideas in an article entitled *An Encyclopaedia of Work* that was published in 2021 by The Ecologist (Miklič, 2021). The Encyclopedia of Work in this article is defined as an electronic book where the average amounts of human time required for creating products and services are stated. Implementation of such an encyclopedia is also the subject of my PhD that I am currently working on with a focus on the political will for such a book.

But this is not the first time that measuring productivity has been suggested. Let us take a look at both the past and current situation. We have been studying productivity for a long time now, yet this data about required human time was never collected in one place, and we know only partial values (not the data for the whole production chains). Furthermore, capitalists tend to guard such data and mainly share it between themselves, so they can maximize their profit (generally at the expense of consumers, workers and the environment).

Example of this is the hours-per-vehicle factor (HPV), which is one of the key pieces of data and indicators in the automotive industry. It shows us how much human time is needed to produce one car (Weyer, 2011: 3271-3273). The Harbour Report™ is an annual report and the auto industry's authority on manufacturing efficiency (first published in 1989), quantifying assembly, stamping and powertrain productivity performances – plant by plant, and company by company – for automotive manufacturers. It gauges HPV (the labor hours per vehicle) to calculate the total salary and hourly labor content required to produce one vehicle (Reliableplant.com, 2008). For the year 2007 the Harbour Report™ Press Release with some HPV data for North America can still be found (Autonews.com, 2007) and the Harbour Report™ for 2008 North America could still be bought for \$595 and it shows that the difference among the Big Six (General Motors Company, Ford Motor Company, Toyota Motors, American Honda, Chrysler Group, LLC, and Nissan Motors) from the most to least productive in terms of total manufacturing labor (assembly,

stamping, engine and transmission) has dropped to 3.50 hours per vehicle (or about \$260 per vehicle), down from 10.51 hours (or \$790 per vehicle) in 2003 (Reliableplant.com, 2008; Autotrends.org, 2009). But in the following year availability was drastically restricted. In 2009, participating auto makers voted and decided to keep the future Harbour Reports™ private for an indefinite period of time. Spokeswoman Michelle Hill explained this decision to automotive organization Ward's: we've had success with the European and South American reports being private, so we made the decision to make (North America) private. By doing this, even the limited public access to Harbour Report™ was gone. Now their website only presents some very elementary information about the Harbour Report™ and their owner, the Oliver Wyman management consulting firm, and a login prompt for their now exclusive membership (Theharbourreport.com, 2023). This demonstrates the current state of the dominant productivity studies for the automotive industry.

The foundations for these kinds of studies were already laid down by Frederick Winslow Taylor, who started systematically researching productivity in the 1880s while working at the Midvale Steel Company, and who published his seminal work *The Principles of Scientific Management* in 1911. He called his theory "scientific management", which is now also known as Taylorism (Gorman, 2008: 3955-3958). He wanted to increase efficiency or as he wrote (Taylor, 1911: 25):

Now, among the various methods and implements used in each element of each trade there is always one method and one implement which is quicker and better than any of the rest. And this one best method and best implement can only be discovered or developed through a scientific study and analysis of all of the methods and implements in use, together with accurate, minute, motion and time study.

Taylorism often has a negative connotation, but Taylor himself stated that scientific management is just a tool (*ibidem*, 133-134):

The knowledge obtained from accurate time study, for example, is a powerful implement, and can be used, in one case to promote harmony between the workmen and the management, by gradually educating, training, and leading the workmen into new and better methods of doing the work, or, in the other case, it may be used more or less as a club to drive the workmen into doing a larger day's work for approximately the same pay that they received in the past.

On the one hand he is fairly dubious about workers' motives and their solidarity, yet on the other hand he sang high praises of the "enlightened" management (*ibidem*, 104):

And even if the workman were to develop laws where before existed only rule-of-thumb knowledge, his personal interest would lead him almost inevitably to keep his discoveries secret, so that he could, by means of this special knowledge, personally do more work than other men and so obtain higher wages. Under scientific management, on the other hand, it becomes the duty and also the pleasure of those who are engaged in the management not only to develop laws to replace rule of thumb, but also to teach impartially all of the workmen who are under them the quickest ways of working. The useful results obtained from these laws are always so great that any company can well afford to pay for the time and the experiments needed to develop them.

However, is it not strange, looking at the previous example from the automotive industry, that big companies have no problem sharing productivity data between themselves, but have a big problem with this data being available to the general public? Why is that? Could it be, to paraphrase Taylor that "their personal interest would lead them almost inevitably to keep their discoveries secret, so that they could, by means of this special knowledge, personally pay less work to other men and so obtain higher profits"? Whatever the cause, the public accessibility of this kind of data or lack thereof is problematic.

Nevertheless, time prices are not foreign to us, we use them in everyday life. One prominent example is in the form of hiking trail signs (they can be regarded as hours-per-trail indicators).

They show us how much of our lives in hours and minutes we must spend on average to reach a certain destination, for example, a summit.



Mountain signpost in Slovenia with time prices labeled

Phase 2: 2nd price

But why do time prices threaten some people? Let us first look at the case of extreme circumstances. Slovenia experienced massive flooding in August 2023 (Euronews.com, 2023). Many bridges were destroyed in a short period of time, and some individuals took it upon themselves to act for the greater good and undertook the task of rebuilding these vital connections. One is Ambrož Duler and his wife Mirjana Duler, who run a company called Adteh. Ambrož was talking to the despondent local mayor about how they could help. Ambrož decided that they would build a new local footbridge across the Meža river as the previous one was destroyed, but the mayor replied that this was impossible. Ambrož proved him wrong and completed the 22-meter-long footbridge

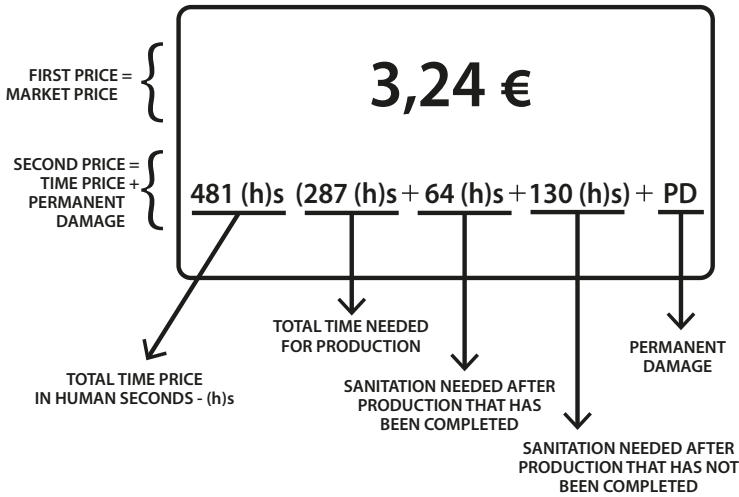
in 36 hours after talking to the mayor and in 24 hours after they obtained all the necessary parts for the bridge (Vecer.com, 2023).

Karl Marx would probably concur that this is an example of socially necessary labor time. In the first German edition of *Capital* he wrote (Dragstedt, 1976: 7-40):

It might seem that, if the value of a commodity is determined by the quantum of labour expended during its production, the more lazy and incompetent a man the more valuable his commodity is, because he needs all the more labour-time for its completion. But only the socially necessary labour-time is labour-time required for the constitution of some particular use-value, with the available socially-normal conditions of production and the social average-level of competence and intensity of labour.

In these hard times, the Duler family and affiliated workers showed us that things can also be done with less money or without money as they spent their own time building the new bridge (but the bridge was not “free” even from this viewpoint as they spent their time building it). In fact, contrary to widely held popular belief, money is not necessary to make things in a society. Money itself does not constitute products (with a pillow filled with banknotes possibly being an exception). What is absolutely vital, however, is to have know-how, a workforce, materials and a consensus to get things done. Many houses will also have to be rebuilt after the floods and housing is a good example to demonstrate the discrepancy between time prices that denote socially necessary labor time, which represents the baseline, and market prices with their capitalistic deviance from this baseline. We can calculate how much time workers need to build a house, then divide the final market price (that the end buyer paid) with their average monthly income to see how much their time they had to spend to buy the house. There is a difference between the first and the second time price. Where did this difference go and is this justified?

We can compute time prices in general and start labeling them on products and on market shelves. This is called the 2nd Price and it could look like this:



An example of a 2nd price label

Time price represents the socially necessary labor time and PD means permanent damage at the current technology level. By clearly labeling the second price beside market price we can clearly see the discrepancies between various products. For example, about 80% of all garlic comes from the People's Republic of China (Tridge.com, 2018). This garlic is more labor intensive as they use chemicals against sprouting, pests and pathogens that must be created (ABC.net.au, 2022), use forced prison labor with additional time price for guards (FT.com, 2018), they pollute the air and water by ship transport, and this is not sanitized (EMSA.europa.eu, 2023), yet Chinese garlic is way cheaper than locally produced garlic (BBC.com, 2019). Is this fair or is this a price pathology and we need a better valuation system? Another example, this time from personal experience, are lemons. The local supermarket was selling lemons from Egypt and South Africa. The price for a kilogram was identical, 1,90 € for either country. So, the countries are a whole continent and thousands of kilometers apart, but the price is the same. Is this sane? In this example market prices are the same, but time prices for these lemons are surely not equal and this information would be made clear to us by The 2nd price

labeling system. A great use of The 2nd price from an ecological standpoint is also that we could calculate how many additional jobs we need to create to clean after ourselves due to unfinished sanitation. Furthermore, objective time prices can help us anchor and limit subjective market prices through the power of transparency and information. Price setters can set and stretch prices, causing inflation, and time prices are a tool for limiting this. Neoliberal proponents should also be happy with a tool like this, as it helps to build perfect competition and perfect information, which are the core ideals of their “free” market ideology (TheGuardian.com, 2017).

The foundations for the 2nd price labeling system are already in place. We could build upon and expand the existing energy labels and ecodesign in the European Union, which, for example, label energy efficiency of household appliances from A to G (Commission.europa.eu, 2023).

If the purpose of Phase 1: The Encyclopedia of Work is just to inform, and the purpose of Phase 2: 2nd Price is to simulate the difference between market prices and time prices, the purpose of Phase 3 is to fully apply time prices in practice.

Phase 3: Parallel global cooperative system

In my opinion, the best way forward is to create a fusion between time banks and cooperatives with a digital currency based on human time, utilizing internet planning as a coordinating mechanism. In this time-based currency, units of currency would be the human hour – (h)h, human minute – (h)min, human second – (h)s, etc. and this currency could be based on blockchain technology. Some interesting practical steps in this direction have already been made in the field of elderly care in Taiwan (Chen et al., 2022).

What is now known as time banking started with Robert Owen and Josiah Warren, who were mentioned earlier. There have been many iterations of this idea since (Hauhart, 2012), but only recently have time banking advocates tried to establish a global system, yet it is still based on individuals rather than

whole communities and production chains. A good example of this would be TimeRepublik, whose slogan is: “A timebank for the internet era” (TimeRepublik.com, 2023). This organization collected a couple of awards and received some media attention recently (BBC.com, 2023). I spoke to the CEO & Co-founder of TimeRepublik Gabriele Donati a couple of years ago. It became apparent that they are focusing more on building friendships, happiness and have more complementary ambitions towards the current system. They were not thinking on the macro level suggested here, which would amount to a parallel system to the existing (dis)order. Perhaps this will change over time.

Cooperatives have a long history as well. The first cooperatives appeared as far back as in the 1700s, and Robert Owen also played a part in this, as he is regarded as the founder of the organized cooperative movement. His own cooperative attempts failed, yet the cooperative ideas he promoted caught on (Williams, 2007: xiv, 1, 10). He was against market-based cooperatives and private ownership, but these kinds of cooperatives proved to be the most successful. In the end, cooperative business proved more popular than cooperative communities. In 1844, the Rochdale Society of Equitable Pioneers was established (Restakis, 2010: 34-40), and they codified the Rochdale Principles of Cooperation, which became the standard for how to run a cooperative (Williams, 2007: 10). The updated version of these principles still forms the foundation of the cooperative movement of today, which is headed by the International Cooperative Alliance (ICA). They define a cooperative as an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise. The seven cooperative principles are: 1. Voluntary and Open Membership, 2. Democratic Member Control, 3. Member Economic Participation, 4. Autonomy and Independence, 5. Education, Training, and Information, 6. Cooperation among Cooperatives and 7. Concern for Community (ICA.coop, 2023a). Nowadays, cooperatives are not a marginal phenomenon. The World Cooperative Monitor states that at least 12% of people on earth are coope-

rators in one of the 3 million cooperatives on earth. Cooperatives provide jobs or work opportunities to 10% of the employed global population, and the 300 largest cooperatives or mutuals generate \$2,146 billion in turnover while providing the services and infrastructure society needs to thrive (ICA.coop, 2023b). Cooperatives could thus prove to be a vital element for a better future and are most suitable for reforms as their capital is owned by their members. A global cooperative of cooperatives could use time prices as a basis for valuation in their internal market between members. Private property is sacred in capitalism, and this would represent transactions within the same “company”. If states would try to challenge this, they would have to undermine the sanctity of private property. We are living under the thumb of global oligopolistic and monopolistic corporations, which act as quasi-states with little or no restraint. Therefore, having an option to be a part of a global cooperation or cooperations with better value for its members and the environment would be a liberating experience.

Over the years, I have changed the name for internet planning as it seemed prudent to do so. Now I prefer to call the internet planning the askonomy. But what is an askonomy? We have two main means of resource allocation on a macro level – “market” and “plan”. Now we also have “ask”. The market is not very political, plan is not very democratic, but ask is both political and democratic. Ask is a system that simply asks members of a society (via the internet) questions like what products and services do they want from their economy, how much they want to work to get them and similar political questions. Deliberation here is key.

What does an askonomy also do? It replaces the subjective price signals introduced by Hayek, which are indirect, with direct signals communicated from individuals via the internet and enables an economic system based on more fixed and objective prices – time prices. A price signal is a change in the price of goods or services which indicates that the supply or demand should be adjusted (Capital.com, 2023). Hayek wrote in his seminal work *The Use of Knowledge in Society* “fundamentally, in a system where the knowledge of the relevant facts is dispersed among

many people, prices can act to coordinate the separate actions of different people in the same way as subjective values help the individual to coordinate the parts of his plan” (1945: 526). Some libertarian authors even claim that price is the only language that everyone speaks (Ebeling, 2018).

But today there is no need to use such an indirect and inefficient way of coordinating an economy anymore. The invention of the internet has opened up new possibilities for organizing an economy. Imagine a big global online shop of all the products and potential products available. Producers and consumers would then cooperate directly and communicate their needs and expectations in real time, develop products together, order them, and vote for the creation of new products. For example, if 20 people preorder a red table, the factory then makes this table. This system is much more responsive than the current one. For political ecology, such a system would also be of value as overabundance of unnecessarily produced objects is diminished and the burden on our environment is lessened. Guessing needs is wasteful, while knowing needs by products on demand is more ecological.

Another thing we should strive to surpass is our fixation with licitation. There are many other ways of allocating resources. For instance, merit, selection by lot or by brute force, but we as a civilization have a fetish for licitation. We directly use bidding in auction houses or when we haggle. Price signals are indirectly also a form of a licitation that takes more time. But we can imagine a world where resources are more evenly distributed. Here we could use a list of rare resources. We already utilize a similar concept with the EU Emissions Trading System ([Climate.ec.europa.eu](https://climate.ec.europa.eu), 2023) but this list would be per capita. For example, ownership of aluminum could be limited to 3,000 kilograms per person. Then if somebody really loves aluminum and does not have enough of it, they can get some from the quota of another person, exchange some other rare resources with them in return or co-own bigger aluminum products. We really should not conflate rare and mass products. This is good for profit, but not for much else. Obfuscating only serves particular people, not everyone.

We have now explored how an alternative could be implemented, but we have not addressed the core question yet.

The core question = life exchange rate

The starting point is this. If one is self-sufficient, one does not need society. But who is self-sufficient today? Do we grow all our own food? Do we create all the materials for our clothing ourselves? Do we mine all the metals needed for our laptops by ourselves? If we are not self-sufficient, we need society to survive, and the division of labor comes into play. Émile Durkheim's doctoral dissertation was on this topic (organic solidarity is a useful concept related to our subject). In *The Division of Labor in Society* he wrote that "the time has passed when the perfect man was he who appeared interested in everything without attaching himself exclusively to anything, capable of tasting and understanding everything, finding means to unite and condense in himself all that was most exquisite in civilization" (1893: 42).

Let us look at a simple case of just two vital jobs: a farmer and a plumber. If a farmer spends 1 second of his life doing his job for a plumber, what number of seconds of his life must the plumber spend doing his job for the farmer in return? This is called the "life exchange rate". But what is a fair life exchange rate? 1 second of life for 1 second of life? 1 second of life for 2 seconds of life? 1 second of life for 0.5 seconds of life? The answer is that these are political questions.

We could also look at domestic work. What is a fair life exchange rate for domestic work between partners, for example, a woman and a man? Is it 1 second for 0 seconds (the man does not contribute)? Is it 2000 seconds for 0 seconds (the man still does not contribute)? Or should it be 1 second for 1 second?

Another area is work between countries. What is a fair life exchange rate between a worker in Germany and a worker in China (calculated from disparity of wages)? If a worker in Germany works for 1 second, should a worker in China work for 1.5 seconds? Should they work 2 seconds in return? Or perhaps

3 seconds or more are optimal for chasing the elusive maximum profit around the globe?

And lastly, we can apply the life exchange rate concept to the ratio between the main classes. What is a fair life exchange rate between a worker and a capitalist? Is it 1 second of worker's life for 0 seconds of the life of the capitalist (the capitalist does not work)? Is it 2,000,000 seconds for 0 seconds (the capitalist still does not work)? Or is it 1 second for 0.05 seconds (because the capitalist had to resell company stocks)? To recap. A life exchange rate of 1 to 100 means that for 1 hour of life one gives to society, one takes 100 hours of life/social labor from the other members of society. It is not about pay discrepancies, it is about life discrepancies.

Why is this important? *Memento mori*. Our time on this Earth is limited. We can talk about the time capital each of us has. For example, Hannah Arendt had a time capital of 69 years, 1 month, and 20 days. That is 25,253 days or ~2,181,859,200 seconds and then she died (Gorman, 2008: 118). The life expectancy at birth in the EU was 80.1 years in 2021 (Ec.europa.eu, 2023), and in the USA it was 76.1 years in 2021 (CDC.gov, 2022). So, is it normal that a second of one person is worth more than a second of another person? Should work and life not be mutually recognized and respected if we utilize a division of labor? Henry David Thoreau wisely reflected:

If it is asserted that civilization is a real advance in the condition of man, and I think that it is, though only the wise improve their advantages, it must be shown that it has produced better dwellings without making them more costly; and the cost of a thing is the amount of what I will call life which is required to be exchanged for it, immediately or in the long run. An average house in this neighborhood costs perhaps eight hundred dollars, and to lay up this sum will take from ten to fifteen years of the laborer's life, even if he is not encumbered with a family estimating the pecuniary value of every man's labor at one dollar a day, for if some receive more, others receive less; so that he must have spent more than half his life commonly before his wigwam will be earned (Thoreau, 1854: 31).

Conclusion

A case has been made for the necessity to talk about market prices and compare them to human time prices. Transparency and knowledge derived from this could stem some excesses of capitalism. Some other concepts have been introduced that might prove helpful but need to be tested. They are all based on experiences and ideas from the past that have been recombined in a novel way and upgraded by the application of new technology. Besides “market” and “plan”, “ask” could be introduced as an allocation and coordination mechanism for our economy. Cooperatives could lead the way. We might introduce a list of rare resources. Labeling permanent ecological damage and time prices on products could change the behavior of consumers. But we have no illusions. Just implementing The Encyclopedia of Work is a huge undertaking and political will for it is not necessarily present, as some people profit from the existing arrangement of things. It was suggested that we make life exchange rates a vital topic of our debates about the future. If we are to have a future at all, focusing on practical utopias and designing them would also be wise, as the biggest existing classic utopia by far is that we can continue with the economy as we have now for an unlimited amount of time. Alternative possibilities are here, the goal is now to put them into practice.

Literature

- ABC.net.au** (2022): Fresh vs fumigated — the difference between Australian and imported Chinese garlic. Accessible at: <https://www.abc.net.au/news/rural/2022-12-10/australian-garlic-farming-sunshine-coast-rural-christmas-gift/101682854>, 15.8.2023.
- Autonews.com** (2007): 2007 North America Press Release. The Harbour Report™. Accessible at: <https://www.autonews.com/assets/pdf/ca2018861.pdf>, 15.8.2023.
- Autotrends.org** (2009): The Big Six Automakers Defined. Accessible at: <https://autotrends.org/big-six-automaker-brands/>, 15.8.2023.
- Barbier, Edward B.** (2019): The Water Paradox: Overcoming the Global Crisis in Water Management. New Haven and London: Yale University Press.

- BBC.com** (2019): The garlic farmers who love Trump's tariffs. Accessible at: <https://www.bbc.com/news/business-50458312>, 15.8.2023.
- BBC.com** (2023): The people turning time into a currency. Accessible at: <https://www.bbc.com/news/business-65397192>, 15.8.2023.
- Capital.com** (2023): What is a price signal? Accessible at: <https://capital.com/price-signal-definition>, 15.8.2023.
- CDC.gov** (2022): Life Expectancy in the U.S. Dropped for the Second Year in a Row in 2021. CDC, National Center for Health Statistics. Accessible at: https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2022/20220831.htm, 15.8.2023.
- Chen, Hungyi, Yuan-Chia Chu, Feipei Lai** (2022): Mobile time banking on blockchain system development for community elderly care. *Journal of Ambient Intelligence and Humanized Computing*. Accessible at: <https://doi.org/10.1007/s12652-022-03780-6>, 15.8.2023.
- Climate.ec.europa.eu** (2023): EU Emissions Trading System (EU ETS). The European Commission. Accessible at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en, 15.8.2023.
- Commission.europa.eu** (2023): About the energy label and ecodesign. The European Commission. Accessible at: https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/about_en, 15.8.2023.
- Dragstedt, Albert** (1976): *Value: Studies By Karl Marx*. London: New Park Publications. Accessible at: <https://www.marxists.org/archive/marx/works/1867-c1/commodity.htm>, 15.8.2023.
- Durkheim, Émile** (1893): *The Division of Labor in Society*. London: The Free Press of Glencoe. Accessible at: <https://archive.org/details/in.ernet.dli.2015.126617/mode/2up>, 15.8.2023.
- Ebeling, Richard M.** (2018): Price Is the Only Language that Everyone Speaks. The Foundation for Economic Education (FEE). Accessible at: <https://fee.org/articles/price-is-the-only-language-that-everyone-speaks/>, 15.8.2023.
- Ec.europa.eu** (2023): Life expectancy at birth down to 80.1 years in 2021. Eurostat. Accessible at: <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230316-1>, 15.8.2023.
- Escobar, Arturo** (2011): Sustainability: Design for the pluriverse. *Development* 54 (2): 137– 140.
- EMSA.europa.eu** (2023): Prevention of Pollution by Ships. European Maritime Safety Agency. Accessible at: <https://www.emsa.europa.eu/we-do/sustainability/environment.html>, 15.8.2023.
- Euronews.com** (2023): In pictures: Slovenia faces 'worst-ever natural disaster' after extreme flooding. Accessible at: <https://www.euronews.com/green/2023/08/07/in-pictures-slovenia-faces-worst-ever-natural-disaster-after-extreme-flooding>, 15.8.2023.
- FT.com** (2018): Supply chains: the dirty secret of China's prisons. Accessible at: <https://www.ft.com/content/1416a056-833b-11e7-94e2-c5b903247afd>, 15.8.2023.
- Gorman, Robert F.** (editor). (2008): *Great lives from history: The 20th century, 1901– 2000, Volume I*. Pasadena and Hackensack: Salem Press.

- Hauhart, Robert C.** (2012): 19th-CENTURY LABOR MONEY SCHEMES, SELF-REALIZATION THROUGH LABOR, AND THE UTOPIAN IDEA. *World Review of Political Economy* 3(2): 177–190. Accessible at: <https://www.jstor.org/stable/41931977>, 15.8.2023.
- Hayek, Friedrich A.** (1945): The Use of Knowledge in Society. *The American Economic Review* 35(4): 519-530. Accessible at: <https://archive.org/details/hayek/mode/2up>, 15.8.2023.
- Hayek, Friedrich A.** (1988): The Fatal Conceit: The Errors of Socialism- The Collected Works of Friedrich August Hayek Volume I. London: Routledge.
- ICA.coop** (2023a): Cooperative identity, values & principles. The International Cooperative Alliance. Accessible at: <https://www.ica.coop/en/cooperatives/cooperative-identity>, 15.8.2023.
- ICA.coop** (2023b): Facts and figures. The International Cooperative Alliance. Accessible at: <https://www.ica.coop/en/cooperatives/facts-and-figures>, 15.8.2023.
- Jameson, Fredric** (1994): The Seeds of Time. New York: Columbia University Press.
- Miklič, Sašo** (2005): The Market as an Inegalitarian and Chaotic Model of Economy and Internet Planning as an Alternative- Politological Reflection. Ljubljana: Miklič Sašo- diploma thesis. Accessible at: <http://dk.fdv.uni-lj.si/dela/Miklic-Saso.PDF>, 15.8.2023.
- Miklič, Sašo** (2021): An Encyclopaedia of Work. *The Ecologist*. Accessible at: <https://theecologist.org/2021/apr/06/encyclopaedia-work>, 15.8.2023.
- Reliableplant.com** (2008): Harbour Report: Detroit Three close productivity gap. Accessible at: <https://www.reliableplant.com/Read/12134/harbour-report-detroit-three-close-productivity-gap>, 15.8.2023.
- Restakis, John** (2010): Humanizing the Economy: Co-operatives in the Age of Capital. Gabriola Island: New Society Publishers.
- Sartwell, Crispin** (2011): The Practical Anarchist: Writings of Josiah Warren. New York: Fordham University Press.
- Taylor, Frederick W.** (1911): The principles of scientific management. New York and London: Harper & Brothers. Accessible at: <https://archive.org/details/principlesofscie00taylrch/mode/2up>, 15.8.2023.
- Theharbourreport.com** (2023): Homepage. Accessible at: <https://www.theharbourreport.com>, 15.8.2023.
- TheGuardian.com** (2017): Neoliberalism: the idea that swallowed the world. Accessible at: <https://www.theguardian.com/news/2017/aug/18/neoliberalism-the-idea-that-changed-the-world>, 15.8.2023.
- Thoreau, Henry D.** (1854): Walden. The Writings of Henry D. Thoreau. Princeton and Oxford: Princeton University Press.
- TimeRepublik.com** (2023): Homepage. Accessible at: <https://timerepublik.com/>, 15.8.2023.
- Tridge.com** (2018): 2018 Will be the Most Difficult Year for Garlic Export: Chinese Garlic at Risk. Accessible at: <https://www.tridge.com/stories/2018-will-be-the-most-difficult-year-garlic-export-chinese-garlic-at-risk>, 15.8.2023.

- Vecer.com** (2023): (INTERVJU) Graditeljja mostu na Prevaljah: To smo naredili spontano, naj nas posnema še kdo. Accessible at: <https://vecer.com/slovenija/intervju-graditeljja-mostu-na-prevaljah-to-smo-naredili-spontano-naj-nas-posnema-se-kdo-10338144>, 15.8.2023.
- Wardsauto.com** (2009): Harbour Report Goes Private This Year. Accessible at: <https://www.wardsauto.com/news-analysis/harbour-report-goes-private-year>, 15.8.2023.
- Warren, Josiah** (1852): *Equitable Commerce: A New Development of Principles, As Substitutes For Laws And Governments, For The Harmonious Adjustment and Regulation Of The Pecuniary, Intellectual, And Moral Intercourse Of Mankind. Proposed As Elements Of New Society*. New York: Fowler and Wells. Accessible at: <https://ia804708.us.archive.org/4/items/equitablecommerc00warr/equitablecommerc00warr.pdf>, 15.8.2023.
- Weyer, Matthias** (2011): Hours-per-vehicle controlling: the renaissance of staff productivity. *International Journal of Production Research* 49 (11): 3271-3284.
- Williams, Richard C.** (2007): *The Cooperative Movement: Globalization from Below*. London and New York: Routledge.
- Wright, Ben** (director). (2004). *Slavoj Žižek: The Reality of the Virtual* [documentary film]. Ben Wright Film Productions.

Integrated Sustainability Optimizations as a Tool for Industry and Politics - The Concept of a Multi-Level Lifecycle Sustainability Optimization Framework

Abstract: Existing frameworks of strategic sustainable development (SSD) do not solve the problem of reallocating the planetary boundaries (PBs) (e.g., the remaining European Union (EU) greenhouse gas budget) to targeted sectoral measures, or one level below that, deriving environmental impact caps for products and services (e.g., the heavy-duty vehicle (HDV) propulsion technology and design for a specific use-case). This poses a problem for both policymakers and industry. Two theoretical case studies of the developed single-level lifecycle optimization (LCSO) framework are brought forward: One of the Austrian strategic measure pathways to climate neutrality, and one of the early-stage development of HDVs. The existing dependencies are presented and subsequently embedded into the idea of a multi-level LCSO framework. Hence, this contribution aims to explore and (further) develop the multi-level LCSO framework as a tool for industry and policymakers to (i.e.) effectively allocate the remaining greenhouse gas (GHG) budget and achieve the goals of the Paris Agreement. With further refinements, the framework might ultimately introduce comprehensive strategic sustainable development (SSD) at all levels. Current challenges

¹ Nicolas Katzer wrote this article under the mentorship of prof. dr. Rupert J. Baumgartner.

of realizing the framework are given, as well as required steps of testing and adaptation, refinements, and further methodological developments.

Keywords: strategic sustainable development, single-level lifecycle optimization (LCSO), greenhouse gas, Paris Agreement, multi-level LCSO framework, industry, policymaking, climate neutrality.

Introduction

The Paris Agreement marks a major turning point in global efforts to combat climate change (Estrada, 2021), with the goal of limiting global warming to well below 2 degrees Celsius above pre-industrial levels (United Nations UNFCCC, 2015). To achieve this ambitious goal and to enable the transition to a climate-neutral future, strategic allocation of the remaining greenhouse gas budget to emitting sectors, and in particular to products and services within those sectors is critical.

Current legislative and institutional frameworks have recognized the urgency of climate action and implemented measures and frameworks, such as the EU Emissions Trading Scheme (EU ETS) (European Commission, 2023b), the proposed EU-wide supply chain due diligence law proposal (EU Commission, 2023a), and corporate social responsibility (CSR) (United Nations UNIDO, 2023). However, existing frameworks of strategic sustainable development (SSD) do not solve the problem of reallocating the planetary boundaries (PBs) (e.g., the remaining European Union (EU) greenhouse gas budget) to targeted sectoral measures, or subsequently, deriving environmental impact caps for products and services (e.g., the heavy-duty vehicle (HDV) propulsion technology (called powertrain) and design of its various components for a specific use-case). This poses a problem for policymakers to develop top-down policies and for industries to develop bottom-up solutions. (Hsu et al., 2020).

To close this gap, the innovative approach of „Lifecycle Sustainability Optimization“ (LCSO) is a possible solution (Wolff et al., 2021), applying an optimization on top of the method of lifecycle

sustainability assessment (LCSA). The latter can combine ecological lifecycle assessment (E-LCA; analysis of environmental impacts such as global warming, ozone depletion, ocean acidification, chemical pollution, etc.), lifecycle costing (LCC; analysis of economic impacts on investments, operating costs, and externalities), and social lifecycle analysis (S-LCA; analysis of social impacts such as human rights violations, fair labor conditions, cultural infringements, etc.) to provide a holistic perspective on the environmental, economic and social aspects of products and services (Hoogmartens et al., 2014). In the subsequential optimization, the possible variable bandwidths (e.g., magnitude of legislative measures or physical limitations of HDV components) are defined first as the solution space. Then, the best suited configuration of the variable values within the solution space is found by applying an algebraic or generational optimization algorithm. By integrating LCSO into strategic sustainable development (SSD) processes, the identification of opportunities for optimization across the entire “lifecycle” can be enabled (Bouchouireb, 2023) – scalable from products and services, to the sector level.

The current state of the author’s research shows the first concrete concepts of specific single- level LCSO frameworks, as well as the derived general single- and multi-level LCSO frameworks. Testing of the specific single-level LCSO frameworks of the exemplary case studies (of the optimization of the identified strategic legislative measures to reach climate neutrality in Austria and the optimization of HDV designs for specific use-cases) are underway. However, these case studies are just exemplary representatives of their respective optimization subject (economies and products, respectively) and may be substituted by other SSD challenges.

Further research will undoubtedly lead to the development of the idea of the multi-level LCSO framework presented in this contribution. The research design is hereby structured around the following research questions:

RQ1: How shall a lifecycle sustainability optimization (LCSO) framework be designed to allow optimizations on different levels (sectors and products & services)?

- **RQ1.1:** *How can the vehicle design be optimized from a sustainability impact perspective while fulfilling the relevant functional requirements for the powertrain?*
- **RQ1.2:** *How can the sector design be optimized from a sustainability impact perspective while fulfilling the “no-regret options” requirements?*
- **RQ1.3:** *Which (environmental, social, economic) aspects can be included in the target functions of the lifecycle sustainability optimization framework at which design process stage?*

Hence, this contribution aims to explore and (further) develop the framework of integrated LCSO as a tool for industry and policymakers to effectively allocate the remaining GHG budget and achieve the goals of the Paris Agreement, ultimately introducing comprehensive strategic sustainable development (SSD) at all levels. The theoretical case study of the Austrian economy and the heavy-duty vehicle (HDV) optimization are applied exemplarily. In doing so, it presents the idea of policymakers specifically deriving legally required measures and optimizing sectors in a structured manner (top-down approach), while the industry can specifically optimize their products and services with LCSO (ideally based on the given legal sector roadmaps). In particular, the scalability and analogies between product & service optimizations and sector optimizations will be explored. This should enable both for policymakers to align and introduce legislation and frameworks, and for industry to develop and place products and services. Thus, this contribution shows the potential of the not yet fully developed LCSO framework to address the complex task of sustainable development and the management of the global climate crisis in a complementary way on several levels (policy and industry).

Background

The idea for the LCSO framework is to enable strategic sustainable development (SSD), hence connecting very diverse optimization challenges and disciplines. For that reason, extended

background information on the various dimensions is provided, to help the readers of specific disciplines to follow along.

Lifecycle (sustainability) assessment

Lifecycle Assessment (LCA) is a method for holistically assessing the impact of a product or service over its entire lifecycle, from raw material extraction through production and use to disposal. The general lifecycle idea in LCA is that a product or service is not considered in isolation but in the context of all associated processes and activities.

The most common approach is the ecological LCA (E-LCA), which was developed in the 1990s as a method for evaluating the environmental impact of products over their entire lifecycle (Bjørn et al., 2020). They are used to quantify environmental aspects such as greenhouse gas emissions, resource consumption, and waste production, and to compare products or processes. However, it is important to note that currently used E-LCA tools (sphaera, 2023; iPoint, 2023; GreenDelta, 2023; Brightway Developers, 2023; Pré Sustainability, 2023) primarily provide relative assessment results (Pré Sustainability, 2023). Thus, current E-LCAs do not provide an unambiguous result as to whether the product/process assessed is sustainable, but only a comparison to alternatives and associated lower impacts. Therefore, a visible trend in the scientific community is towards formulating absolute impact indicators (Ferretto et al., 2022; Luukkanen et al., 2021) or establishing relationships with absolute benchmarks (Doka, 2015; Pehrson, 2020), predominantly to ensure compliance with set climate targets.

Lifecycle Costing (LCC) is a concept used to evaluate the total cost of a product or service over its entire lifecycle. It allows companies, governments, and other stakeholders to consider not only the initial cost but also the costs associated with operation, maintenance, use, recycling, and disposal. The benefit of LCC is that it provides a comprehensive financial analysis that includes all relevant direct cost factors. It helps companies optimize costs over the entire lifecycle rather than focusing solely on short-term acquisition costs (Norris, 2001). LCC enables informed decision-making to identify

economically efficient and environmentally sustainable solutions. In addition to businesses and governments, LCC is also used in research for sustainability assessments (Larsen et al., 2022). It enables the consideration of lifecycle costs versus environmental impacts and supports the identification of cost-effective mitigation measures.

Social Lifecycle Assessment (S-LCA) is an emerging concept that aims to evaluate social aspects along the lifecycle of products or services. The development history of S-LCA is still comparatively short. It complements traditional environmental and economic LCAs and helps to analyze the social sustainability of products, services, organizations, or nations by capturing social impacts such as labor conditions, human rights, health and safety, social equity, and cultural impacts (UNEP, 2020).

Although S-LCA is considered a promising concept, it still faces challenges in terms of standardization and operationalization. There is currently no single S-LCA standard or universally accepted methodology as the development of indicators, data sources, and assessment methodologies for social impacts is complex and requires further research and collaboration.

Some frameworks have been proposed to support and structure S-LCA. The most used frameworks are the one developed by the Setac Lifecycle Initiative (UNEP, 2020), the PSIA Handbook (Pré Sustainability, 2020), and the Social Capital Protocol (Social & Human Capital Coalition, 2019). Another approach is „Doughnut Economics“ by Kate Raworth (2017), which integrates social and environmental aspects in a comprehensive and sustainable economic approach.

More research is needed to further develop methods and standardize impact pathways for S-LCA. There is a need to define and operationalize social indicators, integrate local and cultural differences, develop data sources, and create a common framework for assessing social sustainability along the product lifecycle (Fürtner et al., 2021).

Integrating the three dimensions of sustainability also tackled in LCAs leads to a so-called Lifecycle Sustainability Assessment (LCSA). It is a concept that aims to evaluate the comprehensive sustainability performance of products, services, or

systems over their entire lifecycle, instead of purely environmental, financial, or social aspects (Larsen et al., 2022; Popien et al., 2023). It helps companies, governments, and other stakeholders make sustainable decisions by considering environmental, social, and economic impacts throughout the lifecycle.

The history of LCSA's development is closely linked to the development of LCA and S-LCA. In recent years, the concept of LCSA has evolved to provide a more comprehensive and integrated assessment of sustainability. Various approaches have been developed to address the complexity of sustainability assessments and improve the comparability of results. However, there is currently no standardized framework in place. In addition, an increasing number of tools and software are being developed to enable LCSA to be conducted (Pré Sustainability, 2023). These tools enable the collection and analysis of data along the lifecycle and assist in the assessment and visualization of sustainability performance.

Further development of LCSA focuses on several areas. One important aspect is the development of uniform standards and guidelines for conducting LCSAs. This would improve the comparability of results and enable better integration of sustainability aspects into decision-making processes (Bjorn et al., 2020). In addition, as aforementioned, there is a need for a more comprehensive integration of social aspects in LCSA (Hoogmartens et al., 2014).

Lifecycle optimization and design paradox

Lifecycle Energy Optimization (LCEO) and Lifecycle Sustainability Optimization (LCSO) are approaches that aim to optimize the energy consumption and sustainability performance of products, services, or systems throughout their lifecycle. These approaches combine mathematical models and optimization techniques to quantify the potential for reducing energy consumption and improving sustainability performance or to identify the best product design or service design, respectively. Accordingly, these approaches are particularly important in product development and the design process (Bouchouireb, 2023).

The underlying concept of LCEO and LCSO assumes that the lifecycle of a product or system consists of different phases, namely beginning-of-life (BOL; e.g., raw material extraction and production), middle-of-life (MOL; e.g., use phase), and end-of-life (EOL; e.g., recycling or disposal). Each of these phases is associated with a certain energy consumption and environmental impact (O'Reilly et al., 2016).

The mathematical models consider various decision variables, such as the selection of materials, production processes, transportation routes, and patterns of use and recycling. The goal is to identify those decisions that reduce energy consumption or maximize sustainability performance (Wolff et al., 2021). Energy in this context, as the work of O'Reilly et al. and Bouchouireb (Bouchouireb, 2023; O'Reilly et al., 2016) points out, is to be understood as an environmental proxy that is intended to represent a sufficient representation of environmental impacts.

An example of a mathematical model for optimizing energy consumption is the linear programming model, which can be formulated as follows (Bouchouireb, 2023):

$$E_L(X) = E_P(X) + E_U(X) + E_E(X) \quad (1)$$

The formula describes the lifecycle energy (E_L) as the sum of E_P (the production energy), E^U (the use-phase energy), E_E (the end-of-life energy), and X (the set of design variables).

$$(E_L(X)) \quad (2)$$

Is subject to constraints of the form:

$$T_{(I)}(X) \leq 0, \quad (3)$$

$$T_{(E)}(X) = 0, \quad (4)$$

$$T_{min}(X) \leq X \leq X_{max}, \quad (5)$$

In product development, the application of LCEO and LCSO plays a critical role to implement optimizations of energy efficiency and sustainability performance at the early stages of the design process. By integrating sustainability indicators into de-

velopment, potential improvements can be identified and implemented before the product goes into production, which is when many product characteristics and lifecycle phases have been defined. This is described in the so-called „Eco-Design Paradox,“ which states that in the early phases of product development, major improvements can often be achieved in terms of environmental impact, while in the later stages of development, the possibilities for further optimization are limited (Chebaeva et al., 2021), as illustrated in Figure 1. This is because, in the early stages of design, many alternative options and innovative approaches are available to find more sustainable solutions. However, as development progresses, decisions and investments are made that make it more difficult to change already established designs or to make significant improvements (Bouchouireb, 2023). However, the eco-design paradox also implies that the uncertainties are usually very high and information is incomplete in early design phases. Hence, the validity is limited for optimization results at the early stages of development (O'Reilly et al., 2016).

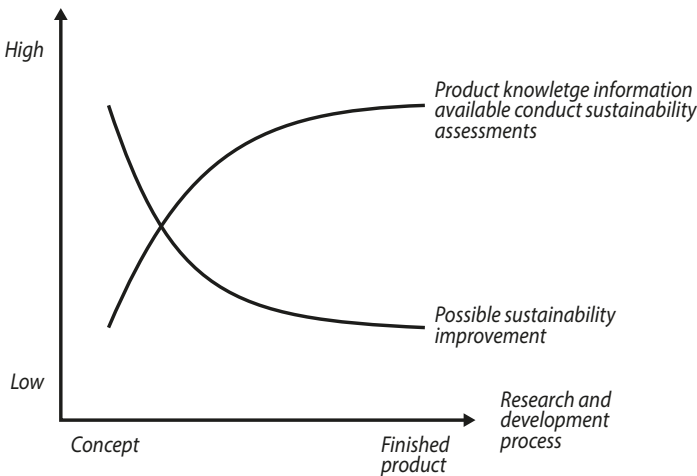


Figure 1: Visualization of the Eco-Design Paradox (Chebaeva et al., 2021)

In order to overcome the Eco-Design Paradox it is important to follow a holistic approach which, on the one hand, considers all

relevant environmental aspects at an early stage to avoid shifts of burdens, and, on the other hand, manages to do so with a limited data availability at early stages of development.

Dranka et al. (2021) depict that for the energy sector most research was conducted on short-term market and cost optimizations. However, there are some publications also focusing on long-term optimizations of value chains and sectors (still mainly to reduce costs), with a few studies applying (environmental) sustainability optimizations within their very own frameworks like Kannegiesser & Günther (2013), Atabaki et al. (2022), and Reinert et al. (2022). Despite optimizing quite different aspects, all of them share the main structure with an optimization goal, a system model with specific variables, constraints, and requirements, and a defined target function. While some include all constraints or requirements within the system model of variables, others state them explicitly as “external drivers” from nature, society, politics, or the economy. Nonetheless, all utilize technology baselines as inputs for their system models, their results do not allow to derive regulations for organizations, products, or services. This link is only provided by studies like the one from Guerrero et al. (2013), which focus explicitly on policy impact optimizations for SSD. In summary, the link between SSD of economies, sectors, policies, organizations, products, and services is essential but seems to be missing.

Regarding the heavy-duty vehicle (HDV) context, state-of-the-art contributions have been made by Bouchouireb et al. (Bouchouireb, 2023) and Wolff et al. (Wolff et al., 2021). Bouchouireb optimizes specific aspects of HDV components to optimize the overall vehicle over its whole lifecycle (Bouchouireb, 2023). Wolff scales the various components of each respective powertrain technology to derive the best-suited package for a generic use case (Wolff et al., 2021). Hence, both tackle some of the challenges described but there are still many important aspects that have not been addressed. While Bouchouireb’s approach already hints at the possibility to connect different levels of optimization, i.e. connecting vehicle design with the underlying design of specific

components, it remains unclear how to connect the product & service level optimization to the upper levels (fleet level and sector level) within the framework.

Political landscape

The political landscape can be described as a multi-level system (Wonka & Lange, 2014), which consists of the normative level (the highest level at which globally accepted conventions and frameworks are elaborated by the United Nations entities), the strategic level (the link between the theoretical-ideological framework from the normative level and the actual implementation, by creating operational (inter-)national guidelines through the legislature of nation-states and similar political structures), and the operational level (the application of concrete guidelines within the theoretical-ideological framework by regional stakeholders). In the following, these individual levels are explained in more detail. First, the single-level LCSO framework is described contextually, then the two theoretical case studies are presented, and third, the case studies' connection is elaborated within the multi-level LCSO framework.

The normative level: UN agreements

The UN deals with all necessary dimensions „to save succeeding generations from the scourge of war“ (United Nations, 1945). In a broader sense, this also means to establish justice and respect to ensure human rights, social progress, freedom and self-determination of everyone, as well as securing standards of living for all equally and to force international cooperation to solve economic, social, cultural, humanitarian problems. This is attempted to be achieved by, if possible, all states, jointly developing basic principles on the respective subject areas. These consequently serve as overarching judicial guiding principles. Matviichuk et al. (2022) calls these internationally ratified global guidelines „universal human principles,“ which would represent the link between ideology and the striving society and legal system.

As an example, due to its direct relevance for the development of new HDVs, The Paris Agreement (United Nations UN-CCF, 2015) sets the global framework in relation to global warming (normative level; limiting the global climate change to well below 2.0 °C warming) in order to protect the global society from enormous environmental risks (IPCC, 2023). It requires all Parties, including the EU, to take ambitious climate action in order not to exceed the remaining GHG budget. The extent to which nations must actually reduce their GHG emissions (or share them among themselves) and how this translates to different sectors (e.g., transportation) and, subordinately, to organizations, products (e.g., HDVs), and services remains undefined at this normative level and is task of the strategic and operational levels.

The strategic level: The Green Deal

In the political space of the European Union (EU), globally accepted framework conditions meet a normative and cultural structure, forming a complex dynamic. The EU is mainly (but not exclusively, as will become clear in the next chapter) concerned with the strategic implementation of normative goals and thresholds. The EU's comprehensive response to the Paris Agreement is the European Green Deal (European Commission, 2021). It goes far beyond mere climate targets by also pursuing other normative objectives (European Commission, 2018), and reflects the EU's commitment to building a carbon-neutral economy and promoting sustainable development. Thus, in the course of the long-term strategy of the European Green Deal, seven so-called „building blocks“ have been developed. Implemented strictly and on its own, each building block comes close to achieving the goal of climate neutrality by 2050. However, when implemented synergistically, they are expected to fulfill the Paris Agreement:

1. Maximise the benefits from Energy Efficiency including zero emission buildings
2. Maximise the deployment of renewables and the use of electricity to fully decarbonise Europe's energy supply

3. Embrace clean, safe and connected mobility
4. A competitive EU industry and the circular economy as a key enabler to reduce greenhouse gas emissions
5. Develop an adequate smart network infrastructure and inter-connections
6. Reap the full benefits of bio-economy and create essential carbon sinks
7. Tackle remaining CO₂ emissions with carbon capture and storage

The focus here is on numerous sectors that are closely inter-linked with one another. From energy and industry to transport, agriculture, finance and education, the aim is to trigger significant change and innovation to achieve a low-carbon and resource-efficient economy. A regulatory framework will be created for all sectors in this regard. For some sectors, operational implementation is even specified at the EU level (more on this in the next chapter). Overall, however, the successful implementation of the Green Deal remains significantly dependent on how strictly the individual member states integrate the common strategic framework into their own development pathways and translate them into operational legislations.

The operative level: Specific regulations for products

The ambitious goals of the strategic level remain merely a potential as long as they are not broken down to national and regional, or to (sub-)sector and product levels. At the operational level, therefore, attempts are made to derive concrete policy instruments within the boundaries of the normative corridor and the strategic regulatory targets (Federal Ministry of BMNT Austria, 2017; Federal Ministry of BMUB Germany, 2016). Since many of the issues to be addressed here are significantly dependent on both cultural and regional-political, as well as geospatial conditions (existing climate, infrastructure, resources, etc.), often these policy instruments need to be at the federal level or lower to ensure relevance and

acceptance (Vazhayil & Balasubramanian, 2012). Furthermore, it must be possible to break down the specific policy requirements down to the level of products and services. Only through concrete and targeted implementation at all levels can the various hurdles and challenges of the current generation be successfully overcome.

The EU Emissions Trading Scheme is an instrument used under the European Green Deal to regulate at least the greenhouse gas emissions of energy-intensive sectors and to ensure the transition to a low-carbon economy (European Commission, 2023). This partially includes the production of HDVs, but not the use and EOL lifecycle phases of the vehicles. Again, other policy instruments, such as EU-wide emission standards, national CO₂ taxes, tolls for GHG-intensive transport modes, tax relief for investment and use of low-GHG alternatives, or mandatory recycling rates play a crucial role here. These are currently derived, or attempted to be derived, primarily at the national level from the pledged Nationally Determined Contributions (NDCs) (Federal Ministry of BMK, 2021). Difficulties exist, however, due to a lack of tools to elicit the policy pathways with the greatest societal support and the lowest total costs.

Effects on the sub-sector of HDVs

Particularly with regard to the transport sector, and specifically that of HDVs, it is often not yet clear from a regulatory perspective which specific policy measures will be implemented to which extent in the individual member states (German Environment Agency, 2021). Numerous policy instruments (due diligence act, circular economy action plan, digital product passports, etc.) will provide a tighter framework that can also be followed at the product level in the near future. However, in the case of the transport sector and HDV development there are no tools yet that are able to evaluate the upcoming requirements in practice, nor are there any frameworks that can capture the links from policy interventions, through application and implementation in product development, to the final positive sustainability impacts. Thus, these links between policy levels and operational implementations are

missing, so that both, the top-down approaches lag far behind the initial implementation deadlines, and bottom-up initiatives cannot develop holistic concepts. Ultimately, this represents a barrier for SSD (Bjorn et al., 2021).

Method

The approach is heavily based on system-science reasoning and methods. Investigating the possible connections between the optimization levels requires methodologically refined research, which will be described in the following sub-chapters. As the authors research just started, the following describes rather the planned research outlook than the carried-out sequences.

Research design

In order to develop the main structure of the intended LCSO framework, a structured literature review was conducted followed by a deductive research phase to frame and consolidate the state-of-the-art of scientific approaches and challenges, as well as concurrent settings of legislation & markets and product development in the realm of SSD. The preliminary LCSO framework will be put into computational experiments to examine (with the results of case studies) the framework's limitations and required adaptations (currently in progress). The LCSO framework, probably adapted to reduce identified limitations, shall then be revised in expert discussions. The author aims to conclude a LCSO framework ready for application on the product-level, but also showing the potential for multi-level optimizations on higher levels.

Structural literature review & deductive research

The literature review method is to evaluate published books, articles, and other relevant sources critically and systematically on a specific topic or research question. The primary purpose of a literature review is to summarize, synthesize, and evaluate the existing knowledge and research on the particular topic of

LC(S)A and LC(S)O of products and particularly of HDVs, but also of sectors and economies. It aims to identify gaps in current understanding, highlight areas of consensus or controversy, deliver possible linkages between the different topics and levels, and provide a foundation for further research.

Regarding which literature will be included, peer-reviewed scientific literature (e.g. peer-reviewed papers) will serve as sources for methodological approaches and proposed frameworks, whereas scientific literature and gray literature (e.g., process and product information and legislative publications) will be considered for upstream-specific background information and legislative boundaries. Databases like SCOPUS or search engines, respectively, will be used for the identification of the literature.

The literature review on LCSAs and LCSOs of HDVs has been completed and the resulting single-layer LCSO framework is in the process of being revised by industry experts and tested in computational experiments and case studies. The literature review on LCSAs and LCSOs of economies and industries is underway with the first ideas of its single-layer LCSO framework conceptualized.

Computational experiments & case studies

A case study is defined as “an empirical inquiry that investigates a contemporary phenomenon, in-depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin, 2009, S. 18). Computational experiments refer to a methodology that utilizes computational models and simulations to investigate and analyze complex systems or phenomena.

Hence, they are the main techniques used in this research. The methods are going to be used to evaluate the developed LCSO framework regarding eventual use-case specific limitations, required methodological advancements, and the reproducibility, fidelity, and uncertainty of the results. This also includes but is not limited to the simulations, lifecycle impact calculation, optimization algorithm testing and application, parameter exploration, and sensitivity analysis of products and services, but also of sectors

or economies. Specifically, the optimization of HDVs is analyzed on the product level and the optimization of climate neutrality pathway measures of Austria on the economy level. Furthermore, the assumed connections between the two levels or the effects on each other, respectively, are going to be investigated.

Expert discussion

The method expert discussion refers to a determined conversation topic within a group of knowledgeable individuals who possess expertise, experience, or specialized knowledge in a particular field or subject matter, in this case in sustainability assessments and optimizations of products and services, sectors, and economies. The purpose of expert discussions is to facilitate in-depth and focused conversations among experts to explore, analyze, and generate insights, recommendations, or solutions related to a specific topic or problem.

Expert discussions with practitioners and researchers are crucial to answering the research questions, as only they can provide the required insights into what challenges they commonly encounter at which design process stage and what information they have normally given at that point. The exact design to conduct the expert discussions is dependent on the research partner, respectively, if additional external expertise is required.

The author is currently finalizing the single-level LCSO framework of HDV development with results from expert discussions with industry partners and researchers of LCSO HDVs.

Preliminary results

This chapter describes the overall preliminary LCSO framework and its anticipated capabilities to tackle several obstacles mentioned in the current policy and industry context with case studies of the Austrian economy and a separate one of HDVs as example. It then provides an overview: First, on the logic behind the strategic LCSO framework in general; Second, on the intended appli-

cation of the LCSO Framework for the Austrian economy; and Third, on the conceptual application of the LCSO Framework for HDV development. Ultimately, leading towards the chapter “discussion”, the idea of connecting the presented two case studies (and any other theoretical LCSO application of the framework) is described and (in the chapter Discussion) deliberated on.

The general LCSO framework

The General (single-level) LCSO Framework is intended to suit as a tool for strategic lifecycle sustainability optimizations of various prospective solutions. It consists of modular building blocks, enabling it to be adaptable for the present topic on the one hand and, on the other hand, to provide enough consistency for linkages to its functioning and its context (more on that in the chapter “4.4 The integrated multi-level LCSO Framework”).

Each optimization follows the same procedure, similar to the one of a traditional LCA, as presented in Figure 2:

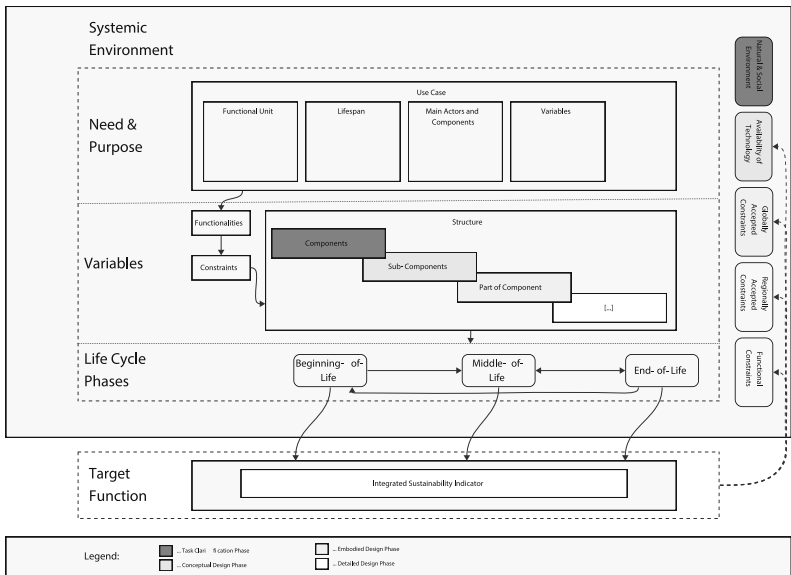


Figure 2: The single-level LCSO framework.

1.) Scoping: The *Systemic Environment* of the optimization subject, must be described in terms of constraining factors from nature, society, economy, and technology and linked optimizations; 2.) Goal: the subject's *Need & Purpose* must be narrowed down, by scanning all lifecycle phases for the relevant sustainability dimensions to derive the functional unit most suitable to measure the success of the optimization; 3.) Lifecycle Inventory: the subject's *Variables* must be identified and put into relation with each other so that the resulting system models the real correlations as well as possible. 4.) Lifecycle Impact Assessment: 4.1) an adequate sustainability indicator must be chosen as a target function for the optimization; 4.2) The optimization then manipulates the identified and structured variables within the boundaries given by the systemic environment and finds their optimal values according to the set target function; 5.) Interpretation: The result must then be put into context, meaning that the overall (absolute) sustainability must be verified and that it must be included as part of the *Systemic Environment* for subsequent optimizations.

Furthermore, the LCSO Framework offers the possibility to distinguish between development phases: Early development phases of optimal solutions must be manageable despite having little information available to work with – streamlined single-layered optimization models are applied to evaluate first approximations of optimal solutions of the subject. Contrarily, consequential development phases can build on extensive foundations of information – complex multi-layered optimization models are applied to evaluate approximations of optimal solutions of the subject and its sub-sets. The strategic development phases are named according to the framework of Diaz et al (2021) from product development, going from a so-called “Task Clarification Phase” (dark gray), through the “Conceptual Design Phase” and the “Embodied Design Phase”, to the “Detailed Design Phase” (each proceeding phase colored in lighter gray).

CSO Fraork: Case study of the austrian economy

The federal ministry for climate protection (BMK) of Austria identified, based on leading Austrian research results, the potential measures and their respective positive impacts to reduce greenhouse gas emissions. Based on that it is hosting a website to “make potential development paths for the implementation of 2050 targets (and any interim targets) [according to the EU budget allocations under the Paris Agreement] transparent and to support the coordination process for long-term strategies.” (Federal Ministry of BMK, 2021)

This was taken as the main source for this exemplary LCSO framework of the Austrian economy, which is depicted in Figure 3:

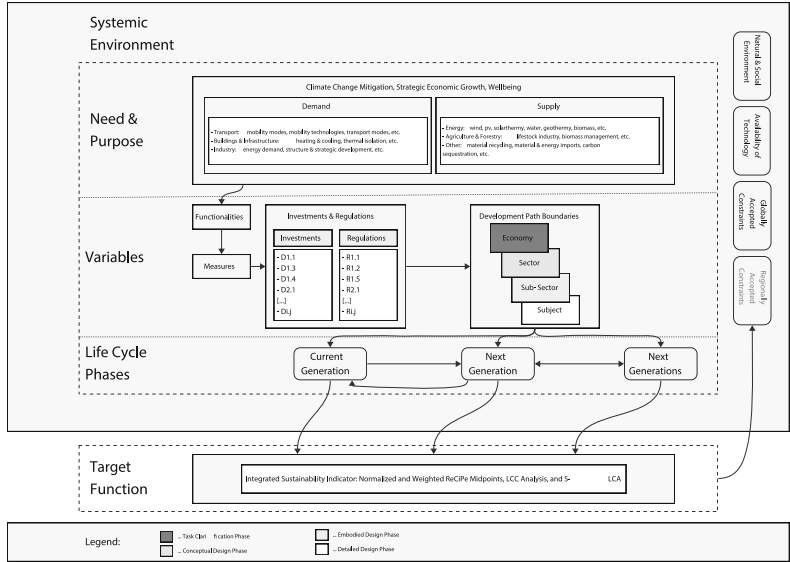


Figure 3: Single-level LCSO – a case study of the Austrian Economy.

The LCSO framework was applied as follows:

1. Systemic Environment: The Paris Agreement (“Globally Accepted Constraints”) and, a level deeper, the European Green Deal (“Regionally Accepted Constraints”) are taken as *Systemic Environment*, next to the omnipresent “Natural & Social Environment” and “Availability of Technology”.

2. Need & Purpose: Identified measures within all sectors must be optimized (regarding their efforts and timing) to stay within the *Systemic Environment*. The functional unit is chosen as overall effectiveness [sustainability impact/\$].
3. Lifecycle Inventory: Identified measures and the corresponding variables and boundaries are implemented in an impact-pathway model.
4. Lifecycle Impact Optimization
 - a. Target Function: An integrated sustainability indicator, including the ecological, social, and economic dimension is chosen.
 - b. Optimization: The variables with their corresponding boundaries are optimized according to the set target function.
5. Interpretation: With the optimal set of measures regarding their efforts and timing, staying within the *Systemic Environment* will be assured, and the strategic realization of corresponding investments and regulations will be implemented as “Regionally Accepted Constraints” in the *Systemic Environment* for optimizations of sectors (e.g., transport), sub-sectors (e.g., on-road transport), or even specific subjects like HDVs.

LCSO Fraork: Case study of HDVs

The case study of HDVs was based on an extensive literature review to identify the various variables of a vehicle’s components and sub-components, as well as their configurations and dependencies. The structure of LCSO framework itself is mostly based on the research of Bouchouireb (2023) and Wolff et al. (2021), combining their approaches and extending the multi-level structure:

1. Systemic Environment: The Paris Agreement (“Globally Accepted Constraints”), a level deeper the European Green Deal (“Regionally Accepted Constraints”), and, another level deeper, the result of the first case study are taken as *Systemic Environment*, next to the omnipresent “Natural & Social Environment” and “Availability of Technology”.

2. **Need & Purpose:** Identified variables (a vehicle's components and sub-components) must be optimized (regarding their composition and scaling) to stay within the boundaries of the *Systemic Environment*. The functional unit is chosen as ton-kilometer [tkm] for cargo transports.
3. **Lifecycle Inventory:** Identified (sub-)components are implemented in an impact-pathway model and the corresponding variables and boundaries.
4. **Lifecycle Impact Optimization**
 - a. **Target Function:** An integrated sustainability indicator, including the ecological, social, and economic dimension is chosen.
 - b. **Optimization:** The variables with their corresponding boundaries are optimized according to the set target function.
5. **Interpretation:** With the optimal set of (sub-)components regarding their composition and scaling, staying within the *Systemic Environment* will be assured and the strategic realization of optimized HDVs will be implemented in the database of “Availability of Technology” as part of the *Systemic Environment* for optimizations on higher optimization levels.

The case study HDV development is illustrated in *Figure 4*:

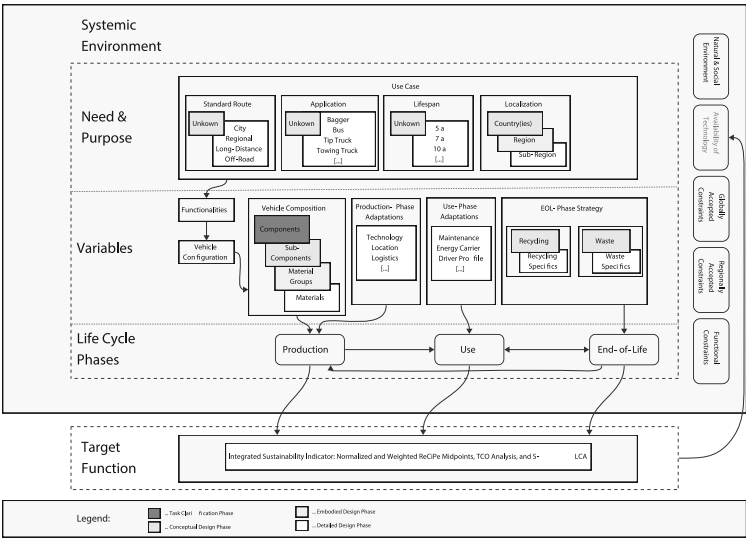


Figure 4: Single-level LCSO – case study of HDV development.

The integrated multi-level LCSO framework

The idea of an integrated multi-level LCSO framework is based on the required linkages between the various levels of SSD. Whereas on the level of products and services, organizations, and projects exist as Lifecycle Assessment (LCA), Environmental Management Systems (EMS), and Environmental Impact Assessment (EIA) as tool, respectively, to evaluate their (ecological) sustainability performance, their correlations and connections to upper levels like sectors and economies remain unclear. The integrated multi-level LCSO framework attempts to open the discussion on how these linkages can be provided within a structured framework, theoretically operationalizing SSD on all levels conjointly.

To achieve that, the multi-level LCSO framework consists of several single-level LCSO frameworks, which are connected through the enveloping Systemic Environment (and ideally through an uniform sustainability indicator as target function as well), as can be seen in *Figure 5*. The highest optimization level of the multi-level LCSO framework, hereafter called *Global Society Level*, is defined by exclusively being limited to the “Natural and Social Environment” and the “Availability of Technology”. Hence, its optimization subject is bound purely normative-ethical questions such as prioritization of „how much value does nature have vis-à-vis humanity?“ or “Which rights does every human being and society possess?“, etc. It represents the overall strategic sustainable development of the global society and includes the vision of and for humanity, incl. economic systems. Therefore, it is possibly comparable to UN agreements such as human rights, the Climate Agreement of Paris, or the Sustainable Development Goals (SDGs) and provides the specified “operating space” in which the global society agrees to stay in. The results of the *Global Society Level* are, hence, taken as “Globally Accepted Constraints” into the *Systemic Environment* of embedded optimization levels.

Embedded into the *Global Society Level* sits the *Regional Society Level*. It also tackles normative-ethical issues, but as regional ideology and culture become more relevant, different optimization topics are handled, such as “how should the importance of

community aspects be weighted against good of individuals?“. It represents the overall strategic sustainable development of a society within a country/culture/(large) region and includes the optimization of the economic system and all sectors. However, it is important to note that the *Regional Society Level* can be differentiated into further sub-levels, as it may resemble all kinds of geospatial and geopolitical units. Therefore, it can be distinguished into several sub-optimizations within the *Regional Society Level*. Taking the continent Europe as an example to be applied in the multi-level LCSO framework, the highest level would be the EU. For the optimization model, the EU could further be specified by its embedded member states, which themselves consist of federal states, which in turn hold municipalities, etc. Despite the possibility of more complex structures, the application scheme as described for the *Global Society Level* remains the same on the *Regional Society Level* (and all sub-levels): the optimization results serve as additional boundaries for embedded optimization levels, i.e. called “Regionally Accepted Constraints”.

Required to fulfill all additional constraints of the above are optimizations carried out on the so-called Subject Level. This includes optimizations of the design of products and services, organizations, and infrastructure projects, bound to its geospatially related “Regionally Accepted Constraints” in addition to the global and omnipresent ones. As the optimization models may vary significantly, no further specification can be given. Nonetheless, also optimization of the *Subject Level* can be described within sub-optimization problems as well. The result of a *Subject Level* optimization resembles the development of the omnipresent *Systemic Environment* elements. Whereas optimizations of products and services directly encompass their (strategic sustainable) development, which in turn leads to an adaptation of the “Availability of Technology”, optimizations of organizations and infrastructure projects alter the *Systemic Environment* of “Nature and Society Constraints”. These SSD adaptations can thereafter be considered by embodying optimization levels.

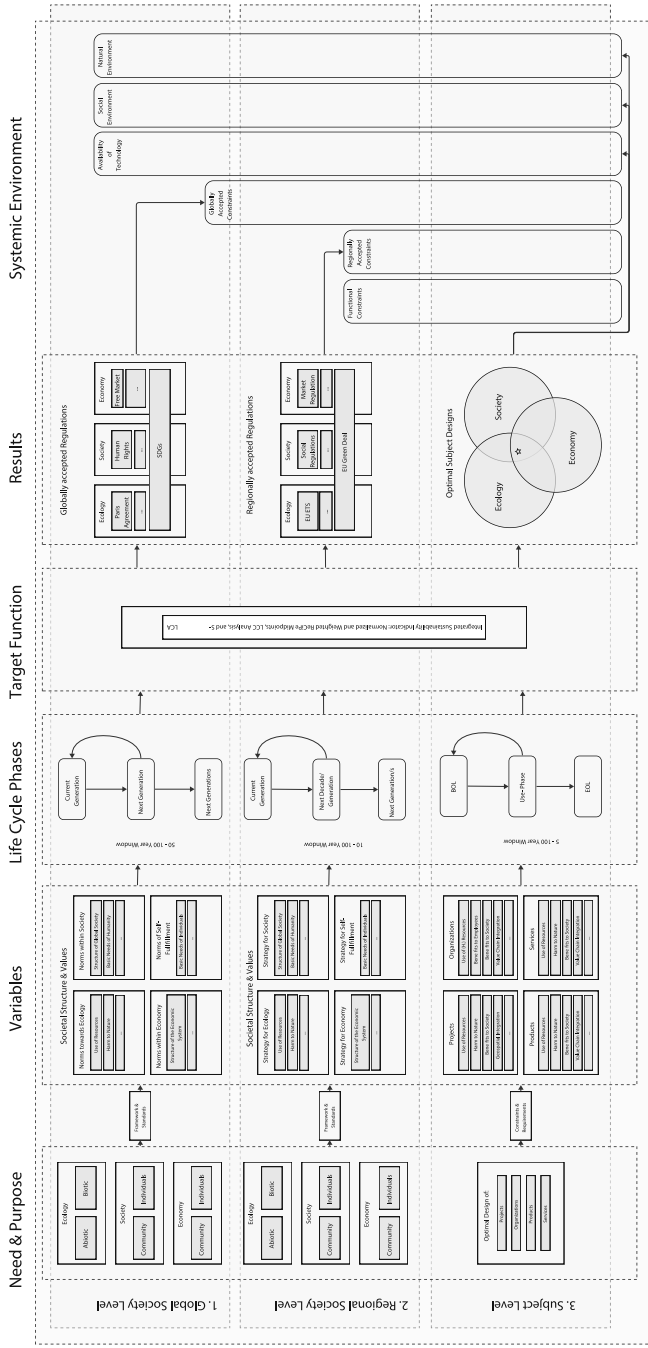


Figure 5: The multi-level LCSD framework.

Discussion and conclusion

As the multi-level LCSO framework is in progress of being refined and no results of the case studies are available yet, the discussion and conclusion are limited to the framework's theoretical functioning, limitations, and shortcomings for now. Nevertheless, the presented theoretical case studies allow for some discussion on both, the single-level optimization, and the multi-level optimization.

Starting with the single-level LCSO optimization, it becomes clear by looking at the presented case studies that the framework is very flexible concerning the definitions within its required five elements. On the one hand, this is necessary, as very different optimization problems require that degree of flexibility. On the other hand, it may hinder identifying the most suitable definition for the optimization problem at hand due to missing guidance. This becomes especially true when considering that optimization problems of upper or lower levels may be strongly intertwined, in which case streamlining of variables and scenarios may be required. The same is true for the *Target Function*: as it is not fixed yet, neither comparable results nor a functioning allocation between optimization levels can be provided. However, with the current LC(S)A approaches available, the *Target Function* cannot be fixed without compromising at least some of the framework's applicability – no current method is suited for assessments on all levels (from strategic (sub-)global challenges of economies, ethics, and well-being to specific projects, organizations, products, and services).

This brings us to the multi-level LCSO framework, for which the just-mentioned aspects of a required fixed *Target Function* and streamlining of variables and scenarios are true as well. However, the multi-level LCSO framework holds an additional challenge, namely the *Systemic Environment*. While in single-level optimizations the *Systemic Environment* can be described for each application individually to suit the challenge at hand, connecting several single-level optimizations to a multi-level construct requires the uniformity of the *Systemic Environment*. From this follows the requirement to use the same (for the optimization framework adapted) datasets for the *Systemic Environment*.

Despite the challenges, the author of this contribution argues that a multi-level optimization framework is required to connect the different levels and dimensions to finally enable SSD. So, what does it take to take this idea a step further?

Most important seems the discussion with experts of different disciplines to concise (and correct, if necessary) the structuring, illustration, framing, and wording of the framework to make it comprehensive for all practitioners. This feedback round should be accompanied by simultaneous testing and refining of the current state of the single-level LCSO framework. Interlinked single-level LCSO studies should then be analyzed conjointly, to define the necessary degree of streamlining of mutual/similar variables and scenarios to structure the multi-level LCSO framework in more detail. This partly also entails the structuring of the datasets of the *Systemic Environment*. Lastly, a uniform (absolute) sustainability indicator must be developed allowing to reference results from one to another optimization level and vice versa.

Literature

- Atabaki, M. S., M. Mohammadi, V. Aryanpur. (2022). An integrated simulation-optimization modelling approach for sustainability assessment of electricity generation system. *Sustainable Energy Technologies and Assessments* Volume 52, Part A. <https://doi.org/10.1016/j.seta.2022.102010>
- Bjørn, A., Chandrakumar, C., Boulay, A.-M., Doka, G., Fang, K., Gondran, N., Hauschild, M. Z., Kerkhof, A., King, H., Margni, M., McLaren, S., Mueller, C., Owsianiak, M., Peters, G., Roos, S., Sala, S., Sandin, G., Sim, S., Vargas-Gonzalez, M., & Ryberg, M. (2020). Review of life-cycle based methods for absolute environmental sustainability assessment and their applications. *Environmental Research Letters*, 15(8), 083001. <https://doi.org/10.1088/1748-9326/ab89d7>
- Bouchouireb, H. (2023). Lifecycle Energy Optimisation: A multidisciplinary engineering design optimisation framework for sustainable vehicle development. 85. KTH Royal Institute of Technology.
- Brightway Developers. (2023). www.brightway.dev/. Retrieved from brightway: <https://documentation.brightway.dev/en/latest/index.html> on May 26th 2023
- Chebaeva, N., Lettner, M., Wenger, J., Schögl, J.-P., Hesser, F., Holzer, D., & Stern, T. (2021). Dealing with the eco-design paradox in research and development projects: The concept of sustainability assessment levels. *Journal of Cleaner Production*, 281, 125232. <https://doi.org/10.1016/j.jclepro.2020.125232>

- Diaz, A., Schögg, J.-P., Reyes, T., & Baumgartner, R.** (2021). Sustainable product development in a circular economy: Implications for products, actors, decision-making support and lifecycle information management. *Sustainable Production and Consumption*, 26, pp. 1031-1045. doi:10.1016/j.spc.2020.12.044
- Dranka, G. G., P., Ferreira, A. I. F., Faz.** (2021). A review of co-optimization approaches for operational and planning problems in the energy sector. *Applied Energy*. 304. <https://doi.org/10.1016/j.apenergy.2021.117703>
- Estrada, F. a.** (2021). Economic impacts and risks of climate change under failure and success of the Paris Agreement. (1504), pp. 95-115.
- European Commission.** (2018). A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. COM(2018) 773 final. Brussels, Novmeber 28th, 2018
- European Commission.** (2021). 222.ec.europa.eu/commission/. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en on August 7th, 2023
- European Commission.** (2023a). www.ec.europa.eu/commission/. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1145 on June 14th, 2023.
- European Commission.** (2023b). www.climate.ec.europa.eu/. Retrieved from https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en on June 14th 2023
- Federal Ministry of BMUB Germany.** (2016). Climate Action Plan 2050 Principles and goals of the German government's climate policy. www.bmuv.de/. Retrieved from <https://www.bmuv.de/en/publication/climate-action-plan-2050-en> on June 14th 2023
- Federal Ministry of BMNT Austria.** (2017). The Austrian strategy for adaptation to climate change. www.bmk.gv.at/. Retrieved from <https://www.bmk.gv.at/en/topics/climate-environment/climate-protection/austrian-strategy-adaptaion.html> on June 14th 2023
- Federal Ministry of BMK Austria.** (2021). Pathways for the implementation of 2050 objectives for Austria. Retrieved from www.klimarechner.at/ on August 7th 2023
- Ferretto, A., Matthews, R., Brooker, R., & Smith, P.** (2022). Planetary Boundaries and the Doughnut frameworks: A review of their local operability. *Anthropocene*, 39, 100347. <https://doi.org/10.1016/j.ancene.2022.100347>
- German Environment Agency.** (2021). NDC Design Systematic analysis. Climate Change 52/2021. Retrieved from <https://www.umweltbundesamt.de/publikationen/NDC-Design> on May 26th 2023
- Guerrero, S. E., S. M. Madanat, R. C. Leachman.** (2013). The Trucking Sector Optimization Model: A tool for predicting carrier and shipper responses to policies aiming to reduce GHG emissions. *Transportation Research Part E*, 59, 85 - 107. <https://doi.org/10.1016/j.tre.2013.08.005>
- GreenDelta.** (2023). www.openlca.org. Retrieved from [openlca.org](http://www.openlca.org): <https://www.openlca.org> on May 26th 2023
- Hoogmartens, R., Van Passel, S., Van Acker, K., & Dubois, M.** (2014). Bridging the gap between LCA, LCC and CBA as sustainability assessment tools. *Environmental Impact Assessment Review*, 48, 27–33. <https://doi.org/10.1016/j.eiar.2014.05.001>

- Hsu, A., Brandt, J., Widerberg, O., Chan, S., & Weinfurter, A.** (2020). Exploring links between national climate strategies and non-state and subnational climate action in nationally determined contributions (NDCs). *Climate Policy*, 20(4), 443–457. <https://doi.org/10.1080/14693062.2019.1624252>
- IPCC.** (2023). Summary for Policymakers. In: *Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, H. Lee and J. Romero (eds.). IPCC, Geneva, Switzerland, (in press).*
- iPoint.** (2023). www.ifu.com/de/umberto/. Retrieved from ifu: <https://www.ifu.com/de/umberto/> on May 26th 2023
- Kannegiesser, M., H.-O., Günther.** (2014). Sustainable development of global supply chains—part 1: sustainability optimization framework. *Flexible Services and Manufacturing Journal* volume 26, pages 24–47. 10.1007/s10696-013-9176-5
- Larsen, V. G., Tollin, N., Sattrup, P. A., Birkved, M., & Holmboe, T.** (2022). What are the challenges in assessing circular economy for the built environment? A literature review on integrating LCA, LCC and S-LCA in lifecycle sustainability assessment, LCSA. *Journal of Building Engineering*, 50, 104203. <https://doi.org/10.1016/j.jobe.2022.104203>
- Luukkanen, J., Vehmas, J., & Kaivo-oja, J.** (2021). Quantification of Doughnut Economy with the Sustainability Window Method: Analysis of Development in Thailand. *Sustainability*, 13(2), 847. <https://doi.org/10.3390/su13020847>
- Matviichuk, A., V. Shcherbak, V. Sirko, H. Malieieva, Y. Leheza** (2022). Human principles of law as a universal normative framework. *Cuestiones Politicas*, Vol. 40, No. 75. <https://doi.org/10.46398/cuetpol.4075.14>
- Norris, G. A.** (2001). Integrating lifecycle cost analysis and LCA. *The International Journal of Lifecycle Assessment*, 6(2), 118–120. <https://doi.org/10.1007/BF02977849>
- O'Reilly, C. J., Göransson, P., Funazaki, A., Suzuki, T., Edlund, S., Gunnarsson, C., Lundow, J.-O., Cerin, P., Cameron, C. J., Wennhage, P., & Potting, J.** (2016). Lifecycle energy optimisation: A proposed methodology for integrating environmental considerations early in the vehicle engineering design process. *Journal of Cleaner Production*, 135, 750–759. <https://doi.org/10.1016/j.jclepro.2016.06.163>
- Pehrson, I.** (n.d.). Integrating planetary boundaries into the lifecycle assessment of electric vehicles.
- Popien, J.-L., Husmann, J., Barke, A., Thies, C., Cerdas, F., Herrmann, C., & Spengler, T. S.** (2023). Comparison of lithium-ion battery supply chains – a lifecycle sustainability assessment. *Procedia CIRP*, 116, 131–136. <https://doi.org/10.1016/j.procir.2023.02.023>
- Pré Sustainability.** (2023). www.pre-sustainability.com. Retrieved from pre-sustainability: <https://pre-sustainability.com/articles/recipe/> on May 26th 2023
- Pré Sustainability.** (2023). www.simapro.com. Retrieved from SimaPro: <https://simapro.com> on May 26th 2023

- Raworth, K.** (2017). Doughnut Economics: seven ways to think like a 21st century economist. London: Penguin Random House.
- Reinert, C., L. Schellhas, J. Mannhardt, D. Yang Shu, A. Kämper, N. Baumgärtner, S. Deutz, A. Bardow.** (2022). SecMOD: An Open-Source Modular Framework Combining Multi-Sector System Optimization and Life-Cycle Assessment. *Frontiers in Energy Research* Vol 10. 10.3389/fenrg.2022.884525
- Social & Human Capital Coalition.** (2019). Social & Human Capital Protocol. Capitals Coalition. February 1st 2019
- sphera.** (2023). www.sphera.com/life-cycle-assessment-software-ppc/. Retrieved from sphera: <https://sphera.com/life-cycle-assessment-software-ppc/> on May 26th 2023
- United Nations.** (1945). Charter of the United Nations, 24 October 1945, 1 UNTS XVI. Retrieved from [un.org](https://www.un.org/): <https://www.refworld.org/docid/3ae6b3930.html> on August 7th 2023
- United Nations UNFCC.** (2015). Conference of the Parties, Adoption of the Paris Agreement. FCCC/CP/2015/L.9/Rev.1. Paris, France: United Nations. Dec. 12th 2015
- United Nations UNIDO.** (2023). www.unido.org/. Retrieved from <https://www.unido.org/our-focus/advancing-economic-competitiveness/competitive-trade-capacities-and-corporate-responsibility/corporate-social-responsibility-market-integration/what-csr> on June 14th 2023
- Vazhayil, J. P., R. Balasubramanian.** (2012). Hierarchical multi-objective optimization of India's energy strategy portfolios for sustainable development. *International Journal of Energy Sector Management* Vol. 6 No. 3, 301-320. doi. [org/10.1108/17506221211259691](https://doi.org/10.1108/17506221211259691)
- Wolff, S., Seidenfus, M., Brönnner, M., & Lienkamp, M.** (2021). Multi-disciplinary design optimization of lifecycle eco-efficiency for heavy-duty vehicles using a genetic algorithm. *Journal of Cleaner Production*, 318, 128505. <https://doi.org/10.1016/j.jclepro.2021.128505>
- Wonka, A., Lange, G.** (2015). Politische Entscheidungen im Mehrebenensystem der EU. In: Liebert, U., Wolff, J. (eds) *Interdisziplinäre Europastudien*. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-03620-1_8

Just sustainability transformations by deliberate social collaboration: furthering the learning-oriented ‘docking phenomenon’ in public institutions to enhance engagement, diversity, equity and inclusion

Abstract: Just sustainability transitions are increasingly called for to address contemporary socio-environmental challenges. Contributing to the field of collaborative transitions governance, we investigate how engagement can take place in ‘docking’ procedures, such as processes of transformative social learning occurring between ‘expeditions’, characterised by reformatory and transformative learning logics, and ‘cruise ships’, employing a conformative learning logic. In this empirical study, social engagement is explored through transdisciplinary research with mission-oriented public sector initiatives and organisations in Sweden. They collaborate with various societal actors to innovate their work inclusively or to bring about systemic transformation collectively. By learning from their experiences, we identify three spheres of engagement based on different forms of involvement, communication, and learning. These are categorised as: consultation for cruise ship processes (sphere I); participation in expedition processes (sphere II); and co-creation in docking stations (sphere III). In particular, the second and

the third spheres empower societal actors to explore uncharted waters, see how to be together differently in the system and how to transform the system together. Such an enabling approach fosters the development of responsibility and response-ability, but needs to be further studied to gain a more comprehensive understanding of participatory and co-creative dynamics (e.g., by extending engagement to a broader variety of actors, including fringe stakeholders, or analysing power dynamics in depth). Thus, this initial exploration is the beginning of a deeper study on engagement in docking, but it can be considered a first step to foster collaboration and transformative social learning in navigating just sustainability transitions.

Keywords: docking, expedition – cruise ship framework, just sustainability transitions, social engagement, transformative social learning.

Introduction

In the face of the contemporary socio-environmental challenges, we are not all in the same boat. There is a variety of ships on the sea, from oil tankers and super-yachts to migrant vessels and canoes, and there is a broader more-than-human world under and around water. The impacts of climate change and environmental degradation have affected, are affecting, and will affect very differently different societal groups and ecosystems (Buchanan and Mathieu, 1986; Bullard, 1999; Ikeme, 2003; Lazarus, 1994; Mohai, Pellow, et al., 2009; Walker, 2012). According to Swyngedouw (2013), the cataclysmic imaginaries forecasting environmental apocalypse are perpetuating illusions since the socio-environmental Armageddon is already here for many. Acknowledging this allows addressing existing and imminent distributive injustices such as inequity of environmental costs and benefits, lack of recognition, and exclusion, and moving towards just sustainability, environmental justice, and equity (Agyeman, 2013; Bullard, Agyeman, Evans, 2003; Pellow, 2017; Schlosberg & Collin, 2014).

Sustainability, justice, and equity have plural and contested meanings (Pickering et al., 2022; Dryzek, 2022; Rawls, 2017; Sen, 2008; Shelton, 2007). However, a focus on these is fundamental in making complex choices to achieve the transformative change (Bennett et al., 2019; Leach et al., 2018; Martin et al., 2020; Pickering et al., 2022) urgently needed at a system level in response to contemporary persistent sustainability challenges (Köhler et al., 2019; Loorbach, Frantzeskaki, & Avelino, 2017; Scoones et al., 2020). As processes of transformative change, just sustainability transitions foster a dual commitment to human well-being and sustainability, by ensuring social justice and quality of life within the ecological boundaries for current and future generations (Swilling et al., 2016; Kaljonen et al., 2021; Jenkins et al., 2018; McCauley and Heffron, 2018; Bouzarovski, 2022).

Several multidimensional approaches to social justice (e.g., Fraser, 1995, 2008, 2009) and environmental justice (e.g., Schlosberg, 2007) highlight three interlinked dimensions of justice which are key in sustainability transitions: distribution, procedure, and recognition (Kaljonen et al., 2021; Jenkins et al., 2018; Williams and Doyon, 2019). Distributive justice focuses on how material and immaterial resources, harms, benefits, and opportunities are distributed. (Kaljonen et al., 2021; Walker, 2012; Pickering et al., 2022). The procedural dimension stresses the importance of fairness and participation in policy processes and decision-making with attention to inclusion and exclusion in the procedures, and the capacity to exercise agency and influence the resultant decisions (Kaljonen et al., 2021; Pickering et al., 2022; Williams and Doyon, 2019). Recognitive justice requires that different socio-cultural values, identities and practices are respected, acknowledging historical injustices that affected minorities (Fraser and Honneth, 2003; Hobson, 2003; Kaljonen et al., 2021; Pickering et al., 2022; Whyte, 2011, 2018).

It is increasingly recognised that socio-environmental politics and the governance of just sustainability transitions needs to account for all three forms of justice. Especially, participation together with the understanding of differences should be placed at

the centre (Huttunen et al., 2022; Ikeme, 2003). In sustainability transition studies, most focus on participation and other forms of deliberate actor-engagement has been in transition arenas and in shielding or upscaling niches (Hölscher et al., 2019; Huttunen et al., 2022; Loorbach, 2010; Voß, Smith, and Grin, 2009). However, this approach has been considered too limited or narrow since broader participatory and collaborative transition processes hold potential for improved legitimacy and trust in policy processes, participants' learning and empowerment, and enhanced policies delivery (Bartels and Wittmayer, 2018; Chilvers and Longhurst, 2016; Chilvers et al., 2018; Huttunen et al., 2022; Warren, 2009). Such participatory processes are characterised by different degrees of participants' involvement, communication, collaboration, and influence (Fung, 2006; Huttunen et al., 2022), but in order to be effective these should involve knowledge exchange, equal consideration of different arguments, questioning of original positions or power relations, and transformative social learning (Huttunen et al., 2022; Macintyre et al., 2018; Moore, 2016; Voß and Bornemann, 2011; Voß, Smith, and Grin, 2009).

According to Collins and Ison (2009), a focus on social learning in participatory processes would help stimulate new ways of thinking about the nature of the issue at hand and dive deep into inquiries not only about the *means*, but also *the meanings* of participation. Social learning takes place when individuals and groups use dialogue to address problems together by surfacing assumptions with reflexivity, experimentation, and initiation of novel approaches (Slater & Robinson, 2020; Wals, 2009; Wals & Rodela, 2014). Learning in collective settings requires situated engagement with others to recognise the diversity of mental models or epistemological constraints and it allows understanding the complexity of the situation from a systemic perspective (Collins & Ison, 2009). Thus, participation as social learning stimulates enacted responsibility and enabled response-ability (Ibid.); it can produce novel collective knowledge and actions to adapt and respond to complex challenges (Slater & Robinson, 2020; Wells, 2012); and holds both instrumental and normative value (Slater &

Robinson, 2020) since it can be seen both as an end, or as means to an end (Claridge, 2004; Cleaver 1999).

Approaching participation both as a goal of democratic societies and as a means for transformative change, we aim to advance knowledge and support practice to promote the fair and equitable engagement¹ of different societal actors in collaborative sustainability transitions. In this paper, we build on the ‘expedition – cruise ship’ framework including the emerging phenomenon of ‘docking’ introduced in the next sections, to explore how the participation and social learning of diverse societal actors takes place in docking processes and contribute to address injustices and inequalities in sustainability transitions.

The next section introduces the background with the expedition – cruise ship framework and the concept of docking and its application in public sector institutions in Sweden. This will be followed by our findings of different spheres of societal engagement in docking processes, and by a discussion situating these results in their broader context of collaborative just sustainability transitions. Lastly, we share some concluding remarks and ways forward on enhancing engagement, diversity, equity, and active inclusion in transformative projects.

Theoretical background: the ‘expedition - cruise ship’ framework and the ‘docking’ phenomenon

To navigate sustainability transitions collaboratively with a learning orientation, Holmberg (2019) and Holmberg and Holmén (2022) introduced the “expedition – cruise ship framework”, based on different logics (Fig. 1) that distinguishing between modes of governance that either maintain or transform complex systems. In this paper, the analogy is used as an entry point to discern public sector organisations (PSOs)’ modes for daily operations and innovation.

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¹ In our findings, we refer to ‘engagement’ and not to ‘participation’ to avoid confusion with other models of participation and with the second sphere of engagement that describes ‘participation in the expedition and cruise ship processes’

Cruise mode	Expedition mode
Current structures, routines, etc. provide support	Current structures, routines, etc. hinder
Optimising and refining existing systems	Thinking beyond existing systems
Goals, targets, steering, controlling	Guiding principles, trust, autonomy, flexibility
Measuring performances related to predefined results	Creating space for exploration, reflection and learning

Figure 1: Some differences between the cruise and expedition mode (Holmberg and Holmén, 2023).

‘Expeditions’ are learning-oriented sustainability experiments that negotiate direction and explore alternatives to the current activity, outside of existing structures and by thinking beyond established systems; thinking together with multiple voices; thinking broadly to experiment with various perspectives and imaginaries; thinking behind symptoms to identify underlying causes and leverage points; and thinking ahead to test new possibilities in practice (Holmberg, 2019; Holmberg & Holmén, 2022). Their focus is on ‘doing better things’ and ‘seeing things in new ways’, in line with generative double-loop learning, which questions long-held assumptions and fosters the collective development of new ways of looking at systems and operating in them (Garavan, 1997; Holmberg, 2019; Holmberg & Holmén, 2022), or levels II and III of learning that function reformatively and transformatively (Bateson, 1972; Holmberg & Holmén, 2023; Holmén, 2020; Winter et al., 2015). Expeditions create a space for trying new ways and increasing the ability to explore and learn together (Holmberg, 2019; Holmberg & Holmén, 2022). They offer an opportunity to co-create and test alternatives in a small scale without jeopardising the normal ways of operating: what works can be adopted or adapted, and failed experiments become useful lessons (Holmberg & Holmén, 2022). By exploring uncharted waters, expeditions can inform the cruise ship about risks and suggest new routes for deep transformations (Ibid.), i.e. by learning which paths that are desirable and how those can be navigated.

In the work of Holmberg and Holmén (2022), ‘Cruise ships’ represent incumbent actors and institutions that are result-oriented, focused on conducting their business as usual and optimising it. Their aim is to ‘do things better’, in line with adaptive single-loop learning, a basic, sequential, and incremental form of learning (Garavan, 1997; Holmberg & Holmén, 2022), or learning level I that is conformative and transmissive (Bateson, 1972; Holmén, 2020; Holmberg & Holmén, 2022; Winter et al., 2015). Cruise ships tend to think and operate in silos by dividing expertise and addressing challenges with codified structures and methods for monitoring, evaluating, following up, and steering for the needs of day-to-day activities (Holmberg & Holmén, 2022). They are important in the governance of a system and need to be part of transitions, but they are often reluctant to or incapable of adopting and adapting to learning not in line with incremental or path-dependent modalities of change (Ibid.).

Expanding the expedition – cruise ship framework, Holmberg and Widbom (2020) introduced the concept of ‘docking stations’ as platforms for transformative social and expansive learning (Cranton, 1994; Engeström, 2016; Macintyre et al., 2018; Cf Mezirow, 1991, 1997) between expeditions and cruise ships. ‘Docking’ is not yet formalised in the literature, but is here treated as a sensitising concept (Bowen, 2006) that emerges from the experiences and needs of practitioners and sensitises researchers to further inquire into the phenomenon.

The concept of docking is emerging from and evolving with the experiences of Swedish municipalities (e.g., *Ale Kommun*), counties (e.g., *Region Örebro Län*), and public agencies (i.e., the Governmental Agency for Innovation, *Vinnova*; the Energy Agency, *Energimyndigheten*; the Transport Administration, *Trafikverket*; the Agency for Economic and Regional Growth, *Tillväxtverket*; and the Research Council for Sustainable Development, *Formas*). Most of these public sector organisations (PSOs) have been part of the *Transformativ Innovationspolitik* (Transformative politics for innovation) course annually organised by the Chalmers Initiative for Innovation and Sustainability Transitions (CIIST) where

some have taken upon transdisciplinary research, projects and initiatives involving backcasting expeditions and docking experiments and the alike. For example, the Energy Agency, *Formas* and *Vinnova* are launching and funding “Impact Innovation”, a national strategic program for the 2030s which aims to drive sustainability transitions through mission-oriented innovation (Hill, 2022; Kattel & Mazzucato, 2018) based on collaborations among agencies and actors from business, academia, public sector, and civil society (Impact Innovation, n.d.; Vinnova, n.d.).

Building on their experience, we interpret the docking phenomenon as a learning-oriented process for systemic change, in which the logics of expeditions and cruise ships meet and embark on a transformative journey to collaboratively find new ideas for innovation and transitions. By engaging in transformative social or expansive learning in exploratory processes, double-loop learning allows co-developing new ways of operating in system towards common objectives. The learning can be then ‘scaled up’, to impact higher institutional levels by altering incumbent regimes’ rules and logics, or ‘scaled deep’ to change people’s values, beliefs, and norms, by promoting different perceptions, fostering new mind-sets, and introducing alternative value systems, ways of relating and knowing (Lam et al., 2020). Although these characteristics are common in all docking processes, our ongoing research on the phenomenon suggest that docking can happen in different directions and with different goals. It can take place ‘inwards’ to build transformative capacity internally in the PSO; ‘in between’ to transfer learning and innovate among agencies and actors; or ‘outwards’ to bring about systemic change in society.

Spheres of engagement in docking

As described in the previous section, to embark on a transformative journey, cruise ships need to acknowledge the necessity of a shift from learning level I to levels II and III, by first sending out expeditions to explore alternatives with a reformative learning logic, and then docking it together with a transformative learning

orientation. To understand how different actors interact and collaborate in these processes at the level of cruise ships, expeditions, and docking stations, we propose a classification in three spheres based on different learning logics, ways of being together and communicating. The first sphere describes processes of consultation for cruise ship processes. The second one is about active participation in expedition processes. The last sphere represents co-creation in docking stations. These spheres are listed according to an increasing degree of involvement, responsibility, and transformative potential, but they are all important in different ways for bringing about change in collaborative transitions (Figure 2).

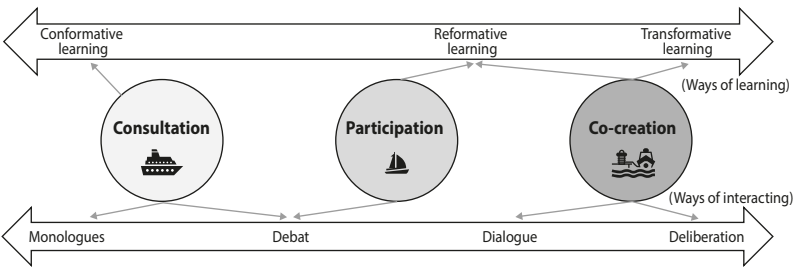


Figure 2. Visualisation of the three spheres of engagement and the ways of learning and interacting that characterise each.

Sphere I: Consultation

In preparation for transforming cruise ships through docking, the PSOs involved in this study open up for engagement processes. Before sending out expeditions, many PSOs conduct a mapping of the system to identify the actors and key stakeholders to include. The agencies then invite these groups for consultations to exchange information, listen to their expertise and needs. According to them, the societal actors *“have a big say in what kind of actions we are doing going forward we try to be mindful that we don’t just listen to the big voices or the incumbents, we try to understand the need for the whole ecosystem of actors that is needed for us to reach the term for transformative goals”* (Informant 11, personal

communication, June 29, 2023). In these interactions, however, communication mainly happens through monologues or debates. Some PSOs just listen to what participants say in response to their questions or questionnaires. In other cases, some actors may engage in confrontational debates (e.g., when they are not satisfied with the provision of a certain public service or have demands that are challenging). Although the learning resulting from these exchanges holds potential for the PSOs to do things better and identify the areas to further explore with expeditions, the limited process of engagement does not offer other societal actors the opportunity to engage in deeper forms of collective learning. Participants are passively involved in collaborative transitions in the sense that their voice is listened to. However, they do not have a space to question the conventional ways of ‘being together as usual’ in consultations beyond suggesting marginal improvements to the engagement settings, and they are not given any power or responsibility to be part of deep transformations.

Sphere 2: Participation

To broaden the horizons and bring in new perspectives for systemic transformation through learning level II, a wide range of societal actors can take part in expeditions. An example is given by the expedition of Ale municipality, in which it was explored with citizens how to address complex challenges like inequalities in income, education, and life expectancy. Two hundred interviews were conducted with the municipality inhabitants and ‘the human encounter’ was voted among the thematic areas identified. To explore it, an expedition group was formed with politicians, civil servants, and residents from different backgrounds. Together, they went through the steps of a backcasting process, discussing what characterises a desired future, how the present state looks like, what is the gap between the two, and what actions can be taken to bridge the gap. This required interacting with others through constant dialogue to listen openly to each other’s perspectives and work collaboratively towards a common

understanding in open-ended processes. Beyond some expectable challenges, the participatory process is considered to have *“been very good working because the participants have been part of signing all the steps. They don’t feel like we’re just giving them something, they’ve been part of it entirely”* (Informant 12, personal communication, June 29, 2023). Thus, partaking in expeditions gives societal actors an opportunity to be directly involved and engage with others through mutual learning to do better things, ‘be together in better ways’ and collectively develop capacity to understand and address the complex challenge faced. The participants share responsibility in ensuring the quality of the participation and the learning, but they need to take one step further with learning level III in the third sphere to bring about transformative change through docking based on such learning.

Sphere 3: Co-creation

Engagement in the docking station through co-creation enables different societal actors, together with members of the cruise ship and the expedition, to learn from each other through reformatory and transformative logics, and collectively bring about systemic change. This third sphere has not yet been extensively explored in practice, but the PSOs involved collaborate with each other in strategic innovation programs and are interested in further developing transformative ways of engaging with other actors in such spaces. In these innovation programs, docking can take place in between public agencies working on a common mission or sharing lessons learnt in separate projects. For this, expeditions are either collectively sent out to explore a common question, challenge, or issue of concern in context, or different organisations test alternatives separately. Then, they come together to discuss the findings in the docking station, where different logics and organisational cultures meet to co-develop new ways of being together and new ways forward for transforming the system collaboratively. These discussions happen through deliberation by using dialogue to understand each other and carefully examining the situation to

take collective decisions towards a common directionality. For example, the Impact Innovation Program is developing a new docking platform named ‘accelerator’ to “*collaborate in the new programs with open doors in order to include or make it easier to interact*” (Informant 10, personal communication, June 20, 2023). Taking part in co-creation in docking processes enables actors to be directly involved, collectively learn from the lessons of the expedition, and shift to learning level III that allows ‘seeing things differently and changing these things together’. In doing so, participants develop shared responsibility and response-ability to bring about transformative change through deliberate and purposeful transitions towards a negotiated and common direction.

Discussion

The need to “broaden out” and “open up” engagement processes is increasingly recognised in organisations to address sustainability challenges in pluralistic and polylogic ways (Brown & Dillard, 2014; Smith & Stirling, 2007; Stirling, 2008). Participation is considered essential for just sustainability transitions (Huttunen et al., 2022; Ikeme, 2003), but there is a lack of critical engagement with the meaning and means of participation in establishing what constitutes meaningful inclusion, active and equitable participation, as well as ensuring these in practical processes (Collins & Ison, 2009; Few, 2003). Addressing complex challenges in more collaborative ways requires shifting to a relational notion of power. This is described as something which circulates and is linked with a systemic understanding and transformation of systems through processes of social learning by combining enacted responsibility and enabled response-ability (Collins and Ison, 2009).

Building on this, we introduce learning-oriented forms of participation that take place in docking processes to collaboratively navigate just sustainability transitions. Moving beyond hierarchical ladders of engagement (Arnstein, 1969; Collins and Ison, 2009), we propose three spheres of participation characterised by different degrees of involvement and responsibility. These

are translated in different ways of interacting and in various learning-oriented approaches to changing the ways of being together. Shifting from the first sphere to the third one, participants move from interacting through monologues or debates to communicating, understanding each other, and collectively constructing meaning through open-ended dialogues and focused deliberations towards a shared direction. This allows advancing from conformational learning level I (i.e., being together as usual or slightly improving the ways of being together), to reformational learning level II (i.e., doing better things together), and to transformational learning level III (i.e., seeing how to be together differently in the system and transforming the system by being together).

In the spheres, participation can be seen as means for transformational change through collaborative sustainability transitions and social learning (sphere I and II), or as the goal of truly participatory democratic societies (sphere III). Hamilton and Ramcilovic–Suominen (2023) distinguish between inclusion and transformation, with the former being described as a process for social change that expands the same and reinforces hegemony, and the latter as a process that opens up for novelty and leads to radical outcomes of social change beyond what was before. In sphere I, the type of engagement in docking processes reflects inclusionary dynamics, with PSOs deciding top-down which stakeholders to involve and how to consult them. Then, in the second sphere, participants can engage in more transformational dynamics by setting off to explore uncharted waters. This approach of going beyond the established and stepping into the unknown needs to be taken collectively and relationally (Hamilton and Ramcilovic–Suominen, 2023) and can lead to discovering better ways of being together. Lastly, engagement in sphere III is in line with Hamilton and Ramcilovic–Suominen (2023)'s concept of transformation and it can be considered 'enabling'. An enabling approach fosters agency and response-ability and it highlights uncertainties embedded in choosing aims and directions for transformations with an emancipatory, hopeful, and caring stance (Scoones et al., 2020).

However, it is important to notice that the learning does not occur in an equally distributed way among the actors involved. Who learns and how deeply is different in each sphere. As mentioned in the description of sphere I, there the learning is mostly in the hands of the cruise ship that ‘brain-picks’ or absorbs information from the actors consulted. The latter get their voice heard to some extents, but they are not really part of a learning process, beyond personal lessons that can be derived from the experience. In a similarly skewed process, the expedition’s participants are the only subjects of the learning happening in sphere II. In it, actors learn individually and collectively, testing alternatives on a smaller scale, but not yet sharing the learning with the cruise ship. A balanced but differentiated process of learning takes place in the docking station. In it, the expedition learns how to challenge and encourage the cruise ship to change: the cruise ship learns from the expedition about the exploration’s findings: and all the actors reflect together and learn how to transform the cruise ship and the system they are embedded in inspired by the lessons learnt.

In addition to this, different actors not only learn in different ways and to different degrees in each sphere, but also their room of manoeuvre and legitimacy differs substantially. The three dimensions of justice in sustainability transitions guarantee fairness and inclusion in decision-making, the respect of diversities, and an equitable distribution of socio-environmental harms, benefits, and opportunities. However, this does not fully account for the power and power dynamics related to the knowledge produced at different levels of learning. Only in the third sphere all the actors involved should have equal opportunities to access the co-produced learning. Together with the shared responsibility and response-ability, this empowers actors to develop and exercise their agency in co-creating for transformative change.

Focusing on the empowering and emancipatory aspect, it is of interest to further explore and broaden the participation in docking processes to other actors who are, so far, excluded from these spaces, such as ‘pirate ships’ from minorities or fringe stakeholders comprising ‘poor, adversarial, weak, non-legitimate

and divergent groups' (Lyra & Lehtimäki, 2023, p. 406). Some of these actors are often considered non-collaborative and seeking to challenge the status quo in alternative ways with limited social acceptance or legitimacy (Lyra & Lehtimäki, 2023). However, in just sustainability transitions it is important to consider and include all voices, especially the ones of those who are the most affected by the socio-environmental challenges addressed, and an enabling approach to transformations should provide everyone with equal opportunities to participate and access knowledge-power. Further research needs to be conducted on the topic, but we hypothesise that an increasing diversity of actors involved with diverse world views, frames, or epistemological constraints, would enrich the complexity and richness of docking processes and outcomes, as well as providing a better understanding of the functioning of the three spheres of engagement.

Conclusions

This transdisciplinary research explored collaborative approaches to just sustainability transitions. Learning from the experiences of Swedish PSOs, our analysis showed that various societal actors can contribute to transitions by engaging in docking processes in different ways. We identified three spheres of engagement based on different forms of involvement, communication, and learning.

The first sphere is characterised by limited involvement through consultation, interactions through monologues or debates, and a conformative learning logic focused on being together as usual or slightly improving the ways of being together. Engaging in the second sphere entails a more active involvement through dialogues, and a reformatory learning logic that encourages participants to do better things together. The last sphere is based on a deeply active engagement through dialogue and deliberation towards a common direction to see things differently and bring about systemic transformation with learning logic level III.

These findings provide a first understanding of participation in docking processes from the perspective of mission-orient-

ted Swedish PSOs that aim to address sustainability challenges in pluralistic and polylogic ways, and serve the public interest through social learning for innovation and transformation. More qualitative experiences, voices, and perspectives need to be gathered from other stakeholders involved in the expeditions and cruise ship processes with these PSOs, as well as from potential actors who are excluded from these spaces (e.g., fringe stakeholders). This would allow to see how the process is interpreted and experienced by different actors, gather more comprehensive perspectives on how to enhance engagement, and truly ensure diversity, equity, and active inclusion in transformative projects.

This study will be completed with further transdisciplinary cycles with the PSOs and societal actors involved in participatory and co-creative forms of docking to include more voices and co-develop more comprehensive and detailed tools or approaches to enhance engagement in docking processes. Therefore, this preliminary exploration is the beginning of a deeper study of engagement in the phenomenon of docking, but it can be considered a first step to promote collaboration in navigating just sustainability transitions.

Literature

- Agyeman, J. (2013). *Introducing just sustainabilities: Policy, planning, and practice*. Zed Books Ltd.
- Agyeman, J., Bullard, R. D., & Evans, B. (2003). Towards just sustainabilities: Perspectives and possibilities. *Just sustainabilities: Development in an unequal world*, 323-355.
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners*, 35(4), 216-224.
- Bartels, K. P., & Wittmayer, J. M. (Eds.). (2018). *Action research in policy analysis: critical and relational approaches to sustainability transitions*. Routledge.
- Bateson, G. (1972). The logical categories of learning and communication. *Steps to an Ecology of Mind*, 279-308.
- Bennett, N. J., Blythe, J., Cisneros-Montemayor, A. M., Singh, G. G., & Sumaila, U. R. (2019). Just transformations to sustainability. *Sustainability*, 11(14), 3881.
- Bouzarovski, S. (2022). Just transitions: A political ecology critique. *Antipode*, 54(4), 1003-1020.

- Bowen, G. A.** (2006). Grounded theory and sensitizing concepts. *International journal of qualitative methods*, 5(3), 12-23.
- Brown, J., & Dillard, J.** (2014). Integrated reporting: On the need for broadening out and opening up. *Accounting, Auditing & Accountability Journal*, 27(7), 1120-1156.
- Buchanan, A., & Mathieu, D.** (1986). Philosophy and justice. *Justice: Views from the social sciences*, 11-45.
- Bullard, R.** (1999). Environmental justice challenges at home and abroad. *Global ethics and environment*, 33, 46.
- Chilvers, J., & Longhurst, N.** (2016). Participation in transition (s): Reconceiving public engagements in energy transitions as co-produced, emergent and diverse. *Journal of Environmental Policy & Planning*, 18(5), 585-607.
- Chilvers, J., Pallett, H., & Hargreaves, T.** (2018). Ecologies of participation in socio-technical change: The case of energy system transitions. *Energy Research & Social Science*, 42, 199-210.
- Claridge, T.**, 2004. Designing social capital sensitive participation methodologies. *Report, Social Capital Research, Brisbane, Australia.*
- Cleaver, F.** (1999). Paradoxes of participation: questioning participatory approaches to development. *Journal of International Development: The Journal of the Development Studies Association*, 11(4), 597-612.
- Collins, K., & Ison, R.** (2009). Jumping off Arnstein's ladder: social learning as a new policy paradigm for climate change adaptation. *Environmental policy and governance*, 19(6), 358-373.
- Cranton, P.** (1994). *Understanding and promoting transformative learning: A guide for educators of adults.* Jossey-Bass.
- Dryzek, J. S.** (2022). *The politics of the earth: Environmental discourses.* Oxford university press.
- Engeström, Y.** (2016). *Studies in expansive learning: Learning what is not yet there.* Cambridge University Press.
- Few, R.** (2003). Participation or containment? Insights from the planning of protected areas in Belize. *Participatory Planning in the Caribbean: Lessons from Practice*, Pugh J, Potter RB (eds). Ashgate: Aldershot; 23-44.
- Fraser, N.** (1995). Recognition or redistribution? A critical reading of Iris Young's Justice and the Politics of Difference. *Journal of Political Philosophy*, 3(2), 166-180.
- Fraser, N.** (2008). Social justice in the age of identity politics: Redistribution, recognition, and participation. In *Geographic Thought* (pp. 72-89). Routledge.
- Fraser, N.** (2009). *Scales of justice: Reimagining political space in a globalizing world* (Vol. 31). Columbia University Press.
- Fraser, N., & Honneth, A.** (2003). *Redistribution or recognition?: a political-philosophical exchange.* Verso.
- Fung, A.** (2006). Varieties of participation in complex governance. *Public administration review*, 66, 66-75.
- Garavan, T.** (1997). The learning organization: a review and evaluation. *The learning organization*, 4(1), 18-29.

- Hamilton, R. T. V., & Ramcilovic-Suominen, S.** (2023). From hegemony-reinforcing to hegemony-transcending transformations: horizons of possibility and strategies of escape. *Sustainability Science*, 18(2), 737-748.
- Hill, D.** (2022). Mission-oriented Innovation—a handbook from Vinnova. <https://www.vinnova.se/en/publikationer/mission-oriented-innovation—a-handbook-from-vinnova/>
- Hobson, B.** (2003). *Recognition struggles and social movements: Contested identities, agency and power*. Cambridge University Press.
- Holmberg, J.** (2019). Oseglade vatten? – Då behövs expeditioner! [Uncharted waters – that's when you need expeditions!] I J. Algehed, E. Eneqvist, C. Jensen, & J. Löf (Red.), *Innovation och Stadsutveckling: En forskningsantologi om organiseringsutmaningar för stad och kommun* (s. 12).
- Holmberg, J., & Holmén, J.** (2022). Higher Education Leadership: Cruise or Expedition? I H. Lotz-Sisitka & E. Rosenberg (Red.), *NORRAG Special Issue 07: Education in Times of Climate Change*. Network for international policies and cooperation in education and training.
- Holmberg, J., & Widbom, J.** (2020). Medskapande i backcastingexpeditioner—Ale i 360 grader. [Co-creation in backcasting expeditions – Ale in 360 degrees] *Socialmedicinsk tidskrift*, 97(4), 691-701.
- Holmén, J.** (2020). *Navigating Sustainability Transformations: Backcasting, Transdisciplinarity and Social Learning*. Chalmers Tekniska Högskola (Sweden).
- Hölscher, K., Wittmayer, J. M., Avelino, F., & Giezen, M.** (2019). Opening up the transition arena: An analysis of (dis) empowerment of civil society actors in transition management in cities. *Technological Forecasting and Social Change*, 145, 176-185.
- Huttunen, S., Kaljonen, M., Lonkila, A., Rantala, S., Rekola, A., & Paloniemi, R.** (2021). Pluralising agency to understand behaviour change in sustainability transitions. *Energy Research & Social Science*, 76, 102067.
- Ikeme, J.** (2003). Equity, environmental justice and sustainability: incomplete approaches in climate change politics. *Global environmental change*, 13(3), 195-206.
- Impact Innovation.** (n.d.). *This is Impact Innovation*. <https://impactinnovation.se/en/about-us/this-is-impact-innovation/>
- Jenkins, K., Sovacool, B. K., & McCauley, D.** (2018). Humanizing sociotechnical transitions through energy justice: An ethical framework for global transformative change. *Energy policy*, 117, 66-74.
- Kaljonen, M., Kortetmäki, T., Tribaldos, T., Huttunen, S., Karttunen, K., Maluf, R. S., ... & Valsta, L.** (2021). Justice in transitions: Widening considerations of justice in dietary transition. *Environmental innovation and societal transitions*, 40, 474-485.
- Kattel, R., & Mazzucato, M.** (2018). Mission-oriented innovation policy and dynamic capabilities in the public sector. *Industrial and corporate change*, 27(5), 787-801.
- Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wiecezorek, A., ... & Wells, P.** (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental innovation and societal transitions*, 31, 1-32.
- Lam, D. P., Martín-López, B., Wiek, A., Bennett, E. M., Frantzeskaki, N., Horcea-Milcu, A. I., & Lang, D. J.** (2020). Scaling the impact of sustainability initiatives: a typology of amplification processes. *Urban Transformations*, 2(1), 1-24.
- Lazarus, R. J.** (1992). Pursuing Environment Justice: The Distributional Effects of

Environmental Protection. *Nw. UL Rev.*, 87, 787.

- Leach, M., Meyers, B., Bai, X., Brondizio, E. S., Cook, C., Díaz, S., ... & Subramanian, S. M. (2018). Equity and sustainability in the Anthropocene: A social-ecological systems perspective on their intertwined futures. *Global Sustainability*, 1, e13.
- Loorbach, D. (2010). Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance*, 23(1), 161-183.
- Loorbach, D., Frantzeskaki, N., & Avelino, F. (2017). Sustainability transitions research: transforming science and practice for societal change. *Annual review of environment and resources*, 42, 599-626.
- Lyra, M. G., & Lehtimäki, H. (2023). In the Margins of Stakeholder Engagement: Fringe Stakeholders' Inclusion in Sustainability Transition Initiatives. In *Stakeholder Engagement in a Sustainable Circular Economy: Theoretical and Practical Perspectives* (pp. 393-425). Cham: Springer International Publishing.
- Martin, A., Armijos, M. T., Coolsaet, B., Dawson, N., AS Edwards, G., Few, R., ... & White, C. S. (2020). Environmental justice and transformations to sustainability. *Environment: Science and Policy for Sustainable Development*, 62(6), 19-30.
- McCauley, D., & Heffron, R. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy policy*, 119, 1-7.
- Macintyre, T., Lotz-Sisitka, H., Wals, A., Vogel, C., & Tassone, V. (2018). Towards transformative social learning on the path to 1.5 degrees. *Current Opinion in Environmental Sustainability*, 31, 80-87.
- Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104-1310.
- Mezirow, J. (1997). Transformative learning: Theory to practice. *New directions for adult and continuing education*, 1997(74), 5-12.
- Mohai, P., Pellow, D., & Roberts, J. T. (2009). Environmental justice. *Annual review of environment and resources*, 34, 405-430.
- Moore, A. (2019). Deliberative elitism? Distributed deliberation and the organization of epistemic inequality. In *Deliberative Systems in Theory and Practice* (pp. 53-70). Routledge.
- Pellow, D. N. (2017). *What is critical environmental justice?*. John Wiley & Sons.
- Pickering, J., Coolsaet, B., Dawson, N., Suiseeya, K. M., Inoue, C. Y., & Lim, M. (2022). Rethinking and upholding justice and equity in transformative biodiversity governance. *Transforming biodiversity governance*. Cambridge University Press.
- Rawls, J. (2017). A theory of justice. In *Applied Ethics* (pp. 21-29). Routledge.
- Schlosberg, D. (2007). *Defining environmental justice: Theories, movements, and nature*. OUP Oxford.
- Schlosberg, D., & Collins, L. B. (2014). From environmental to climate justice: climate change and the discourse of environmental justice. *Wiley Interdisciplinary Reviews: Climate Change*, 5(3), 359-374.
- Scoones, I., Stirling, A., Abrol, D., Atela, J., Charli-Joseph, L., Eakin, H., Ely, A., Olsson, P., Pereira, L., Priya, R., van Zwanenberg, P., & Yang, L. (2020). Transformations to sustainability: Combining structural, systemic and enabling approaches. *Current Opinion in Environmental Sustainability*.

- Sen, A.** (2008). The idea of justice. *Journal of human development*, 9(3), 331-342.
- Shelton, D.** (2007). Equity. *Oxford handbook of international environmental law*. 640–662. Oxford university press.
- Slater, K., & Robinson, J.** (2020). Social learning and transdisciplinary co-production: a social practice approach. *Sustainability*, 12(18), 7511.
- Smith, A. and Stirling, A.** (2007), "Moving outside or inside? Objectification and reflexivity in the governance of socio-technical systems", *Journal of Environmental Policy & Planning*, Vol. 9 Nos 3-4, pp. 351-373.
- Stirling, A.** (2008), "'Opening up' and 'closing down': power, participation, and pluralism in the social appraisal of technology", *Science, Technology & Human Values*, Vol. 33 No. 2, pp. 262-294.
- Swilling, M., Musango, J., & Wakeford, J.** (2016). Developmental states and sustainability transitions: prospects of a just transition in South Africa. *Journal of Environmental Policy & Planning*, 18(5), 650-672.
- Swyngedouw, E.** (2013). Apocalypse now! Fear and doomsday pleasures. *Capitalism Nature Socialism*, 24(1), 9-18.
- Vinnova.** (n.d.). *Impact Innovation - mobilizing for sustainable development*. <https://www.vinnova.se/en/m/impact-innovation/>
- Voß, J. P., & Bornemann, B.** (2011). The politics of reflexive governance: challenges for designing adaptive management and transition management. *Ecology and Society*, 16(2).
- Voß, J. P., Smith, A., & Grin, J.** (2009). Designing long-term policy: rethinking transition management. *Policy sciences*, 42, 275-302.
- Walker, G.** (2012). *Environmental justice: concepts, evidence and politics*. Routledge.
- Wals, A. E.** (Ed.). (2007). *Social learning towards a sustainable world: Principles, perspectives, and praxis*. Wageningen Academic Publishers.
- Wals, A. E., & Rodela, R.** (2014). Social learning towards sustainability: Problematic, perspectives and promise. *NJAS-Wageningen Journal of Life Sciences*, 69, 1-3.
- Warren, M. E.** (2009). Governance-driven democratization. *Critical policy studies*, 3(1), 3-13.
- Wells, J.** (2012). *Complexity and sustainability*. Routledge.
- Whyte, K. P.** (2018). The recognition paradigm of environmental injustice. *The Routledge handbook of environmental justice*, 113-123. Abingdon: Routledge.
- Williams, S., & Doyon, A.** (2019). Justice in energy transitions. *Environmental Innovation and Societal Transitions*, 31, 144-153.
- Winter, J., Cotton, D., Hopkinson, P., & Grant, V.** (2015). The university as a site for transformation around sustainability. *International Journal of Innovation and Sustainable Development*, 9(3-4), 303-320.

Looking for the Intersection Between Spatial Equality and Ecology in Municipal Governance - *A Case Study of Gothenburg*

Abstract: The concept of ‘just transition’ is getting an increased academic attention and spurs different fields to develop their own take on it. This research report answers the academic call for a holistic understanding of ‘just transition’, as it uses the framework of climate, energy, environmental justice (CEE) to give a more comprehensive understanding in the case study of Gothenburg. This is complemented by spatial justice as Gothenburg is a segregated city and all large social projects (such as climate transition) must be understood spatially, through multiple realities with different geographical outcomes. Reading the city’s policy documents “An Equal Gothenburg” and “Environmental and Climate Programme”, this research report investigates eco-social integration (or lack thereof) as a way of searching for ‘just transition’ on a policy level. The analytical framework uses spatiality as a criterion and thereafter the research report analyses subgoals in the two documents, in relation to ‘just transition’ understood from a CEE perspective. The overall picture is that the eco-social integration stays on an overarching wording level in one part of the “Environmental and Climate Programme”. The integration is excluded in concrete subgoals and indicators; and therefore, the justice perspective could easily be overlooked in actual work. Furthermore, some areas are not related to justice at all. This is the case for energy consumption, transportation and participation. Areas which need to be

¹ Sara Malm wrote this article under the mentorship of prof. dr. Kristina Grange.

included for a 'just transition.' This research report is to be viewed as a systematic starting point, from where further research is needed to better understand the actual environmental and climate work carried out by the municipality and the consequences this has for spatial justice in the city.

Keywords: just transition, City of Gothenburg, governance, conflicts, synergies, eco-social integration, CEE, spatial, spatiality, environment, justice

Introduction

Since the turn of the millennium, the academic field of 'just transition' is taking form and getting more and more attention. The concept 'just transition' is viewed from many different perspectives and is seen as relevant e.g. in terms of labour rights, energy poverty, climate justice, environmental justice, sociotechnical system transition (Wang & Lo, 2021; Heffron & McCauley 2018), spatial justice (Garvey et. al. 2022) and public health (McMonagle 2021).

The concept was first used in the 70s by activists and labour unions to strengthen labour rights in a time of mass layoffs from industries that didn't meet up to new sharpened environmental requirements. Realizing that industry shutdowns and socioeconomic restructuring were inevitable; workers chose to take up the fight for labour rights in the transition; a *just* transition. (Wang & Lo, 2021) Ever since academia picked up the concept it has been broadened and come to interest a multitude of disciplines. Several different definitions has been developed for what 'just transition' means; leading to critique that a lack of common understanding makes academic debates harder and undermines acceptance of the concept in society at large. (Wang & Lo, 2021; Heffron & McCauley 2018) The fact that the academic field of 'just transition' is growing points to its relevance for our time and Wang & Lo (2021) believe that the transition from fossil-based economies to green economies has a risk of producing as well as reproducing injustices in society if we do not specifically address justice through social transformation. (Wang & Lo, 2021).

So how could 'just transition' be understood? Both Heffron & McCauley (2018) and Wang & Lo (2021) demonstrate the need to incorporate perspectives from multiple academic streams to provide a holistic view of just transition, even if the perspectives they include differ from each other. This research report departs from this need and make use of a holistic understanding as a theoretical framework for how a just transition could be understood in a Gothenburg context.

Furthermore, this research report positions itself in gaps pointed out by Wang & Lo (2021). They highlight the need for empirical studies within the academic field. So far, focus have been on theorizing about the concept and how it *should* be done. Studying how just transition is *understood and applied in practice*; how different ideas about what a just transition means conflict with each other and what opportunities and problems arise, would contribute with new knowledge to the research field. (Wang & Lo, 2021) There have been studies that focus on local examples (Kolde & Wagner 2022; Sovacool et.al. 2019) and the policy work of different countries and regions for just transition has been studied on a general level (Krawchenko & Gordon 2021). However, the number of empirical local studies is still limited and there is a continued need to deepen the knowledge of management and governance for just transition in a local context.

In the case of Gothenburg, relevant research and insights has been presented by Khan et.al (2020) as they studied eco-social integration in urban sustainability governance in Sweden's three largest cities. They found more similarities than differences, stating that:

"[s]till, despite decades of work with local sustainable development, most recently through the Sustainable Development Goals and Agenda 2030, we find that environmental and social welfare concerns continue to be managed as two quite separate topics while apparent connections between them are not addressed in a systematic way." (Khan et.al. 2020: 13)

Delimited projects and specific policy areas made measures for eco-social integration, however comprehensive strategies for integration were lacking and departmental separation was the norm. Key insights from the study are which type of eco-social integration that did occur and which type that were not. Khan et.al (2020) writes that:

"the type of eco-social integration we observe in the three cities relates primarily to local environmental issues such as access to green areas, rainwater protection, urban gardening, and improved local living environments. This is in contrast to conceptual work on sustainable welfare, which emphasizes global issues such as climate change, its social implications, and eco-social policy integration as a way forward [6,7]. At the urban level, the most apparent connections between ecological and social concerns seem to be those that are tangible for local citizens and communities." (ibid)

The challenges related to climate change were treated as environmental problems with technical solutions, whereas the social implications were largely neglected. Also, ecological impacts of consumption and lifestyles were found to be individualized as the municipalities mostly addressed the issue in the form of advice and information to households. Little attention was given to variations in ecological footprints depending on socio-economic differences.

This research report serves as a starting point that lays the ground to further research concerning just transition in Gothenburg. Its aim is to give systematic focus to the two steering documents "Environmental and Climate Programme" and "An Equal Gothenburg", in order to highlight synergies and conflicts that could arise in between the documents' goals in relation to the concept 'just transition'. It acknowledges previous research and conclusions made by Khan et.al. and to some extent, re-examines the matter. However, relevance is found in the in-depth systematic approach in regard to scrutinizing each goal in both documents separately as well as this reports extra focus given to spatiality. As has been concluded, a systematic approach to eco-social integration is lacking in Sweden's three largest cities, and

this report with its following, within the period of a PhD of four years, has the aim to contribute to this systemization.

The City Management Office in the City of Gothenburg has the overall responsibility for implementing the city's steering documents. The PhD research will have its focus on the City Management Office and the integration of the work for equality and the work addressing climate change and environmental degradation. As such the main research area is just transition in the local context of the City of Gothenburg. As a starting point this research report will look into the steering documents "Environmental and Climate Programme" and "An Equal Gothenburg", to highlight how they could be understood and related to the academic field of just transition, how the two documents overlap or overlook each other and what synergies and conflicts that could be found. The overall criteria for the research report is that the just transition aspects could be studied geographically on a municipal scale. The spatial dimension is considered as fundamental for Gothenburg, which is a segregated city.

Main questions

1. How could the goals and subgoals within »Environmental and Climate Programme« and »An Equal Gothenburg« be understood based on different definitions of 'just transition' within the academic stream for climate, energy, environmental and spatial justice?
2. How do »Environmental and Climate Programme« and »An Equal Gothenburg« overlap, overlook each other and what are the opportunities for synergies or conflict – in terms of spatial just transition within the Gothenburg geography?

Theory

'Just transition' is understood based on how the term is used within the academic stream that integrates environmental justice, climate justice and energy justice. (Wang & Lo, 2021; Heffron &

McCauley 2018) This is complemented by spatial justice, as argued by both Heffron & McCauley (2018) and Garvey et. al. (2022). Regarding the Gothenburg context, where there are large differences in living conditions in different parts of the city (Göteborg Stad 2017), this research report takes a position to include the spatial dimension of how 'just climate transition' could be understood in Gothenburg. Just as Soja (2010) argues that justice has a geography and just as Massey (2005) believes that large social projects must be understood through multiple realities that take place spatially, this research report assumes that climate transition in Gothenburg results in different geographical outcomes.

Using a framework of 'just transition', based on climate, energy, environmental and spatial justice, gives focus to the distribution of gains and losses spatially and between groups. It is a way to make visible in what way the aspect of justice is integrated into the work for climate transition, for which the City Management Office is responsible. Synergies, conflicts and oversights between »Environmental and Climate Programme« and »An Equal Gothenburg« can be made visible based on how the governing documents relate to the different definitions of 'just transition'. A special focus is given to the spatial dimension of justice in terms of gains and losses in the transition. Chosen academic stream also means that others are ruled out, such as labour rights, socio-technical transition and perceived justice by the general public.

Labour rights is not considered to be relevant to this research report's focus area, nor to be particularly relevant to Gothenburg in general. However, it would be particularly suitable for studies that focus on communities whose predominant economy is based on industries that need to be phased out in the transition, for example in Lysekil. Furthermore, this research report chooses not to focus on the socio-technical perspective. Partly because it misses important aspects of justice and partly because it is governing, not technical innovations, that are in focus for this study. When it comes to 'just transition' based on perceived justice by the public, there is some relevance for the PhD research that will follow this report, because legitimacy and anchoring in Gothenburg can affect the action space for the City Management

Office and relevant administrations. However, this perspective is not the main focus and would at best supplement the perspectives raised based on climate, energy, environmental and spatial justice. In terms for this research report, that serves as a starting point for the PhD research, the perspective of perceived justice is not relevant as it cannot be studied through a text analysis in policy documents and it does not relate to any of the main questions that are posed to the steering documents themselves.

Material and method

In the City of Gothenburg, the structure for how the city works for equal living conditions and for environmental sustainability is two separate processes. At a steering level the areas are separated into two; each basing their work on a programme. Both programmes are adopted by the municipal council and aim to be integrated in all of the city's committees' and boards' work. Following the two programmes, each of the areas have a different structure of supporting documents that aim to concretize how to fulfil the goals of the programmes. The name of the programmes are "An Equal Gothenburg" and "Environmental and Climate Programme". In the aim to address justice within the climate transition in Gothenburg; these two steering documents (and their supporting documents, working groups, etc) are of high relevance. Starting systematically from the goals and subgoals within the programmes gives a foundation to continue research from; whether it be in supporting documents, working groups, follow-up material or within policy areas that more specifically aim to integrate the two perspectives (such as within city planning). However, in the frame of this research report the exclusive focus will be given to "An Equal Gothenburg" and "Environmental and Climate Programme".

The underlying method of this research report is content analysis. I extracted the goals and subgoals of the two reports into a matrix (see appendix). I systematically coded which of the subgoals that refer to the other document. As "An Equal Gothenburg" was written before "Environmental and Climate Programme", it does not refer at all. So in this case, what is interesting is to whi-

ch extent and where "Environmental and Climate Programme" refers to "An Equal Gothenburg". Thereafter I summarized each goal and made an assessment if and how it could synergize with the other document and contribute to a geographically more (or less) just transition. Lastly, I made a remark on what theoretical understanding of just transition the goal relates to.

"An Equal Gothenburg" is divided into four goals (A-D in appendix). These four goals in turn have 5-7 subgoals each. "Environmental and Climate Programme" is divided into three goals (A-C in appendix). These three goals in turn have 4 subgoals each.

Each of the subgoals in both steering documents have been analysed if it relates to 'just transition' and could be studied in a geographical sense. The appendix includes short remarks on each of the subgoals. The ones deemed to be directly relevant (green marked in appendix) and those deemed to be secondarily relevant (yellow marked) have been categorized as to which kind of aspect of 'just transition' that is applicable. Since one of the criteria for the subgoals to be judged relevant is that it could be studied geographically all of the relevant subgoals will have a spatial aspect to them. However, the aspects of environmental, energy and climate will vary in between the goals.

Discussion

Question 1. How could the goals and subgoals within "An Equal Gothenburg" and »Environmental and Climate Programme« be understood based on different definitions of 'just transition' within the academic stream for climate, energy, environmental and spatial justice?

"An Equal Gothenburg"

Goal A. "Create a good start in life and good conditions for growing up"

Goal A concerns living conditions for children, the environment they grow up in and the opportunities they get to create a good

life. In terms of studying just transition, the two main themes that occur as relevant in this section are (1) the access to biodiverse, green, social meeting spaces and (2) having the opportunity to influence both the local environment and Gothenburg's work for biodiversity and climate. The first theme could be understood as environmental distributive justice and the second participatory justice studied from a spatial point of view.

Subgoals

1. Give every child the possibility to develop to their full potential

Family centred way of working. Preschools and schools are important actors to even out living conditions. Secondary relevant for study; as it could include strengthening mental access to nature for health and social interactions.

2. Focus on early interventions

Early interventions so that children do not end up in serious problems. Socio-political with no clear climate perspective. Not relevant for the study on just climate transitions with a geographic focus.

3. Strengthen grownups around children

Reaching out and supporting parents/carers of children, that are in need. In order to support health and development of the child. Secondary relevant for study; as health is interconnected with spending time in nature and the interventions could strengthen mental access to nature for child.

4. Promote children's language development in all arenas where children and young people are

Interventions to strengthen language development in children with extra need of support. Socio-political with no climate perspective. Not relevant for the study on just climate transitions with a geographic focus.

5. Give children and young people the opportunity to strengthen social networks and abilities

Interventions to use and create new meeting spaces for children and youth, to enhance social cohesion and trust in society. It

could imply both indoors and outdoor spaces. Outdoor spaces could synergize with biodiversity. The geographic outlay of green spaces/nature with a social meeting aspect is relevant to study as a part of just transition.

6. Give children and youth the opportunity for participation, influence and the right to be themselves

Interventions giving children opportunity to partake, be heard and have influence in matters that concern their life. Climate change and environmental degradation concern all children's lives. Degree of influence or ways that opportunity to influence is created can be studied geographically as part of a just transition.

7. Children and youth shall have accessible and meaningful free time

Interventions to give children a meaningful spare time to enhance their development. It includes opportunities to partake in culture, sports, associations and to be able to influence the local environment. Having the opportunity to influence the local environment could be studied geographically as part of a just transition.

Goal B. Create conditions for work

Goal B concerns interventions to close the gap between employment market and people far away from employment. All interventions are with a strong socio-political focus and are not relevant to study from a geographic perspective on just transition. The goal has some overlap with just transition from the perspective of labour rights. However, rather than focusing on labour rights in a transitioning operation, it would be to make use of the city's transition in order to get people into the labour market. The goal does not focus on the environmental or climate labour market, although this could be included. In the cases the subgoals could be studied from a justice perspective and could be applied in transition work, it still isn't applicable to study geographically. Hence, all of the subgoals are excluded from this study, as it has a defined spatial focus.

Subgoals

1. Match skills to facilitate entry into the labour market

Interventions for Gothenburg city, as an employer, to recruit with reasonable demands on competences. Not putting too big demands for the position, to make it easier to get an employment in the beginning of a career. Not relevant for the study on just climate transitions with a geographic focus.

2. Tailor education and learning to facilitate entry into the labour market

Interventions to validify knowledge and experiences, to match education and competence development on the right level. Not relevant for the study on just climate transitions with a geographic focus.

3. Work to provide correct information to employers

Interventions aiming to give employers information about what kind of support they can get when employing workers with special needs. Not relevant for the study on just climate transitions with a geographic focus.

4. Facilitate the first step into the labour market

Interventions for employing persons without a high school diploma; where the position is combined with competence development and reaching a high school diploma. Not relevant for the study on just climate transitions with a geographic focus.

5. Broaden the possibility of entering the labour market

Interventions to stimulate social enterprises and labour cooperatives. As a way to give persons, with difficulties to get or keep an employment, opportunity to integrate in the labour market. Synergies could be found with biodiversity in the sense that such enterprises and cooperatives could enhance biodiversity (as in the case of »Vägen ut«). However, these initiatives are less relevant to study from a geographic perspective, which excludes them from the study.

6. Work for lifelong learning

Interventions to ensure adult education, as a way to give persons without high school diploma the opportunity to compensate and

enhance their employability. Not relevant for the study on just climate transitions with a geographic focus.

7. Develop the employer role

Interventions for Gothenburg city, as an employer, to make use of norm critical and non-discriminatory employment methods. Not relevant for the study on just climate transitions with a geographic focus.

Goal C. Create sustainable and equitable living environments

Goal C concerns the city planning and has a strong geographical perspective. All city planning ends up as geographical realities and as such could be studied geographically. The discernment in this case is due to which interventions that includes both ecological/climate and social values. Almost all of them do or could. The subgoals within this goal includes all justice aspects; environmental, climate, energy, spatial and participatory. Sometimes housing provision isn't totally relevant to study in terms of just transition, but that is to be scrutinized. In "Environmental and Climate Programme", goal C is the only goal referred to.

Subgoals

1. Increase participation and influence in urban development

Interventions to ensure that inhabitants have opportunities to influence and partake in developments of the local environment. Norm critical perspectives, citizen dialogues and communications as well as tools for social consequence analysis and children consequence analysis should all be adopted. Interventions for biodiversity and climate often have a geographical location. Studying opportunities for influencing and partaking is relevant for the study.

2. Create the conditions for a functioning local environment

Interventions to ensure equal access to well designed and well kept local environments. This includes places for play, culture, recreation, sports, open spaces. For grown ups, children and youth. Good air quality, good sound environment and good quality

open spaces at preschools and schools. Integration of biodiversity at these spaces is relevant and also relevant to study geographically for just transition.

3. Reduce residential segregation

Interventions to mix housings in terms of type of lease, housing type and cost levels. To link areas together through bridging/overcoming physical and mental barriers. Both conflicts and synergies are possible in terms of integrating ecological and social values. Climate smart housing could increase costs. Bridging physical barriers could include biodiversity into the social connection. Barriers, climate smart vs cost levels of housing as well as level of services in the local environment could be studied geographically with a just transition perspective.

4. Increase access to housing

Interventions to ensure opportunities for suitable housing and good living environment for all inhabitants in Gothenburg. Housing companies owned by the city has a vital role. Foremost a socio-political intervention. However, conflicts could occur between climate smart housing and cost levels. New, refurbished or old housing has a geographical dimension that could be studied. This sometimes has a climate aspect and sometimes not.

5. Equal access to the city's resources

Interventions to strengthen connections and open spaces in between city areas, in order to enhance people to meet and to create a feeling of safety. Infrastructure should support equal access to the city's resources such as culture, workplaces and service. Transport planning, focusing on biking lanes, walkways and collective transport, could be studied geographically from a just transition perspective. Also, the links or barriers could be studied.

Goal D. Create the conditions for participation, influence and trust

Goal D concerns inhabitants' opportunities to participate and influence as well as the level of trust in society. Depending on which area of participation or which topics discussed it is or is not of

interest for the study. Many interventions are clearly socio-political without climate perspectives. However, to some extent opportunities for influence and participation could be studied geographically. Also, inhabitants' input on the central level could be analysed from a geographical perspective as where from voices are raised as well as which voices that have an impact in the political arena.

Subgoals

1. Systematically integrate the participation perspective

Integrating the aspect of participation in all the other interventions. Participation and influence in climate transition is relevant to study geographically to enhance opportunities for a more just transition.

2. Increase voter turnout

Interventions to increase voter turnout in groups of society that today have a low turnout level. Not relevant for the study on just climate transitions with a geographic focus.

3. Create inclusive citizen dialogue

Interventions to increase participation and influence through citizen dialogues. A norm critical approach is crucial to include groups of society that usually is harder to reach. Civil servants and politicians ought to better make use of initiatives, opinions and needs brought up by inhabitants. Influence and participation could to some extent be studied geographically in relation to just transition.

4. Provide arenas for citizen-driven meeting places

Interventions for Gothenburg to make sure that the citizens have access to local meeting spaces where they themselves can discuss matters they find important. These meeting spaces are understood as indoors spaces. Hence, they are deemed as not relevant for the study on just climate transitions with a geographic focus.

5. Develop participation in the meeting with the municipality's operations

Interventions to strengthen transparency and opportunities for participation, inclusion and cocreation in the city's operations, which inhabitants meet and are part of. The interventions are within the

socio-political arena without clear climate perspective. Not relevant for the study on just climate transitions with a geographic focus.

6. Strengthen civil servants' treatment of people in order to create trust

Interventions for civil servants to meet inhabitants in a factual, impartial, legally correct, norm critical manner and free from discrimination. Although climate transition could include many meetings between civil servants and inhabitants the interventions are directed to the workers. A geographical perspective on the workers is not relevant for studying just transition in Gothenburg.

7. Create participation and trust through new forms of participation

Interventions to strengthen civil society, associations as well as networks. A vital civil society creates links and strengthens connections between people. Strengthening civil society could include those with a focus on climate and biodiversity. However, the support is so much broader in its scope. Not relevant for the study on just climate transitions with a geographic focus.

”Environmental and Climate Program”

Goal A. Nature: Gothenburg has a high level of biodiversity

Goal A concerns nature and the biodiversity in Gothenburg. In terms of distribution of classified »nature« in detailed plans, wetland and water status it could be studied geographically with a just transition perspective as it connects to equal health. The distribution of management plans including biodiversity as well as conservation-oriented care and protection; the relevance for the study depends on the quality of such areas from a social perspective. The likelihood is that it contributes to the sense of care given to the close environment, which has a positive health effect. The level of social interactions on such places are at the moment unclear. The municipality's purchases could be studied geographically. The justice aspect of this goal is spatial and environmental.

Subgoals

1. The City of Gothenburg manages and protects species' habitats so that natural values develop

Interventions to take inventory and protect biotopes of responsibility, on both municipal and non-municipal land. The environmental department has found 23 biotopes of responsibility. These could be studied geographically. Areas identified for conservation-oriented care and formal protection could also be studied geographically. Synergies could be created if biotopes are co-designed to be social spaces. The relevance to study it, from the perspective of just transition, depends on working methods, criteria and the geographic spread.

2. The City of Gothenburg works for cleaner seas, lakes and waterways

Interventions for a good water status in seas, lakes and waterways. Inventory of current water status, reduction of total discharges into water and development of better methods of purification. The geographic spread of water status in different recipients could be studied geographically and with a just transition perspective.

3. The City of Gothenburg increases biodiversity in the urban environment

Interventions to ensure maintenance of green areas in the urban environment, where biodiversity is included in the management plans. Interventions to increase area of wetland and the area classified as »nature« in detailed plans. Wetlands and »nature« could be studied geographically from a just transition perspective. Biodiversity as a factor included in management plans aims to be adopted 100 % throughout the city. However, it could be studied geographically along the road as could the distribution of green areas.

4. The City of Gothenburg's purchases contribute to promoting biodiversity

Interventions to ensure that the goods and services that Gothenburg municipality buys are strengthening biodiversity. This includes environmentally certified/labelled goods and

services, organic food and building and construction contracts. Schools could be studied geographically in terms of which buys organic food or not. Also building and construction contracts could be studied geographically as of where in the municipality demands are put on biodiversity.

Goal B. The climate: Gothenburg's climate footprint is close to zero

Goal B concerns how the city can reach net zero greenhouse gas emissions. The interventions that concern the production side and the city's procurement of goods and services are very important and at the same time not relevant to study geographically on a Gothenburg scale (even though bigger scales and other theories would have been of value). Emissions deriving from private cars and primary energy consumption within homes are two very relevant factors to study in relation to just transition as it coincides with class. Gothenburg is a segregated city and studying this geographically is relevant. The outlay of the walking, biking and public transport infrastructure is also highly relevant to study geographically as the distribution of opportunities to adjust and travel. Justice aspects relevant for this goal are climate, energy and spatiality.

Subgoals

1. The City of Gothenburg reduces energy use in homes and premises

Interventions to reduce primary energy consumption in homes and premises, per capita in Gothenburg. This is measured per capita but has a clear just perspective to it. Community facilities (schools, preschools, hospitals, etc) are common resources. Homes are private resources with different primary energy consumption. Business premises are to some extent also unevenly distributed; both in terms of class who accesses them as well as the geographical spread. Homes and either their square meter per person or their energy consumption could be studied geographically. The distribution of square meters business premises could be studied geographically as well.

2. The City of Gothenburg only produces energy from renewable sources

Interventions to ensure that the municipally owned energy company's production facilities switch over to producing electricity and district heating 100 % from renewable fuels. These efforts concern funding and the production side of the transition. Not relevant for the study on just climate transitions with a geographic focus.

3. The City of Gothenburg reduces the climate impact from transportation

Interventions to reduce climate impact from transport by at least 90 % by 2030 compared to 2010 and the motorized road traffic to reduce by 25 % by 2030 compared to 2020. Road traffic is the second largest source of geographical emissions of greenhouse gases in Gothenburg, after the refineries. Measures need to be taken to replace fossil fuels with renewable ones. At the same time, total motorized road traffic needs to decrease because renewable energy sources cannot supply the same volume of road traffic. Hence, the proportion of residents who walk, cycle and take public transport needs to increase. Emissions from private car traffic has a geographical and just transition dimension. The emissions depend on the fuels in the car. However, both fossil fuels need to be replaced and the total amount of cars reduced. Car ownership could be studied geographically (maybe also divided into fossil driven and electrified). The outlay of walking, biking and public transport infrastructure could be studied geographically with a just transition perspective.

4. The City of Gothenburg reduces the climate impact from purchases

Interventions to reduce amount of greenhouse gas emissions from a life-cycle perspective for all goods and services that the city procures. Not relevant for the study on just climate transitions with a geographic focus on a Gothenburg scale.

Goal C. Human: Gothenburgers have a healthy living environment

Goal C concerns the inhabitants to have a healthy environment. Good air quality and good sound environment as well as access to a green area of at least 0,2 ha within 300 meters of housing; all have a positive health effect and could be studied geographically with a just transition perspective. They all relate closely to city planning. Exposure to chemical substances deemed as particularly harmful could be studied geographically on a school level. It would then be relevant only for school years where most children stay in their local area. Justice aspects of interest are environmental, climate and spatial.

Subgoals

1. The City of Gothenburg reduces the use of harmful substances

Interventions to reduce substances that are designated by the Chemicals Inspectorate as particularly harmful, in order to reduce health problems in humans and animals. The efforts apply in the city's operations as well as in services and contracts that are procured. This could be studied geographically in terms of how it is applied in schools throughout the city. However, it is mainly seen as relevant for workers within operations and procured contracts and services, which could be studied in terms of justice but is not relevant to study geographically on the Gothenburg scale.

2. The City of Gothenburg ensures good air quality for the inhabitants of Gothenburg

Interventions to reduce air pollution where people live and spend time, with a specific focus on nitrogen dioxide and particles (PM10). Air pollution mainly comes from road traffic. Air pollution at preschools, housing and »continuous urban areas« could be studied geographically with a just transition perspective.

3. The City of Gothenburg ensures a good sound environment for the inhabitants of Gothenburg

Interventions to reduce noise at housing, preschools and green areas. The biggest source of noise is road traffic. Noise can amon-

gst other things lead to cardiovascular diseases and sleep difficulties. Noise and efforts to reduce it could be studied geographically with a just transition perspective; focusing on preschools, housing and proportion of residents that have access to a green area within 300 metres with a noise level under 50 dBA.

4. The City of Gothenburg secures access to green areas and uses ecosystem services

Interventions to increase the proportion of preschools with a green area factor of 0,45 or more and ensure that all residents have access to a green area of at least 0,2 ha within 300 meters of their housing. This would have a positive effect on public health. It could be studied geographically with a just transition perspective.

Question 2. How do »Environmental and Climate Programme« and »An Equal Gothenburg« overlap, overlook each other and what are the opportunities for synergies or conflict - in terms of spatial just transition within the Gothenburg geography?

”An Equal Gothenburg” was written before ”Environmental and Climate Programme”. Therefore, it does not refer to the latter steering document. As ”Environmental and Climate Programme” was written later, it is of interest to highlight were it refers to ”An Equal Gothenburg” and where it does not. Furthermore, it is of interest to highlight other areas of the two documents which could be relevant to synergize with each other.

The three subgoals that refer to ”An Equal Gothenburg”

In ”Environmental and Climate Programme” three subgoals within goal C refers to ”An Equal Gothenburg”. They are:

- *The City of Gothenburg ensures good air quality for the inhabitants of Gothenburg*
- *The City of Gothenburg ensures a good sound environment for the inhabitants of Gothenburg*

- *The City of Gothenburg secures access to green areas and uses ecosystem services*

All three subgoals could be related to subgoal 2 (goal C): *Create the conditions for a functioning local environment* in "An Equal Gothenburg". All three subgoals are part of the goal *Human: Gothenburgers have a healthy living environment*. The target goal 2030 for the three subgoals are divided, 60 % of them has the goal "yearly increase" and 40 % of them has the goal 100 %. Although the subgoals states a connection to the steering document "An Equal Gothenburg" the indicators are purely put on quantity and nothing concerning spatial equality. As such the aim to connect the subgoals to equality has the risk of falling short. Particularly for the subgoals with a target goal of "yearly increase" it is highly relevant to study the geographical justice/injustice of air quality, noise levels and access to green areas. But also, the subgoals with target goals of 100 % is relevant to study on the road towards 2030 and in events that the target goal is not met.

Another reflection in terms of the three subgoals is that they all connect to local environments. The indicators are in relation to preschools, housing and "continuous urban areas". Both good air quality and good sound level refers to road traffic as the main source of disturbance. Therefore, in order to improve the conditions road traffic needs to be addressed. However, the subgoal about transportation (within goal B concerning climate) does not refer to "An Equal Gothenburg". The subgoal for access to green areas and usage of ecosystem services has a local focus as its indicators look into percentage of green area within preschools and distance to green area from housing. The green areas could be synergized with subgoals within goal A concerning nature, but all these subgoals do not refer to "An Equal Gothenburg".

The goals and subgoals that do not refer to "An Equal Gothenburg"

Looking into the goals and subgoals in "Environmental and Climate Program" that does not refer to "An Equal Gothenburg" it is:

- all of the subgoals within goal A *Nature: Gothenburg has a high level of biodiversity*
- all the subgoals within goal B *The climate: Gothenburg's climate footprint is close to zero*
- one subgoal *The City of Gothenburg reduces the use of harmful substances* (within goal C *Human: Gothenburgers have a healthy living environment*)

Goal A concerning nature has subgoals for areas classified as "nature" in detailed plans, wetlands, water status, biodiversity considerations in management plans, conservation care and protection. The areas classified as "nature", wetlands and water status have positive impacts on air quality, health and biodiversity. They could be studied geographically from an environmental justice perspective and also to some extent synergize with goal C *Human: Gothenburgers have a healthy living environment*. Different management plans and levels of protection might have synergizing possibilities, depending on the social values of the areas that are maintained. The areas might be a mix of social areas in forests with walking paths, trees in alleys that improve air quality and temperature that both have a clear justice aspect to its geography as well as classifications of "biotopes of responsibility" that might have its very specific geography in itself that it would make less sense to study it geographically from a justice perspective.

Goal B concerning climate could be divided into subgoals that focus on (1) the production side and the city's procurement of goods and services and (2) emissions deriving from private cars and primary energy consumption within homes. The first focus is of great importance for the city's transition to reach net zero greenhouse gas emissions. However, it does not qualify to be studied geographically on a municipal scale and with a justice

perspective. It might be of interest to study from a sociotechnical transition perspective. However, the geographical distributions of gains and losses are not to be seen within these subgoals. The second focus, on the other hand, is of great relevance for the research report as it has a geographical dimension to it. Emissions from private cars and primary energy consumption within housing relates to economic wealth. As Gothenburg is a segregated city, it also has a geographical outlay.

The transition to reach net zero greenhouse gas emissions is presented as partly needing technical solutions and partly needing a behaviour change. In order for the electricity to be enough for working machines, industries and transportation the total amount of private cars in Gothenburg is said to have to decrease with 25 %. However, nothing is said about the socioeconomic or geographical distribution of private car ownership or how this distribution of ownership should/will change. In terms of primary energy consumption, the target goal 2030 is stated as an average usage per inhabitant. The distribution of how much primary energy is consumed is not measured or discussed. It could, however, be studied geographically from an energy justice perspective.

Furthermore, the reduction of road traffic by 25 % is said to also need an increase of people walking, cycling and using public transportation. The transport transition in Gothenburg comes with new opportunities for these means of transportation. This could be studied geographically and with a justice perspective on access to public transportation, biking and walking lanes. Integration of the street structure (that increases walking possibilities) as well as the existence of barriers (that decreases walking possibilities) could be studied geographically with a justice perspective.

Goal B concerning climate raises important and perhaps controversial perspectives on just transition in Gothenburg. Inhabitants have differently sized climate footprints which is a relevant and telling aspect of equality (or lack thereof). A just transition needs to address this.

The subgoal for a reduction of harmful substances could be studied geographically at a school level from a justice perspective.

However, it is not considered as a main focus for highlighting Gothenburg's work for just transition (or the lack thereof).

Missed dimensions found within "An Equal Gothenburg"

In the steering document "An Equal Gothenburg" some aspects, that are not mentioned in "Environmental and Climate Programme", are given focus and these could contribute to important aspects for a just transition. They are:

- Participation for children and grownups
- Housing

Participation could be studied in itself as a justice through participation. However, this research report and following PhD research has spatiality as a criterion. As such the interest for the study is to look into the levels of possibility to participate, influence and be heard in different geographical areas. The participation could concern the local environments, or it could concern the city's work for climate and environmental improvement. In goal A *Create a good start in life and good conditions for growing up* children are the main focus and one of the subgoals *Give children and youth the opportunity for participation, influence and the right to be themselves* highlights the possibility to influence matters that concern their life. Climate change and environmental degradation very much concern all children's and youths' life. Hence giving children and youth the possibility to participate and influence could be viewed as part of a just transition. In goal C *Create sustainable and equitable living environments* participation is the theme for one of the subgoals, highlighting interventions to give inhabitants the opportunity to influence and partake in local development. This could include the development of green and blue areas. Furthermore, the entire goal D *Create the conditions for participation, influence and trust* concerns participation in different segments of society. Two of the subgoals are relevant, putting focus on

- integrating the aspect of participation in all other interventions
- increasing participation and influence through citizen dialogues, making use of initiative, opinions and needs brought up by inhabitants

As participation often is lifted as a perspective on justice in its own right, it is important here to re-state that this research report has spatiality as a criterion for the study. As such, participation as an aspect to the report is relevant to study to the extent that it can be studied geographically in relation to just transition.

In terms of housing potential conflicts could arise between work for reduction of primary energy consumption and equality. In goal C *Create sustainable and equitable living environments* reduction of residential segregation and increasing of access to housing are two subgoals relating to housing. Refurbishing housing has historically led to increased rents pushing low-income households to move away from their apartments, leading to gentrification. A possible conflict could be that refurbishments for better energy solutions as well as new production of energy smart housing couples up with expensive rents, which would give the impression that you need to be rich to live in energy smart apartments. This phenomenon could be studied from a justice perspective. The geographical dimension to it might or might not be of relevance. However, it is still worth mentioning as an aspect to take into consideration for further research.

As a last remark, subgoals in "An Equal Gothenburg" highlights many of the points already made from the point of view of "Environmental and Climate Programme" concerning green areas, air quality, sound environment, transport infrastructure and local environment. Please look further into the appendix for the systematic overview.

Conclusions

Looking into overlaps, oversights, synergies and conflicts in between the steering documents "An Equal Gothenburg" And "Environmental and Climate Programme" in relation till just transition some key insights arise. First of all "An Equal Gothenburg" was written before "Environmental and Climate Program" and therefor does not refer to the latter steering document. Therefore, the research report has looked into where "Environmental and Climate Programme" refers to "An Equal Gothenburg" and where it does not. The subgoals that mention the relevance of "An Equal Gothenburg" all relate to the local living environments and could be related to the same subgoal within the "An Equal Gothenburg"; *Create the conditions for a functioning local environment*. The three subgoals are all part of the goal that focuses on the humans and their living environment; they concern good air quality, good sound environment and access to green areas. As such they concern environmental justice (green areas) and secondary measurements on climate justice (air and sound, mainly from traffic). Synergies identified, in the city's steering document, relate to local environments and communities as concrete areas where equality could matter. This research report also highlight that although two of the subgoals that refer to "An Equal Gothenburg" closely depend on road traffic (good air quality and good sound environment), the subgoal concerning transportation transition does not refer to "An Equal Gothenburg".

When it comes to the goal that focuses on Gothenburg's climate footprint "An Equal Gothenburg" is not referred to. Both the subgoal concerning transportation and primary energy consumption are two areas of relevance in terms of spatially just transition. Arguably, studying and addressing differences in climate footprint would put focus on core inequalities in the city, as the socioeconomic gaps and segregation co-relates. It would be to put spotlight on the elephant in the room saying that different groups and geographies have differently sized footprints and need to change their consumption and transportation to different degrees. Clearly this hot potato would be easier to leave outside the debate, instead focusing on technical solutions, general percen-

tage decrease in road traffic and average primary energy consumption. Leaving the distribution of who and where the biggest footprints arise. However, in order to seriously integrate environmental, climate and equality work for a just transition the climate justice needs to be addressed.

Environmental justice could be related to one of the subgoals where "Environmental and Climate Programme" refers to "An Equal Gothenburg"; namely the access to green area. However it could also be strengthened by geographically looking into the distribution of biodiversity maintenance, areas classified as "nature" in detailed plans, wetlands and water quality in recipients.

Energy justice is mainly understood as part of "An Equal Gothenburg" where housing is highlighted as an area for equality. Gentrification is a part of the city's history. Refurbishments of old housing for better energy solutions has the risk of contributing to this, just as energy smart new housing might raise rent levels. Green gentrification might be of interest to study geographically depending on if the mechanisms operates with a spatial dimension. Energy justice could arguably also be a part of the climate justice mentioned above in terms of primary energy consumption especially and transportation secondarily.

Lastly, participatory justice could be derived from "An Equal Gothenburg" as an aspect that might be of interest to study geographically. In cases possible it could be of interest to study *which groups from which geographies* have influence, participate in the creation of Gothenburg's work for environmental and climate improvement as well as for their local environment.

As a concluding remark; there are potential for more synergies and conflicts in between the two steering documents "An Equal Gothenburg" and "Environmental and Climate Programme" than the city itself acknowledges. Foremost the socioeconomic dimension and different climate footprints, coupled with energy justice/consumption, could be highlighted and worked with. Environmental justice could be strengthened in their synergies and participatory justice from a spatial perspective could be looked into as a possible area to work with further.

Literature

- Garvey, A., Norman, J. B., Büchs, M., Barrett, J.** "A 'spatially just' transition? A critical review of regional equity in decarbonisation pathways" in *Energy Research & Social Science*, vol. 88 (2022).
- Göteborg Stad;** "Göteborgs Stads program för en jämlik stad 2018-2026" (2017)
Länk: <https://goteborg.se/wps/wcm/connect/3acbb00f-65fd-4ab6-94bd-ab7325c08353/G%C3%B6teborgs+Stads+program+f%C3%B6r+en+j%C3%A4mlik+stad+2018-2026.pdf?MOD=AJPERES>
- Heffron, R. J. & McCauley, D.** "What is the 'Just Transition'?" i *Geoforum*, vol. 88 (2018)
- Khan, J., Hildingsson, R., Garting, L.** "Sustainable Welfare in Swedish Cities: Challenges of Eco-Social Integration in Urban Sustainability Governance" i *Sustainability*, vol. 12 (2020)
- Kolde, L. & Wagner, O.** "Governance Policies for a 'Just Transition' – A Case Study in the Rhineland Lignite Mining District" i *Journal of Sustainable Development of Energy, Water and Environment Systems*, vol. 10 (2022)
- Krawchenko, T. A. & Gordon, M.** "How Do We Manage a Just Transition? A Comparative Review of National and Regional Just Transition Initiatives" i *Sustainability*, vol. 13 (2021)
- Lilja, M. & Vinthagen, S. Motstånd** (2009) Sahara Printing
- Massey, D.** "Aspatial Globalisation" i *For Space* (2005) London SAGE
- McMonagle, R., Castellanos, I., Patel, S. S.** "Advancing Energy Justice as a Climate and Public Health Solution" i *World Medical & Health Policy* (2021)
- Soja, E. W.** *Seeking Spatial Justice* (2010) University of Minnesota Press
- Sovacool, B. K., Martiskainen, M., Hook, A., Baker, L.** "Decarbonization and its discontents: a critical energy justice perspective on four low-carbon transitions" i *Climate Change*, vol. 155 (2019)
- Wang, X. & Lo, K.** "Just transition: A conceptual review" i *Energy Research & Social Science*, vol. 82 (2021)

Attitudes Towards Climate Change in the View of Terror Management Theory, Authoritarianism, and Correlates of Conspiracy Thinking

Abstract: This paper proposes an innovative approach to the ongoing debate on climate policies implementation by using the theoretical framework from the field of political psychology to interpret the data on attitudes towards climate change. It aims to shed light on the vital role of psychological and social factors in shaping public attitudes toward climate change and policy responses. A diagnosis of support and resistance to climate policies is undertaken using the recent data and theoretical framework of selected psycho-political theories. The study provides valuable insights into attitudes toward climate change across political orientations, offering a basis for shaping effective climate policies.

Keywords: climate change, climate denialism, political psychology, political orientation, climate policies.

¹ Aleksandra Prusak wrote this article under the supervision of prof. dr. Andrej Lukšič.

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Introduction

This paper aims to analyse the crucial psycho-political factors affecting social attitudes towards climate change and their influence in the context of creating environmental policies. In the face of climate change and the associated social, economic and technological challenges, well-designed, effective and socially acceptable public policies are a crucial element in the process of mitigation of the effects of climate change. This is why it is essential to analyse the factors that affect individuals' views and behaviours on climate change.

The starting point of this analysis was the search for the causes of climate denialism as the most effective and rapidly spreading obstacle to climate change policies. Despite the common intuition that climate denialists are a significant and influential group in Poland, it turns out that they are only a marginal group of radicals in society. According to various sources, the percentage of climate denialists in Poland oscillates around 8-10% (ESS, 2018; Sokołowski et al., 2023; Babińska, 2021). Despite the optimistic nature of the data, climate denialism should not be ignored, even if it only affects a specific minority of the population. This is particularly important in light of the increasing diffusion of content associated with climate denialism into the mainstream, which, especially under information chaos and the difficulties in verifying the authenticity of information and its sources, provides a favourable environment for spreading false information

² Information about the project is available on the website: <https://ibs.org.pl/research/mechanizmy-akceptacji-oplat-srodowiskowych-w-polsce/>

on climate change. This, in turn, obstructs the implementation of climate policies, which are needed as soon as possible to avoid at least some of the adverse effects of climate change. Therefore, awareness-raising activities on climate change should be carried forward - so that the introduction of climate change policies is met with understanding, broad public acceptance, and support.

Even though there is comprehensive literature about different types of climate denialism - such as trend denialism, attribution denialism, or impact scepticism (Rahmstorf, 2004) - in this paper, for the clarity of the study, the term *climate change denialism* will be used as an umbrella term, including all varieties of denial of the existence of climate change or human influence on climate change, and also a denial of the fact of the adverse effects of climate change.

The contribution of this paper is the innovative approach to the debate on the origins of public acceptance of climate policies and the effectiveness of their implementation mechanisms. Focusing on the psycho-political aspects of attitudes toward climate change proposes them as a valuable starting point for creating recommendations for implementing climate policies. An essential point of consideration in this work is using some of the most recent data relating to attitudes toward climate change depending on political orientation. The survey that collected this data was conducted on a representative group of more than 10,000 respondents, which makes it a relatively accurate picture of the problem under analysis.

Psycho-political factors of attitudes towards climate change

The following chapter presents scientific findings on the psycho-political factors motivating or reinforcing climate denialism in its various forms. The phenomena described are among many but highlighted in this paper as particularly interesting and still rarely seen from the public policy design and implementation perspective.

Climate denialism and the risk of authoritarian behaviours and radicalization

Climate change denial is the most common problem faced by scientists, policymakers and activists, who are trying to educate on the issue and implement any initiatives to mitigate climate change. Whereas, in most cases, climate denialism is a product of avoiding learning about a specific problem, especially when it is complex and new. The outcome of such reasoning usually manifests as individuals trying to construct a more straightforward and safer narrative, pretending that the situation is not as severe as it has been said, or leaving the issue for the authorities to deal with (Haltinner and Sarathchandra, 2018).

Climate change denial may occur in various forms and on different levels. One such form is to minimise the threat, which can manifest itself, for example, by downplaying or dismissing the adverse effects of climate change. Another interesting behaviour connected with climate change denial is idealising the charismatic leaders who deny climate change (Dodds, 2021). The second example may be analysed in the context of the theory of authoritarianism, which is based on three components: [1] authoritarian submission to authorities, [2] authoritarian aggression on behalf of authority, and [3] conventionalism, understood as the adherence to tradition (Altemeyer, 2006). Additionally, authoritarian individuals easily submit to influential, charismatic leaders and faithfully follow their directions. Such attitudes can, in turn, breed radicalisation of the group or aggression against other groups (Oesterreich, 2005). In this context, it is also worth mentioning that climate change denialism is correlated with right-wing populism and antiegalitarianism (Jylhä & Hellmer, 2020). This relation may partly explain the particular popularity of populist political leaders in the last few years. It became typical that they made climate activists and legislators trying to introduce climate policies as a leading political enemy. This is one of the recent forms of the general tendency to politicise the issue of climate change and to build the main focus of the political debate around this particular issue.

Additionally, these factors may cause a higher risk of social conflicts, misinformation and information chaos, and – in the end - negatively affect the implementation of climate change-related policies. Climate denialism seems to be just a part of the problem, where the main risk is radicalisation and an increase in the intensity of intergroup conflicts and political polarisation. Beyond the risk of social and political instability, it may also affect introducing environmental laws in a challenging social context, when on the one hand, the political costs are very high, and on the other – the effectiveness of newly-implemented laws cannot meet the expectations and even worsen the social and political reality.

The popularity of conspiracy theories

The conspiracy theories related to climate change are among the most impactful barriers to raising awareness of the problem and successfully implementing climate policies. The main thrust of conspiracy theories relating to climate change claims that it is a conspiracy of scientists to obtain additional funding or a scheme directed at destroying the fossil fuel industry and promoting nuclear power (Douglas & Sutton, 2015). The case of climate-related conspiracy theories, as well as many other essential social issues or challenges (e.g. COVID-19 pandemic or war in Ukraine), are the topics particularly at risk of being an object of conspiracy theories. That is because when facing unusual events affecting many areas, which are too complex, people tend to find more straightforward explanations and randomly mix the facts to fit into their theories (Douglas & Sutton, 2023).

This particular tendency to accept conspiracy explanations of events is clarified by *conspiracy thinking*, also called *political paranoia*. According to Korzeniowski (2010), political paranoia is characterised as a belief that the main driver of socio-political events is the conspiratorial activity of clandestine others against the individual or their group. Most conspiracy theories are built as an alternative explanation of essential events. Although looking for an explanation for surprising phenomena can be considered a normal and natural coping mechanism in challenging

situations, the difference between the natural reflex to seek an explanation and conspiracy thinking is that most people accept the explanations provided by legitimate authorities, but individuals who think in a conspirational way do not accept them and try to find the “real explanation” (Abalakina-Paap et al., 1999, p. 642). There are three components that are typical for the construction of conspiracy theories: [1] rejection of randomness – the belief that significant events must have great causes; [2] rejection of too probable and too simple explanations, which is explained by the belief, that the truth is hidden by conspirators; [3] strenuously looking for connections between events, even if it should be only an apparent connection (Guzowski, 2016).

What is especially interesting from the socio-political point of view, is the identified group of psychological variables, correlated with beliefs in conspiracy thinking, which are: [1] anomie – what is explained by the lack of legitimation for institutions providing the official explanations of the events; [2] authoritarianism - which is connected with blaming others for current difficulties occurring in the own group; [3] powerlessness – a belief that no one has any control over reality; [4] low self-esteem - which, similarly to authoritarianism, may be a motivation to blame the others for negative events, [5] high levels of external locus of control - which is the belief that there are many events in the world beyond an individual’s control; [6] hostility – a belief that the world is full of harm and against the individual; and [7] low level of trust - which is connected with the belief that others want to damage one’s own group and conspire against them (Abalakina-Paap et al., 1999). The correlates of conspiracy thinking allow us to see the broader perspective of the problem of susceptibility to conspiracy explanations of reality. As particularly vulnerable individuals, we should single out those who are lost on the political scene, sceptics unable to find a party to which they could entrust the representation of their interests. At the same time, not trusting other people or institutions, they are fixed in their worldviews and ready to defend them at all costs while blaming others and radicalizing against them.

These factors also make the influence of conspiracy theories a severe threat to implementing new policies (especially those according to climate change), the general functioning of the state, the social stability and the trust between the authorities and the citizens. This stems from the belief that all actions taken by state actors or other people are simply a pretext for some hidden benefit rather than an attempt to act in the face of real threats.

variable	effect
anomie	lack of legitimation for institutions providing official explanations of the events
authoritarianism	blaming others for current difficulties occurring in their own group
self-esteem	blaming others for negative events
external locus of control	a belief that there are many events in the world beyond an individual's control
hostility	a belief that the world is full of harm and against the individual
trust	a belief that others want to damage one's own group and conspire against them

Table 1: Psychological variables correlated with beliefs in conspiracy thinking. Own elaboration based on Abalakina-Paap et al.,1999

Intending to apply this knowledge for better policymaking, several clues emerge. First, to avoid the influence of conspiracy theories on the implementation of climate-related policies, the public should believe that it impacts socio-political reality and that its interests and the common good are considered. Secondly, the authorities face the challenge of building long-term and stable public trust towards authorities (scientific, social, and political). This can be realized, for example, through the implementation of long-range sectoral policies or public consultations and the inclusion of NGOs and other grassroots citizens' initiatives in the decision-making process.

Radicalisation as a reaction to climate change in light of terror management theory

The Terror Management Theory (Greenberg et al., 1997), which claims that individuals radicalize their attitudes in response to reminders of death, may also be applicable in the context of research on attitudes toward climate change, and this approach has gained popularity in the last decades. TMT explains a large group of social behaviours driven by attitudes related to climate change, such as [1] idealization and following charismatic leaders without any criticism or rationality, [2] high levels of self-esteem, which is often associated with consumerism and materialism and a drive to accumulate goods; [3] increased level of antagonism between different types of groups - not just between environmentalists and anti-environmentalists; and [4] the tendency to radicalise one's views on different scopes, what may lead to conflicts within society (Dickinson, 2009).

However, TMT can also induce positive behaviour, as observed among a group of individuals who initially cared about protecting the environment. However, what is particularly interesting is that among groups initially holding negative attitudes toward climate change, TMT acts classically, thus promoting negative attitudes and actions (Wolfe & Tubi, 2018). According to the classic findings related to the TMT, the radicalization of one's view appears in every group - no matter what their political orientation is; so – the right wing becomes more right-wing, the left wing becomes more left-wing, and the centrists may shift their social and political views slightly in a right-wing way (Weise et al., 2008).

TMT may also be used as an inspiration to create better climate change policies and avoid social conflicts. An interesting example is that individuals with higher levels of fear salience are more likely to be driven by materialistic reasons and thus are less willing to get involved financially in climate action - e.g., paying an emissions tax (Phuc Dang et al., 2021). Several studies also show that exposure to climate change information may encourage a liberal shift in individual attitudes and reflect the perception of climate change as a higher risk, even amongst some climate

deniers (Naidu et al., 2023). Such a perspective may strengthen the importance of climate change education as a crucial part of environmental policies. It also suggests that fear-based communication and education may be ineffective, counterproductive, and radicalize climate sceptics.

These findings conclude that the most strategic part of climate change mitigation policies is the accurate communication of implemented policies based on professional and consistent information and education on climate change rather than outsized and polarizing messages. What is also crucial, in this case, is the need for a fully conscious understanding of social and political risks, such as radicalization, disinformation or higher-intensity conflicts between different groups that are even more radicalized in the unusual context of fear and uncertainty caused by climate change.

Methods

The data presented here were part of an extensive questionnaire constructed to conduct an economic experiment in August 2022 from the representative group of Polish voters (n=10,281).

In addition to questions about the experiment, respondents were also asked about their declared political preferences (which were then verified with detailed questions relating to social and economic views) and attitudes toward climate change. These are among the most recent data from Poland that provide highly detailed information and are collected from a relatively large group of respondents.

Results: The relationship between climate change attitudes and political orientation - a case study of Poland

The following analysis aims to apply the findings on the particularly interesting psycho-political explanations for the various forms of climate denialism to the socio-political reality of Poland. This case study is a significant example of a Central-Eastern European Country where environmental policies are still intensively discussed, and

climate change is one of the most polarising factors. Still, climate change activism is growing, and social awareness of the negative impacts of climate change is rising. On the other hand, the political context is also worth mentioning because of the high levels of polarisation and the intensity of the political conflict (Górska, 2019).

The case is also worth analysis in the context of its party system, which escapes classical typologies. After 1989, in the initial post-transition period, the Polish political scene was based on two blocs, representing the legacy of two significant forces: a pro-democratic one centred around the „Solidarność“ movement and a post-communist one. Since 2005, there has been a reshuffling in this regard, and two major parties have emerged, alternating in power until today - Law and Justice and Civic Platform (currently named “Civil Coalition”). On the other hand, the post-communist left has lost its previous position on the political scene, gradually being marginalised and remaining a relatively weak political force. Another essential thread is the regular emergence of movements and new parties in opposition to the domination of the two most influential parties. These movements are trying to capture the electorate, which is sceptical of the functioning party system and disappointed with the political reality. They are characterised by a sudden increase in support, which does not bring long-lasting results and eventually forces them to cooperate with Law and Justice or Civic Coalition. The other significant element of the current political scene in Poland is the growth of the importance of the Confederation Party, which is an alliance of radical-right, libertarian and nationalist.

The specific information on the approach to climate change and climate change-related policies is visible in the data according to the political orientation. The data shows that the closer a group of voters is to the right wing, the more negative it is about climate change and the more often they deny it (Figure 2). The highest levels of climate denialism are noted among right-wing orientations, regardless of their economic views. Also noteworthy is the group of centrists, among whom there is one of the highest percentages of climate denialism (Figure 1).

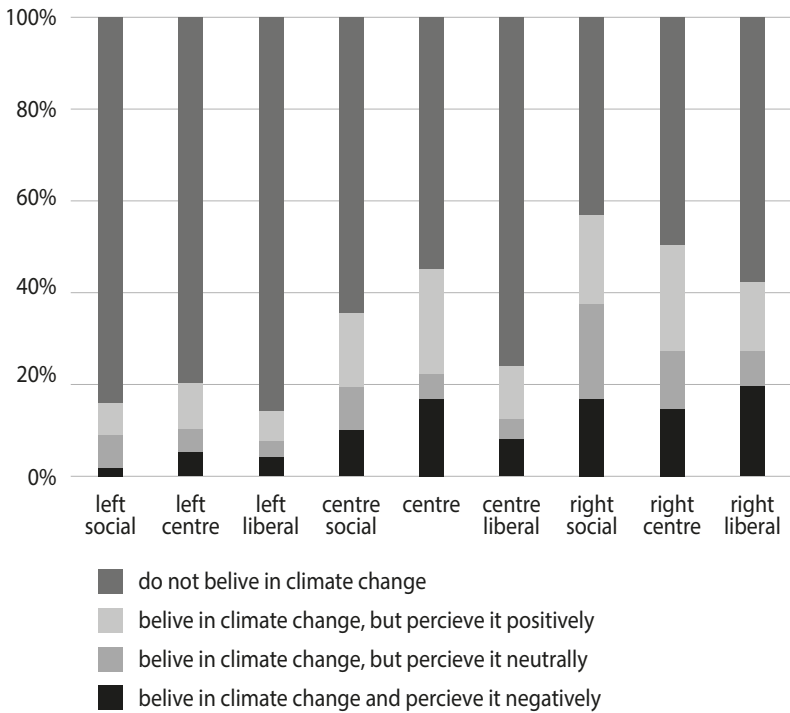


Figure 1: Attitudes towards climate change within Polish electorates of different political orientations.

Source: Own elaboration based on Ariadna, 2022.

The highest levels of climate change denialism occur within electorates of Law & Justice (currently ruling, conservative, economically social) and Confederation (a coalition of highly conservative, economically liberal parties and activists from common areas, e.g. pro-life and anti-vax). Among the electorate of the second one, various forms of climate denialism are noted in over 50% of people (Figure 2).

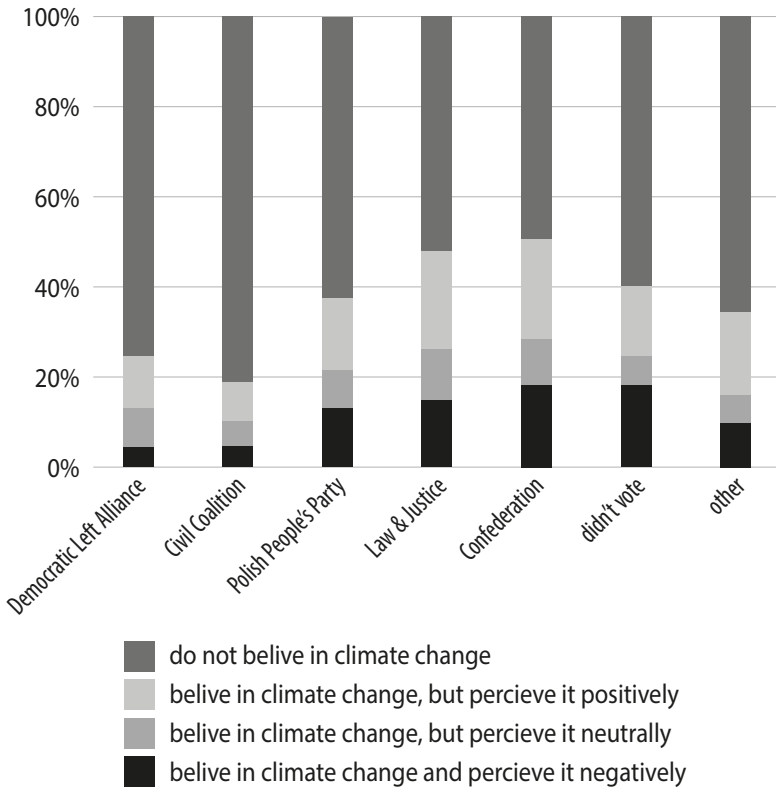


Figure 2: Attitudes towards climate change within electorates of Poland's most significant political parties.

Source: Own elaboration based on Ariadna, 2022.

Discussion

These data are consistent with the survey results on the characteristics of the Polish electorates carried out by CBOS (Centre for Public Opinion Research). According to the latest survey (CBOS, 2023) - among the electorates of the Confederation, Law and Justice and the group of non-voters, exceptionally high levels of political paranoia were noted. Similarly, Law and Justice electorates and non-voters scored clearly highest on the authoritarianism scale. The survey results on anomie and political alienation levels are

interesting, though explainable. Namely, the highest scores on both variables were observed among non-voters or those unable to define their political preferences and among party electorates - Confederation voters. It may be explained by the sense of confusion and lack of influence on political reality, as well as the lack of partisan representation. It also suggests a way to interpret the fluctuation of a group of undecided voters disappointed with the two largest political parties. This group, existing in opposition to both the rules of the political scene and its leading actors, proves to be one of the strategic in the light of social attitudes toward climate change.

The collected data suggest that the individuals most susceptible to various forms of climate denialism are those with a right-wing orientation - particularly those identifying as Confederation voters or those who are inactive voters and those who cannot identify their political preferences. Both groups stood out from the rest of the electorate in achieving high scores on all variables analyzed in the context of climate denialism propensity. Also noteworthy is the high level of authoritarianism and political paranoia noted among voters of the currently ruling Law and Justice party, which also suggests that climate policies are perceived negatively for the right-wing electorate. This is particularly interesting in the context of the growing eurosceptic movements in Poland, which present climate policies as a manifestation of the adverse effects of EU membership and Poland's dependence on Western Europe. This is an example of the already mentioned tendency to construct political messages opposing any climate protection-related activity, climate activism or policymaking. In this case, Law and Justice and the Confederation define the European Union's climate policy (and what is related to it - including climate activism) as one of their main enemies, linking this issue to the protection of Polish sovereignty, which in turn reinforces the negative message and raises the status of the problem.

Therefore, the issue of climate change is politicised - in particular by right-wing parties - and placed in the negative context of being subordinate to other forces and external demands such as a state. Such messages effectively reach the voters of these parties,

thereby increasing support for such an understanding of climate policies, where their high costs and 'top-down enforcement' are shown. In contrast, issues as fundamental and crucial as the negative impact of climate change on agriculture and most sectors of the economy, rising fuel prices, or the increased cost of living for the majority of the population are not visible.

Analysing the Polish case, it can be seen that a significant input in the debate on climate policies is held by right-wing organisations, which promote the vision of climate policies as a form of external oppression. In this example, the influence of the factors described in the earlier parts of the article is visible - this can be seen both in the survey data and when analysing them in the context of Polish political reality.

Conclusions: How to avoid the negative impact of denialism on climate policies?

At least several sources of negative attitudes towards climate change are worthy of attention in the design of climate change mitigation policies. A few main conclusions emerging from the data cited can suggest some good practices for preparing and implementing climate policies with high public acceptance and civic engagement levels.

Firstly, it is essential to prevent the social effects of climate denialism in various forms. In addition to continued and detailed climate education, it is also vital to thoughtfully construct messages about climate change policies. Communication and education about climate change should avoid highly emotional and fear-inducing components, as such emotions stir public sentiment and radicalize intergroup relations - generating social conflicts. Additionally, climate change mitigation policies based on negative communication mechanisms are mostly ineffective, and the risk that they will fail is tremendously high (Haltinner & Sarathchandra, 2018). On the other hand, a communication strategy based on making climate change a personal and close issue is not beneficial because it may cause higher levels of fear

and provoke coping mechanisms based on denial or avoidance (McDonald et al., 2015). As Haltinner and Sarathchandra (2018) propose, accurate communication, empowering people to engage in climate change mitigation and energy transition policies, should be based on the motivation to protect the common good and avoid the negative consequences of climate change 'in their nearest area'. The idea of such a way of communication aims to awaken in individuals a feeling that climate change may affect someone very close and similar to them.

The critical issue, however, is to design climate policies so they find broad public support. Solutions such as public consultations and other forms of incorporating citizens into decision-making processes can be helpful in this area. Various forms of public consultation may also help to reduce the level of anomie and political alienation by increasing the citizen's sense of having a real impact on policy and bringing them closer to the rules of state functioning and decision-making on public policies - including those mitigating the effects of climate change.

An important issue is also the fairness of the proposed solutions – represented by redistribution and progressive economic solutions - so climate policies are socially just and the most vulnerable groups are given special care (Sokołowski & Frankowski, 2023). In this way, climate policies, including environmental taxes, gain a component of social policy, taking care to reduce inequality in the face of climate change. At the level of systemic solutions, the most commonly articulated fears associated with climate policies - that they will be costly, and workers in many sectors will lose their jobs - should be addressed first and foremost. Climate policies should therefore put the need to avoid deepening inequality at the core. To be effective, they must move toward adequately ensuring the interests of all sectors of society.

A good starting point for avoiding the failure of climate policies is to look at their opponents' arguments and consider their concerns, then respond to them with concrete policy solutions, such as progressive carbon tax implementation and fair redistribution. All these components must be foremost coherent

with each other - that encouraging messages from politicians and activists is not just a slogan but a well-thought-out part of a larger project to not only educate and inform the public but to involve citizens in decisions that are, after all, presented to them as essential and affecting their lives.

Literature

- Abalakina-Paap, M., Stephan, W.G., Craig, T. and Gregory, W. L.** (1999), Beliefs in Conspiracies. *Political Psychology*, 20: 637-647. <https://doi.org/10.1111/0162-895X.00160>
- Altemeyer B.** (2006) *The Authoritarians*, Winnipeg, Canada.
- Babińska M.,** (2021) Polacy o globalnym ociepleniu., Raport Centrum Badań nad Uprzedzeniami, http://cbu.psychologia.pl/wp-content/uploads/sites/410/2021/05/RAPORTGO_compressed.pdf
- Centrum Badań Opinii Społecznej, Psychologiczne Charakterystyki Elektoratów** 2023, Raport z Badań, czerwiec 2023, https://www.cbos.pl/SPISKOM.POL/2023/K_071_23.PDF
- Dickinson, J. L.** (2009). The people paradox: self-esteem striving, immortality ideologies, and human response to climate change. *Ecology and Society* 14(1): 34, <http://www.ecologyandsociety.org/vol14/iss1/art34>
- Dodds, J.** (2021). The psychology of climate anxiety. *BJPsych Bulletin*, 45(4), 222-226. doi:10.1192/bjb.2021.18
- Douglas, K. M., & Sutton, R. M.** (2015). Climate change: Why the conspiracy theories are dangerous. *Bulletin of the Atomic Scientists*, 71(2), 98–106. <https://doi.org/10.1177/0096340215571908>
- European Social Survey, European Attitudes to Climate Change and Energy:** Topline Results from Round 8 of the European Social Survey, September 2018, https://www.europeansocialsurvey.org/docs/findings/ESS8_toplevels_issue_9_climatechange.pdf
- Górska P.,** (2019) Polaryzacja polityczna w Polsce. Jak bardzo jesteśmy podzieleni? Raport Centrum Badań nad Uprzedzeniami, <http://cbu.psychologia.pl/wp-content/uploads/sites/410/2021/02/Polaryzacja-polityczna-2.pdf>
- Greenberg, J., Solomon, S., & Pyszczynski, T.** (1997). Terror management theory of self-esteem and cultural worldviews: Empirical assessments and conceptual refinements. In M. P. Zanna (Ed.), *Advances in experimental social psychology*, Vol. 29, pp. 61–139). Academic Press. [https://doi.org/10.1016/S0065-2601\(08\)60016-7](https://doi.org/10.1016/S0065-2601(08)60016-7)
- Guzowski J.** (2016) Psychologiczne źródła teorii spiskowych, Internetowy Magazyn Filozoficzny Hybris 33 (2), 2016, pages 87-100, <https://dspace.uni.lodz.pl/xmlui/handle/11089/20139>

- Haltinner, K., Sarathchandra, D.** Climate change skepticism as a psychological coping strategy. *Sociology Compass*. 2018; 12:e12586. <https://doi.org/10.1111/soc4.12586>
- Jylhä, K.M. and Hellmer, K.** (2020), Right-Wing Populism and Climate Change Denial: The Roles of Exclusionary and Anti-Egalitarian Preferences, Conservative Ideology, and Antiestablishment Attitudes. *Analyses of Social Issues and Public Policy*, 20: 315-335. <https://doi.org/10.1111/asap.12203>
- K. M. Douglas and Sutton R. M.** What Are Conspiracy Theories? A Definitional Approach to Their Correlates, Consequences, and Communication, *Annual Review of Psychology* 2023 74:1, 271-298, <https://doi.org/10.1146/annurev-psych-032420-031329>
- Korzeniowski K.** (2010) Paranoja polityczna. Charakterystyka zjawiska i metody jego pomiaru, *Przegląd Psychologiczny* Volume 53 (2), 2010, pages 145-162, https://www.kul.pl/files/714/nowy_folder/2.53.2010_art.2.pdf
- McDonald R.I., Chai H. Y., Newell B. R.** (2015) Personal experience and the 'psychological distance' of climate change: An integrative review, *Journal of Environmental Psychology*, Volume 44, 2015, Pages 109-118, <https://doi.org/10.1016/j.jenvp.2015.10.003>.
- Oesterreich, D.** (2005), Flight into Security: A New Approach and Measure of the Authoritarian Personality. *Political Psychology*, 26: 275-298. <https://doi.org/10.1111/j.1467-9221.2005.00418.x>
- Phuc Dang H., Rahimah A., Ying-Chao Lin J., Quoc Truong-Dinh B., Glebanov P. D., Hassan Raza S., Runnan Li N., Ming-Sung Cheng J.** (2021) What makes consumers willing to pay for carbon taxes—A view of terror management theory, *Sustainable Production and Consumption*, Volume 28, <https://doi.org/10.1016/j.spc.2021.07.033>
- Priyanka A. Naidu, A. Ian Glendon & Trevor J. Hine** (2023) Climate change risk and terror management theory, *Journal of Risk Research*, 26:1, 19-36, <https://doi.org/10.1080/13669877.2022.2107050>
- Rahmstorf, S.** (2004) The Climate Sceptics. Potsdam Institute for Climate Impact Research, Potsdam, http://www.pik-potsdam.de/~stefan/Publications/Other/rahmstorf_climate_sceptics_2004.pdf.
- Sokołowski, J., Frankowski, J.** (2023). Czy Polska będzie drugą Francją? Jak uniknąć konfliktów społecznych związanych z polityką klimatyczną, *IBS Policy Paper* 01/2023, <https://ibs.org.pl/publications/czy-polska-bedzie-druga-francja-jak-uniknac-konfliktow-spoecznych-zwiazanych-z-polityka-klimatyczna/>
- Sokołowski, J., Lewandowski, P., Frankowski, J.** (2023). Jak zapobiec Żółtym Kamizelkom? Ocena preferencji dotyczących podatku węglowego za pomocą eksperymentu ekonomicznego., *Working Paper* 03/2023, <https://ibs.org.pl/publications/jak-zapobiec-zolтым-kamizelkom-ocena-preferencji-dotyczacych-podatku-weglowego-za-pomoca-eksperymentu-ekonomicznego/>
- Weise, D. R., Pyszczynski, T., Cox, C. R., Arndt, J., Greenberg, J., Solomon, S., & Kosloff, S.** (2008). Interpersonal Politics: The Role of Terror Management and Attachment Processes in Shaping Political Preferences. *Psychological Science*, 19(5), 448–455. <http://www.jstor.org/stable/40064778>

Wolfe, SE, Tubi, A. Terror Management Theory and mortality awareness: A missing link in climate response studies? *WIREs Clim Change*. 2019; 10:e566. <https://doi.org/10.1002/wcc.566>

Factors of Success for Emerging Green Political Parties: Example of Slovenia

Abstract: This paper inquires into the nature of green political parties and sets out to uncover the underlying components of their (un)favorable election performance within a specific parliamentary democracy. To do so we'll be identifying the basic elements of new party success through a variety of literature pertaining to the creation and organization of political parties, then continuing with connecting those elements with key narratives of environmental discourse, relying mostly on the thoughts of Dryzek, Hajer, Bomberg and Eckersley. In conclusion we'll focus on applying these learnings onto the emergence of Slovenia's green parties, combining theoretical parameters with local empirical research to provide additional context.

Keywords: green state, new parties, ecology discourse, green political practises, factors of success

¹ Žan Žveplan wrote this article under the supervision of prof. dr. Andrej Lukšič.

Introduction

The goal of this overview is to expand the discussions on the politics of ecology, more specifically, how (new) green parties establish themselves in institutionalized parliamentary systems and the circumstances associated with gaining a foothold within the voting body. Firstly we'll be analyzing the general indicators of success for new political parties and connecting existing international green discourses and political behaviors with national ones, which can assess the disappointing performance of green parties in Slovenia's political landscape. The topic will delve into three primary research questions:

- I. What are the key factors of success for new political parties and which of those are applicable to green parties seeking representation in national parliamentary institutions?
- II. How has political ecology discourse evolved and influenced ways green parties approach elections?
- III. What are the specifics of Slovenia's ecological discourse and how could we contextualize it to overcome the adverse outcomes of specifically green political parties?

These questions will be analyzed through the explanatory scientific method with an emphasis on relevant research intersections of the ecological political thought of Dryzek's environmental discourses (2013), Bomberg's analysis of green political parties (1998), and Fink-Hafner's, Novak's and Knep's analysis of the development of Slovenian green parties in a comparative perspective (2017) with the thoughts of Eckersley (2004) giving local findings a wider context. Besides these main authors, we will be diving into a variety of supporting literature, including sources discussed at the 2023 School of Political Ecology (e.g. Nadić, 2006), as well as processing of secondary sources, including opinion polls and election results.

Factors of success of new political parties

Fundamentally, the advancement of political parties can be attributed to two pillars of determinants: *institutional and non-institutional* (Fink-Hafner in Krašovec, 2013, pp. 44). Under institutional factors we understand the type of electoral system, where it significantly affects the number of parliamentary parties; the proportionality of the representative body; the degree of cooperation or competition between parties and the electoral threshold, that determines the minimum share of votes that a party must achieve in the elections in order to enter the representative body (Hauss and Rayside, 2007, pp 2). Additionally, laws concerning the formation and organization of political parties with a combination of factors such as the number of minimal members a party has to have and all the different financing options it has available (Sartori, 2002, pp. 552). In terms of these types of indicators, green parties don't hold any relevant advantages or disadvantages, as they apply equally to all in a given political environment.

Meaningful differences can be found in non-institutional factors, wherein new parties in general are more inclined to champion novel issues and propose unique solutions, or give prominence to matters that traditional parties have considered less significant, thereby garnering increased support from voters and achieving enhanced electoral success (Barnea and Rahat, 2010, pp. 307). Green parties, obviously championing the increasing threat of environmental concerns, have gained noticeable prominence in the political discourse since the turn of the century and the issues brought forth have remained a staple topic of discussion (Fink-Hafner, Novak, Knep, 2017). Programs of political parties that offer solutions to new problems have a meaningful impact on voters' voting behavior (Vreg, 2000, pp. 182). An illustrative instance of the triumph of new parties in response to emerging societal challenges can be observed in the case of the Green Party's success amidst the nuclear energy controversy in Germany (Fink-Hafner, Novak, Knep, 2017, pp. 76-78). Additionally, noteworthy is the heightened electoral achievement of extreme right-wing political

parties during the immigration crisis. What are commonly referred to as „protest votes“ tend to be advantageous for new political parties, as they not only encourage voter participation in elections but also prompt individuals to support alternative parties or new contenders (Tavits, 2008, pp. 119).

Non-institutional factors of party success and public awareness of support plays an increasing role in shaping the electoral choices of voters. Voters' discontentment with established political institutions and the overall state of politics exerts a substantial influence on the electoral success of new parties. Research on voting behavior has shown that *“voters are more likely to punish when they are dissatisfied than to reward when they are satisfied”* (Tavits 2008, 120). When it comes to green parties, this phenomenon could be attributed to the successes witnessed in the early 1990s. During this period, certain established political parties outright dismissed the perils associated with the escalating environmental changes. Such denial created an opening for new green parties seeking to make their mark in the realm of institutionalized politics (Fink-Hafner, Novak, Knep, 2017, pp. 11-14).

In today's democracies, general political dissatisfaction² has become almost a staple phenomenon, which can be explained as *the result of a critical and even hostile perception of politicians, political parties, parliament and the government across the entire political spectrum*“ (Kropivnik and Vrhovac, 2012, pp. 707). Voter discontent with established parties can result in support for new parties, causing voters to disengage from the party they perceive as a source of dissatisfaction. In doing so, voters “penalize” the old parties and provide an opportunity for new parties or candidates to fulfill their pre-election promises, thereby alleviating the existing dissatisfaction. Voters who are disappointed with their electoral choice (*i.e.* with the parties they voted for in the past) decide to support other, new political parties in the next election (Tavits 2008, 119).

² People's increased dissatisfaction *occurs when the objective improvement of living conditions slows down or even deteriorates so quickly that the population becomes frustrated* (Toš, 1999, pp. 913).

As part of the non-institutional factors, the role of media is substantial to overall awareness about all social issues. Moreover, it influences how we get to know and understand new political parties. According to Liska and Cronkhite (1995), *the media provides us with important information that is necessary for an individual to create an image of the world and given all the capitalistic and ideological factors at play*. This selection and interpretation of information is one of the media's functions known as agenda setting. It determines which topics are important, relevant and worthy of reflection and discussion within a specific society. The media has to be taken in consideration to understand the topics that are important to voters and their inclination to then vote for parties that support them (Nadić, 2006, pp. 441-455). If a green party manages to get an effective foothold within media attention, they have a higher chance to speak to reach more people and be part of the social construction of ecological facts, events and consciousness (Liska, Cronkhite, 1995, pp. 367).

Lastly, it is crucial to acknowledge the ramifications of the economic crisis, as it presented several challenges that potentially influenced the emergence of new parties. The crisis had dual effects. Firstly, it impacted citizens who placed greater emphasis on materialistic values rather than post-materialistic values. Such an effect negatively influenced voter preferences and public policy pertaining to social issues. Secondly, in certain countries, the political response to the economic crisis likely diminished the legitimacy of incumbent political parties, creating fresh prospects for opposition groups and new parties to emerge. Therefore, the economic crisis created a critical multidimensional situation that requires a strategic policy response that a lot of green parties have included in their programs within "green new deals" and "reshaping the balance of economic power" (Fink-Hafner, Novak, Knep, 2017, pp. 14).

Political ecology discourse in relation to new (green) political parties

One social issue that has consistently emerged as a central theme in the formation of parties across various nations in recent decades, is the intricate relationship between humanity and the environment (Lukšič, 2005, pp. 91). According to Hajer, the underlying message, encompassing multifaceted debates, revolves around a fundamental ideological core: the imperative to acknowledge and address the new reality of pollution and climate change. The specifics of „how“ to accomplish this have sparked substantial debate. Over time, the discourse has grown increasingly intricate. Individuals have to confront a multitude of perspectives, expert opinions, scientific disagreements among researchers from different disciplines, and the realization that scientific controversy constitutes an inherent aspect of environmental politics (2020, pp. 83-84).

Environmental issues transcend distinct national or individual boundaries and instead exhibit interconnectedness in multiple dimensions. Human decision-making systems, at the individual level or within collective entities (*i.e.* parties and governments), encounter environmental challenges. When they do, they grapple with two fundamental complexities. Dryzek (2013) explains that “ecosystems are vast and intricate, and our understanding of them remains limited and subject to constant evolution and coinciding with this is the intricate nature of human society, implying that environmental problems reside at the convergence of ecosystems and social systems, resulting in their dual complexity” (Dryzek, 2013, pp. 18-19). Notwithstanding this intricacy, the emergence of green politics has constituted an advancement in the post-war trajectory of the global landscape, particularly in European politics. While environmental concerns are not new, green politics epitomize a broader and more contemporary phenomenon, encompassing the issues of environmental sustainability as well as decentralization, global security, and grassroots democracy. At its essence, the green political paradigm presents a fundamental

critique of modern industrial society by emphasizing the environmental, social, and human repercussions of economic growth and technological progress (Bomberg, 1998, pp. 7-32).

In order to tackle these quite particular issues of modern society, discursive coalitions were created on both sides, consisting of scientists, politicians, political parties, activists, non-governmental organizations, and media houses (Hajer, 2020, pp. 18-27). These coalitions foster and sustain a distinctive manner of discourse and cognition regarding environmental politics, deviating from conventional approaches as the involved actors may not have necessarily convened or adhered to a meticulously devised and mutually agreed strategy. What unifies these actors and confers political influence upon them is their alignment around specific narrative frameworks that they employ when engaging in political activities (Lukšič, 2005, pp. 92-94). Nonetheless, Hajer

emphasizes that the new environmental conflict should not be perceived as a clash with preconceived, unequivocal problems and opposing actors who are either in favor or against a particular stance. Rather, it should be regarded as an intricate and ongoing struggle concerning the definition and interpretation of the environmental problem itself, encompassing multifaceted dimensions and perspectives (Hajer, 2020, pp. 76-77).

This can be understood also in the inter-species context, as Lidskog & Elander (2010, pp. 34) explain that “since nonhumans are not represented in parliamentary systems, their interests are often ignored, and our society and politics remain exclusively anthropocentric.” Recognizing the legal rights of nature is one way, but in many jurisdictions, this remains difficult to implement or operationalize.

The politics of ecology has a very distinct primary concern - to safeguard our biosphere while utilizing a variety of other societal principles, with an emphasis on the interconnectedness of both our socio-economic wellbeing as well as that of nature (Dobson, 2000, pp. 211). The discourse around this is shaped on the basis of a variety of different scientific and philosophical findings and

assertions, which represent a groundwork for future discussion. Discourses are tied to political practices and power (Hajer and Versteeg, 2005, pp. 175-184) or as Dryzek elaborates “discourses themselves can embody power through the way they condition the perceptions and values of those exposed to them, promoting some interests and suppressing others” (Dryzek, 2013, pp. 31-32). How we got about fairly assessing the impact of these discourses, depends largely on analyzing those who criticize and defend it.

One of the many forms of green organizational structures - green political parties- have become a staple of elections in several countries, joining ruling coalitions and even offering government ministers (Fink-Hafner, Novak, Knep, 2017, pp. 63-76). The narrative of green politics highlights the existence of complex social and ecological crises that necessitate political action and structural transformation for their resolution. Despite its inherent egalitarianism, green politics allows for compromises with diverse perspectives, including competitive ones, particularly when considering economic ecosystems (Hajer, 2020, pp. 18-27). The capacity for political action is attributed to a range of actors, both individual and collective, encompassing movements, parties, states, international organizations, and individuals themselves. In green politics, collective actors assume a crucial role, in contrast to the more individualistic focus observed in the discourse surrounding changes in green consciousness (Dryzek, 2013, pp. 92-117). Green political action strives to transform institutions, practices, and policies. Its impact should not be evaluated solely based on the tangible accomplishments of individual parties, networks, and other green organizations, but also by the extent to which the principles and discourse of green politics have permeated broader realms of political and economic life. Green politics have exerted influence on mainstream political competition, particularly in Europe, where public consciousness regarding environmental issues has undergone significant growth in recent decades (Bomberg, 1998, pp. 7-32).

Green parties have gained representation in local, regional, national and supranational parliaments. They are an accepted part

of the political landscape in European states (Fink-Hafner, Novak, Knep, 2017, pp. 63-76), despite their varying electoral fortunes. The green parties also forced the more established „grey“ parties and the political system as a whole to formulate responses to the green electoral threat. This ecological modernization discourse can be understood as an endeavor by the prevailing political establishment to address the environmental concerns posed by “the green challenge”. However, it should be noted that ecological modernization lacks the radical characteristic of green politics (Dryzek, 2013, pp. 241-264), in which parties differ from pressure groups and NGOs. Their main distinction is in that they seek to present a comprehensive view of green society, and operate in the electoral arena. Bomberg’s analysis found that the primary ideological distinction separating green parties is between purists and rainbow leftist parties - green-green versus red-green³.

Focusing only on the political influence of green parties in governments, would ignore the fact that green discourse played a key role in transforming the frames of the political debate and pressuring other parties to adapt their positions on environmental issues and other green topics. The German Greens have a word for this - *themenklau*, theme theft, whereby gray parties steal green ideas (Rudig, 2012). In their pursuit of policy transformation, many green actors have adopted professional parliamentary methods and engaged with „mainstream“ political institutions. New parties are focusing on specific and critical societal concerns and most new green parties have assumed a hybrid identity, combining elements of both a movement and a traditional political party (Bomberg, 1998, pp. 7-32). The radical movement roots implied an uncompromising adherence to non-conformist movement principles. However, their desire to succeed as mainstream political actors demanded compromise and dilution of these principles (Nadić, 2006, pp. 441-455). On national levels, many green

³ Green-green parties adopt radical environmental policies, eschew leftist ideology, and seek to create a clear distance between their view and the views of mainstream parties - left or right. Red-green parties adopt ecological issues as the fundamental part of their political strategy to radically change the contemporary capitalist societies in Western Europe in line with leftist ideology (Bomberg, 1998, pp. 7-32).

parties have addressed - at least partially, the identity question by moving decisively down the parliamentary path. Their movement identity has been restrained by their participation in parliaments across Europe. Nonetheless, a core strategic dilemma has remained: on the one hand, any shift from radicalism undermines their distinctiveness and renders them part of the mainstream tradition they were formed to oppose. On the other hand, failure to adapt to changed circumstances means danger of electoral decline and marginalization of green issues (Dryzek, 2013, pp. 120-141). The claim to be innovative and different is based on grassroots-democratic tradition and critique of the mainstream political establishment. Any shift from radicalism undermines the distinctiveness and renders a party as part of the mainstream tradition. However, green parties have felt more compelled to shed some of their radical claims as more supporters have demonstrated greater willingness to practice when integration of more traditional strategies such as parliamentary participation and bargaining were put in place. Moreover, green voters have become less hostile to coalition-building with other parties, as evidenced by green party participation in quite a few governments in the late 90s and early 2000s (Dobson, 2000, pp. 211).

It is evident that green parties present a unique manifestation of “new parties“. Their differentiation is based on emergence of new issues and de-radicalisation with an aim to increase the chances of breaching the parliamentary threshold.

Outcomes of Slovenia’s national green discourse and green political participation

Slovenian civil society has a longstanding history of engaging in activism to safeguard nature conservation, spanning over a century with the emergence of the environmental movement witnessed in the 1960s. It further progressed with the establishment of a comprehensive national environmental organization. During the cuff of our national independence, the processes began to take shape and went beyond the monotonous or hierarchical forms of political

activity. This is how civil society organizations entered the political space. The emergence of new environmental social movements, public support for environmentalism, and political support for political modernization contributed to the modernization of environmental issues - following the development of European ones, albeit with a time lag (Fink-Hafner, Novak, Knep, 2017, pp. 31-60).

The first surveys of public opinion showed the interest of Slovenians in environmental problems. Data from 1969 indicates that Slovenian voters held a positive attitude towards the environment, specifically emphasizing the importance of preserving and safeguarding our mountainous regions. Malnar and Šinko "found that support for wider issues regarding ecology only increased in the 1980s and 1990s linked to the emergence of media, which assumes a significant role in this context, as it identifies issues and shapes the agenda for public deliberation"(2012, pp. 471-472). However, high awareness of environmental problems does not mean that people will actively care for the environment and this is very clearly one of the reasons why our national green parties have failed to mobilize voters effectively. In the 2000s polls conducted by the Eurobarometer in 2004, 2007 and 2020 (and an accompanying analysis by Arso), show the protection of the environment is important to the majority of Slovenians. In 2004 and 2007 the analysis showed an increase in concern for certain problems in Slovenia to the greatest extent for climate change, while a slight increase is also observed for natural disasters, extinction of species, problems in cities and noise (Arso okolje, Kazalci okolja, 2010). Jumping ahead 13 years, we then saw 65% of respondents choose protection of the environment, which is above EU average statistics that saw only 51%. Moreover, 30% of respondents in Slovenia believed that protecting the environment is fairly important, while only 5% thought that it is not very important in a 2020 survey (Kovač in Krečič, Arso okolje, 2023). The overwhelming majority of participants admit that their environmental concerns have a direct impact on their daily lives and well-being. Understanding this aspect is crucial because of the public attitudes towards environmental problems and their sig-

nificant role in shaping political party decisions pertaining to the environment. When a broader segment of the population shows interest in environmental matters, it becomes more favorable for parties to address those specific needs of the electorate. Public opinion holds the power to shape the political agenda, spur the enactment of environmental protection legislation, and encourage political actors to adopt sustainable policies (Tavits, 2008, pp. 119).

This public opinion was (un)successfully leveraged for the political establishment of Slovenia's green parties and can be determined with an overview of election results. In the first Slovenian multi-party elections in April 1990, the Greens of Slovenia⁴ achieved great success: they won 8.8% of the vote and 8 out of 80 seats in the parliament (Fink-Hafner, Novak, Knep, 2017, pp. 20-24). Despite the fact that the national institutional and wider political environment were inclusive, the Greens were unsuccessful in the 1992 elections, which were organized because of the new constitution adopted in December 1991. They managed to obtain fewer votes and only 5 parliamentary seats, but also three ministerial portfolios (for science, environment and health). From the parliamentary elections of 1996, 2000, 2004, 2008 and 2011, none of the green parties managed to enter parliament independently. It was only in the recent early elections in 2014 that the small green party managed to enter parliament, and even so only because they were part of the coalition *Združena Levica* (Fink-Hafner, Novak, Knep, 2017, pp. 20-24). Then once again no successes in 2018 or 2022.

Here we now come to an obvious contradiction - according to previously mentioned polls, Slovenians care about ecological issues, yet don't support green parties at elections. Why? It seems apparent that standing behind what is perceived as an important socio-economic and political issue is not enough to warrant party success, at least not on our national level. As is now evident our national green parties exploited the different institutional and

⁴ The Greens of Slovenia (ZS) is a political party from Slovenia, which was founded on June 11, 1989 in Mostec, Ljubljana. In 2018, the party from *Zeleni Slovenije* was renamed *Andrej Čuš and Zeleni Slovenije*, but after the elections it returned to its original name. The current president of the Greens of Slovenia is Andrej Čuš.

non-institutional factors for election success quite poorly. As all new parties, aiding them in their efforts was surely our (I) *national political environment*, with a stable proportional electoral system with a low threshold (4%) of parliamentary entry, (II) *an open party system* and (III) *financing of political parties* that saw gradual corrections in the direction of fairer access to public funds (Fink-Hafner in Krašovec, 2013, pp. 40-43). The biggest financing blunder was self-inflicted when in 1994, all the deputies of the Greens joined the Liberal Democracy of Slovenia⁵, while continuing to enjoy all the financial benefits until the end of the government mandate in 1996. This event divided the Greens of Slovenia and also poisoned the relations between the green parties, which we can still see today (Fink-Hafner, Novak, Knep, 2017). Furthermore (IV) *social values of voters* and the emergence of postmodern, green values in the eighties of the 20th century can be observed as well, yet it did not reflect in the election results, and the (V) *economic crises*, which in fact marked a unique opportunity for all new parties, greens included, because of the voters openness to radical replacement of the parliamentary elite, did not have a significant performance impact.

Where our national green parties lacked was in establishing any semblance of a charismatic leader, which immensely helped other (non-officially-green) forming parties in the early years of our independence. The only slight exception being Dušan Plut⁶, an environmental activist in the 80s and the first the leader of the Greens of Slovenia. Plut stood out among green politicians because of his personal involvement in the fight for the environment, expertise, experience and persuasive public speaking on environmental problems and environmental policy, yet cannot be realistically compared with the likes of his contemporaries such

⁵ And in doing so founded the ecological forum LDS.

⁶ In 1989, he became the founding president of the Greens of Slovenia (until 1993), which, together with eight delegates, were included in the socio-political assembly at the time and joined the DEMOS pre-election coalition in 1989 and entered the Demos government. In 1990, he was elected to the five-member, democratically (directly) elected presidency for the first time (it worked until 1992). In 2014, Plut ran on the Združena Levica ticket for the European Parliament, but was not elected.

as Kučan⁷ and Janša⁸ (Fink-Hafner, Novak, Knep, 2017, pp. 17-31).

While it might suffice to understand these blunders of our national green politics simply from the lens of being plagued with lack of management strategies, interpersonal conflicts between members and splits, the reasons for lack of political success could also be understood from a more nuanced perspective of the evolution of political ecology discourse. Here we look at Eckersley (1992, 2004) and her notions of creating a discourse coalition in regards to environmental issues. She calls for an ecological democracy, a transformation of the liberal democracy to a green democracy, which includes the voices of all relevant communities in the communication and decision-making processes (Eckersley, 2004, pp. 111-113). Only by this extension of the democratic imaginary beyond human populations and fixed territorial and party boundaries, with a more radical idea of what a state can look like, how different actors can work together towards an encompassing future of inter-species solidarity, could we potentially expect different, more successful results.

Conclusions

In regards to the initial research questions it can be stated that the basic factors of success for new political parties as identified in analyzed literature, can be applied to new green parties. With a specific differentiating emphasis on the benefits on relying on new societal issues, in this case connected to environmental challenges of modern society, the dismantling of which follows a fragmented line of discourse and contrasting set of values ranging from radical calls for structural changes, to more refined

⁷ Milan Kučan was the president of Slovenia within the framework of Yugoslavia, from the first democratic elections in 1990 until June 25, 1991, when Slovenia declared its independence. At the end of his two-year term, he was re-elected president in the first elections in independent Slovenia and again in 1997.

⁸ Janez Janša started his political career in Yugoslavia, at the age of 17, when he joined the Union of Communists of Yugoslavia. As a member of the JBTZ quartet and later the Minister of Defense, he was one of the key people in Slovenia's independence. In 2004, he became the president of the 8th government of the Republic of Slovenia. He became prime minister again in 2012, when he succeeded Borut Pahor in this position.

concessions that strive to find compromise with other political actors. On a national level, we come to a contradiction between overall sentiment of the voting body towards environmental policy, which has been consistently supportive and growing, and the lack of any real longstanding success of green parties in terms of their parliamentary participation. This discrepancy points to a variety of specific reasons that would point to the failure on the level of organizational, managerial and interpersonal issues within these parties themselves, but also calls for more holistic questions about the fragmented and singular discourses that would need to be connected within a single coalition with a more profound message that might have the ability to transcend these barriers in the future.

Literature

- Barnea, S., and Rahat, G.** (2011). Out with the old, in with the "new": What constitutes a new party? *Party Politics*, 17(3), 303–320
- Bomberg, Elizabeth E.** (1998). *Green parties and politics in the European Union*. New York: Routledge.
- Dobson, A.** (2000). *Political theory and the environment: the grey and the green (and the in-between)*. In Noël O'Sullivan (ed.), *Political Theory in Transition*. Routledge. pp. 211
- Dryzek, J. S.** (2013). *The Politics of the Earth: Environmental discourses*. Oxford: Oxford University Press.
- Eckersley, R.** (1992). *Environmentalism and political theory: toward an ecocentric approach*. UCL Press.
- Eckersley, R.** (2004). *The Green State: Rethinking Democracy and Sovereignty*. The MIT Press.
- Fink-Hafner, D., Novak, M. and Knep, M.** (2017). *Razvoj slovenskih zelenih strank v primerjalni perspektivi*. Ljubljana: Fakulteta za družbene vede.
- Fink-Hafner, D. and Alenka Krašovec.** 2013. *Factors affecting the long – term success of new parliamentary parties: findings in a post – communist context*. *Romanian Journal of Political Science* 13 (2): 40-68.
- Fink-Hafner, D.** (2001). *Politične stranke*. Ljubljana: Fakulteta za družbene vede.
- Hajer, M.** (2020). *Politika okoljskega diskurza: ekološka modernizacija in polisi proces*. Ljubljana: Inštitut Časopis za kritiko znanosti
- Hajer, M. and Versteeg, W.** (2005). *A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives*. *Journal of Environmental Policy & Planning*, 7:3, 175-184

- Kovač, N. in Krečič, E.** (2023, 29. junij). *Odnos javnosti do okoljskih problemov*. Arso okolje. <https://kazalci.arso.gov.si/sl/content/odnos-javnosti-do-okoljskih-problemov>
- Kropivnik, S. in Vrhovac, S.** (2012). *Pojavi politične patologije v evropskih novih demokracijah*. Teorija in praksa, letnik 49, številka 4/5, str. 707-732, 819
- Liska, J. R. in Cronkhite, G.** (1995): *An ecological perspective on human communication theory*. Fort Worth: Harcourt Brace College Publishers.
- Lukšič, A.** (2005). *Modificiranje in odpiranje okoljskih aren*. Časopis za kritiko znanosti, 33(219), 91-107.
- Lidskog, R. and Elander I.** (2009). *Addressing Climate Change Democratically: Multi-Level Governance, Transnational Networks and Governmental Structures*. Sustainable Development 18(1):32-41
- Malnar, B. and Šinko, M.** (2012). *Forty years of environmental risk perceptions*. Teorija in praksa, letnik 49, številka 3, str. 471-491, 600-601
- Nadič, D.** (2006). *Ideologija partija zelenih*. Teme 30 (3): 441-455.
- Podgornik, J. in Kolar, A.** (2010, 19. april). *Odnos javnosti do okoljskih problemov*. Arso okolje. <https://kazalci.arso.gov.si/sl/content/odnos-javnosti-do-okoljskih-problemov-0>
- Rudig, W** (2012). *The perennial success of the German Greens*. Environmental Politics. 21. 108-130
- Sartori, G.** (2005). *Parties and Party Systems: A Framework for Analysis*. Cambridge University Press.
- Tavits, M.** (2008). *On the linkage between electoral volatility and party system instability in Central and Eastern Europe*. European Journal of Political Research.
- Toš, N.** (1999). Razumevanje politike in zaupanje v politiko. *Teorija in praksa* 912-943
- Vreg, F.** (2000). *Politično komuniciranje in prepričevanje: komunikacijska strategija, diskurzi, prepričevalni modeli, propaganda, politični marketing, volilna kampanja*. Ljubljana: Fakulteta za družbene vede.

Part II:

**ENERGY AND
HOUSING**

Navigating and Managing the Impacts of Science-Based Expertize in Environmental Governance and Policy-Making: Comparative Study of Thermal Power Plant Constructions in Slovenia and in Bosnia and Herzegovina

Abstract: The paper focuses on the examining the role of science-based expertize and public policy-making in environmental governance, through a comparative study of two thermal power plant constructions, one located in Slovenia (Šoštanj block 6), and the other in Bosnia and Herzegovina (Stanari). This is a case-oriented comparative study, which combines in-depth case study analysis, with comparative and content analyses methods. The principal aim is to examine the role of science and scientific facts, as well as their presentation and interpretation, in specific areas of decision-making in public governance. The goal is to investigate how decision-makers evaluate, take in account, and respond to scientific inputs; do they use scientific facts strategically or do they evaluate them individually (case-by-case)?

Keywords: environmental impact assessment, environmental governance, Slovenia, Bosnia and Herzegovina, Stanari, Šoštanj 6.

¹ Selma Hasić wrote this article under the mentorship of prof. dr. Andrej Lukšič.

Introduction

‘Science’ and ‘society’ interact on daily basis, it is important to understand how knowledge derived from particular scientific research is utilized to shape certain policy-making, outlining the appropriate measures and steps that need to be taken, as well as the expected outcomes, benefits and limits.² Scientific knowledge occupies a central role in public governance, yet it no longer holds the unquestioned authority as in the past.³ When science fails to influence policy procedures and/or outcomes, then processes of translation of ‘science’ into usable knowledge and improving the communication between scientists and policy-makers are seen as the most adequate solutions.⁴ Science gains incredibly when it is used effectively and produces positive effects; it is being criticized for when not applied adequately or at all, or in cases when certain negative effects emerge and could not be accounted for.

It is not very well known how structures, agency and competing interpretations of different scientific approaches influence the particular policy outcomes. For instance, if there is a decision to be made, and the policy makers are willing to accept that it should be based on available scientific evidence, how are then the findings of two, three or more different sets of soundly conducted scientific research evaluated against each other, and then taken into final consideration? Which one should the policy-makers trust (more) and what factors need to be taken into account to justify this decision once it is open for subsequent public scrutiny and/or criticism?

This paper is focused on comparative analysis of the factors that enable or constrain the role of different types of scientific expertize inputs in environmental policy-making. This is done

² Jasanoff, S., Wynne B. “Science and Decision-making. Human Choice and Climate Change. Vol. 1. Eds. Steve Raynor and Elizabeth L. Malone.” (1998).

³ Maasen S., Weingart Peds. Democratization of expertise?: exploring novel forms of scientific advice in political decision-making. Vol. 24. Dordrecht: Springer Science & Business Media, 2006.

⁴ Ibid.

through examination and comparison of two different case studies, thermal power plant constructions of Šoštanj 6 located in Slovenia, and Stanari, located in Bosnia and Herzegovina. This is a case-oriented research study⁵, which investigates and connects the quality of democratic procedures (i.e. deliberative and transparent decision-making) with scientific communities' inputs on the topics, which require solid methodical foundations. Data collection methods involve desk research, while data analysis methods primarily include case study method, content and comparative analyses. This research is set on analyzing and comparing the institutional set-ups and legislative processes related to decision-making in environmental governance procedures in Slovenia and Bosnia and Herzegovina, to specifically investigate if the scientific inputs related to TEŠ 6 and Stanari thermal power plants (henceforth TPP) was used and properly evaluated with the specific aim of improving the policy formulation and/or outputs, i.e. how did the decision-makers taken into account and respond to the inputs provided.

The importance of utilizations of scientific expertise in environmental governance

The trust in scientific expertise is connected and intertwined with “our knowledge of the world, which is essentially mediated by others who come together to form a social network. This means the principal epistemic material is scientific in its authority.”⁶ In essence, expertise entails supplying some kind of epistemic (i.e. fact-based), procedure-independent standards, which democratic representatives ought to follow within a procedure-defined under certain conditions imposed by the in-built democratic practices. Expertise is expected to have an epistemic authority, it shou-

⁵ Bennett, A., Alexander L. G. “Case studies and process tracing in history and political science: Similar strokes for different foci.” *Bridges and boundaries: Historians, political scientists, and the study of international relations* 137 (2001): 166.

⁶ Strevens, M. “Economic approaches to understanding scientific norms.” *Episteme* 8.2 (2011): 184-200.

ld rely on the known social practices of obtaining and sharing knowledge, and in theory it should not be founded neither on force nor on argument or persuasion.

The relationship between science and public policy decision-making exists in a grey zone, (i.e. a space characterized by questions) ‘which can be asked of science and yet which cannot be answered by science.’⁷ Usable knowledge “encompasses a substantive core that makes it usable for policy-makers, and a procedural dimension that provides a mechanism for transmitting knowledge from the scientific community to the policy world and provides for agency when theorizing about broader patterns of social learning, policy-making, and international relations.”⁸

Due to long human intervention, ecological systems have become more and more exposed. The costs of traditional approaches became too high to provide future sustainability of the current ecological systems. However, new advancements in technology and associations are significant for adapting to the current issues.^{9,10} The existence of such variability prevents decision makers from using only one approach, but rather to focus on all available alternatives.¹¹ When it comes to effective technology transfer from laboratory to government agency, “there remain few, clearly observable occasions when scientists think they have developed truths for power, power appears disinterested at best, and possibly even uninterested.”¹² This led to development of a procedure for assessing the environmental

⁷ Weinberg, A. M. Science and trans-science. *Minerva* 10 (1972): 209-222.

⁸ Haas, P. “When does power listen to truth? A constructivist approach to the policy process.” *Journal of European public policy* 11.4 (2004): 569-592.

⁹ Ibid.

¹⁰ Nowadays, scientific expertise also helps to address a wide assortment of environmental problems such as climate change, ecosystem management, nuclear energy, and forest resources, more information available at: Zimmerman, D. E., Akerelrea, C., Smith, J. K., & O’Keefe, G. J. “Communicating forest management science and practices through visualized and animated media approaches to community presentations: An exploration and assessment.” *Science Communication*, 27(4) (2006): 514-539.

¹¹ Trench, B. “Towards an analytical framework of science communication models.” *Communicating science in social contexts* (2008): 119-135.

¹² Ibid.

implications in process of decision making, called Environmental Impact Assessment - EIA.¹³ The first legal use of EIA was in the National Environmental Policy Act (NEPA) in 1969 where it was used to resolve discussions regarding the limits to growth and to the conservation movement.¹⁴ In that time, NEPA defined use of EIA as “the beginning of a vast new enterprise of environmental decision-making, complete with regulatory requirements, scientific contributions, and participatory processes.”¹⁵ Later, the use of EIA, as a part of decision- making process in environmental governance, can be traced to the Rio Declaration on Environment and Development which was signed by over 170 countries. EIA was defined in the Declaration “as the tool to be used for projects with potentially significant impacts”. EIA was described as “the most widely emulated environmental policy innovation of the twentieth century.” Nowadays it is universally required in all countries. It is incorporated in the general principles of environmental concerns on national and international levels,¹⁶ and requires a systematic and exact steps determined by the specific legislation.

Furthermore, as an ex ante decision support tool which would involve “the adoption of economic and social goals which are consistent with the environmental goals and are mutually attainable.”¹⁷ These considerations would be assessed by government, provides evidence-based predictions of the future consequences for the environment and propose measures for reduction or removal of significant impacts.¹⁸ EIA assessment is habitually con-

¹³ Impact assessments are carried out to assess the consequences from individual projects (e.g. Environmental Impact Assessment- EIA) to policies and programmes (e.g. Strategic Environmental Assessment- SEA)

¹⁴ Bond, A., Pope, J., Fundingsland, M., Morrison-Saunders, A., Retief, F., & Hauptfleisch, M. Explaining the political nature of environmental impact assessment (EIA): A neo-Gramscian perspective. *Journal of cleaner production*, 244 (2020).

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ Pearce, D., Barbier E., Markandya A. *Sustainable development: economics and environment in the Third World*. Routledge, 2013.

¹⁸ Noorbakhsh, F., Ranjan S. “Integrating environmental impact assessment and economic appraisal in project planning.” (1998).

ducted by developers (i.e. investors), who most commonly employ professional environmental consultancy procedures. The report is further considered by decision-makers in conjunction with their consideration of the development application.

Comparative analysis

The comparative analysis within this chapter aims to unravel the intricate dynamics surrounding the utilization of scientific expertise in the decision-making processes of thermal power plant (TPP) construction. This analysis will provide valuable insights into the parameters that influence the explanatory power of scientific knowledge in practical implementation. Delving into the complexities of environmental governance and the challenges posed by energy transition, this chapter will juxtapose the cases of Slovenia and Bosnia and Herzegovina to understand how scientific expertise navigates the policy landscape in the context of TPP projects.

Parameters that affect the explanatory power of scientific expertise in practice

Bond et al (2020)¹⁹ believe that effectiveness of EIA practice represent a plural concept which can be defined in many ways. The following sub-chapters will focus on examining how regulations or mechanisms, public participation and political interference can have effect on presentation of scientific expertise (effectiveness of EIA) in decision-making processes.

The most important EU directive which directly relates to TPPs and reduction of mentioned emissions are Large Combustion Plant Directive (LCPD) (2001/80/EC) and Industrial Emissions Directive (IED) (2010/75/EU)²⁰. The basic environmental requirements of the IED include preventive measures against pollution, the use of the best available techniques (BAT), redu-

¹⁹ Ibid.

²⁰ Directive of the European Parliament and of the Council on national emission ceilings for certain atmospheric pollutants (Brussels, 23 Oct. 2001) 2001/81/EC (2001).

ction of waste, maximization of energy efficiency, prevention of accidents and remediation of sites. It is important to mention BAT reference documents (BREFs) which deal with different issues such as energy competence, industrial cooling schemes or emissions from storage with significance for industrial manufacturing in general and include some different reference documents.²¹ All are used as reference guidelines and as part the directives increase the efficiency of emission reductions.²² The environmental impacts from TPPs are evaluated in EIA according to EIAD (2011/92/EU), Article 3, which reads “the environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case and in accordance with Articles 4 to 12 which refers on the direct and indirect effects of a project on the living beings, environment, cultural heritage and interaction of all mentioned factors. Also, with regard to the EU EIA Directive 97/11/EC²³, one of the information to be provided by the developer in shall include at least: “an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.”²⁴ With regard to the economic efficiency criteria, EIA have to “provide the physical measures of expected environmental costs and benefits which are converted into economic measures for inclusion in a standard cost-benefit analysis for use in appraisal and decision making.”²⁵

21 The best available techniques (BAT) are currently used “as a tool to establish legally binding emission limit values in environmental permits for industrial installations.” More information available at: Documents include Large Combustion Plants (BREF-LCP), “IPPC – Reference Document on Best Available Techniques for Industrial Cooling Systems (BREF-CS)” and “IPPC – Reference Document on Best Available Techniques on Emissions from Storage (BREF-ESB)”

22 European IPPC Bureau. “BAT reference documents”. European Commission. <https://eippcb.jrc.ec.europa.eu/reference/>

23 This rule is also in a national law Environmental Act the EIA available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31997L0011>

24 Kirkpatrick, S. “Considering alternatives during the EIA process” IEMA <https://www.iema.net/articles/considering-alternatives-during-the-eia-process> (accessed on 10 August 2023)

25 Ibid.

Public participation in decision making is arranged with the EIA directive (2003/35/EC) and includes NGO organizations having an interest in the decision-making procedures. To follow the set obligations, Annex V to the 2003 document specifies the framework for public participation which involves right on information about the project and right on the public opinion which should be taken into consideration in the final decision.

Political interference in TPP construction projects (especially in developing countries) is often presented by politicized coverage of the job opportunity - realities can influence public views. Therefore, for science and risk issues, such as environmental pollution and climate change, it is necessary examine the degree to which both politicians and scientists are featured in news in order to determine how much emphasis is placed on scientific and political perspectives.

Basics of environmental governance and energy transition challenges in Slovenia and in Bosnia and Herzegovina

Energy transition in the EU officially started by setting a strategic long-term vision to lead the transition towards a climate-neutral economy by 2050 in line with the objectives of the Paris Agreement.²⁶²⁷ The EU member states have obligation to achieve EU-level targets by incorporating strategies in their respective national law. Linking the EU-level targets with national commitments is crucial to upgrade the transition which would encompass environmental and socio-economic benefits. Moreover, combining clean energy technologies and policies that propagate energy efficiency have the potential to increase energy security and self-reliance in the Union.

²⁶ United Nations. Paris Agreement. Paris: UN, 2015 https://unfccc.int/sites/default/files/english_paris_agreement.pdf

²⁷ This decision implies on achievement of global warming limitation below 2°C and to pursue efforts to limit temperature increases to 1.5°C above pre-industrial levels, more information available at: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/631047/IPOL_BRI\(2019\)631047_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/631047/IPOL_BRI(2019)631047_EN.pdf)

While the EU countries are on the track to meet their goals in the scope of the emission reductions and use of renewable energy, it seems that the non-European Union (EU) countries of the Western Balkans are stagnant.^{28,29} The Countries of the WB, more precisely the political leaders, tend to focus on short-term benefits that provide security in terms of energy supply. The energy is mainly observed through the lens of security, given that fossil fuels that are cheaper to supply are prioritized over the highly priced ones. With their unfounded expectations and evaluations of production of electrical energy and the market prices of coal alongside with the low emission taxes, the governmental representatives in power have the tendency to settle for the less expensive fuel at the cost of the environment and the citizens.

The main governmental body for the enforcement of environmental laws in Slovenia is the Ministry of the Environment and Physical Planning.³⁰ Local governments are responsible for carrying out government environmental policy choices, but they also have control over other topics of local importance.³¹ The commitment of Slovenia to renewable energy resources is evident in country's ratification of the UNFCCC, the Kyoto Protocol, the Doha Amendment, and the Paris Agreement. The coal phase-out process in Slovenia³² might be accelerated and happen as soon as 2033 due to high losses of the TPP– projected 150 million EUR loss in 2021, and a cumulative loss of 830 million EUR by 2030; there is a reference to an analysis concluding that a coal phase- out wou-

²⁸ One exception is Albania, where the power plants are not supplied with coal in production of electric energy, more precisely the power sources are predominantly dependent on hydropower. In this sense, Albania is one of the countries that had de facto reached the coal phase out stage.

²⁹ N.N." Investing in clean energy in the Western Balkan. "WBIF file:///C:/Users/Jasmin%20Hasic/Downloads/WBIF_clean_energy_WB.pdf (accessed on 1 August, 2023)

³⁰ Other ministries (like the national Ministry of Health) share responsibilities for specific areas, such as enforcing the already suggested laws.

³¹ European Parliament Environment Policy in Slovenia (May 1998) no.6 available at: https://www.europarl.europa.eu/workingpapers/envi/pdf/brief6en_en.pdf

³² According to the EU Commission's reports, Slovenia's national contribution to the 2030 EU-wide renewable energy target of 27% of gross final energy consumption is low, since it is below the 37% target calculated based on the special formula set out in the EU regulations.

ld be the financially most viable option for the plant.³³ Slovenia's domestic energy production is still insufficient for its own needs to be met without a large part of the energy being imported and transportation the number one (40%) final energy consumer.^{43,44}

The main governmental bodies for the enforcement of the environmental laws in BiH are devolved and operate in multiple decision-making centers.³⁴ As a result, environmental issues are under jurisdiction of the RS Ministry Civil Engineering, Physical Planning and Ecology and by the Ministry for Environment and Tourism in FBiH.³⁵ Although decision-making is usually strong at a local level, the enforcement of the laws regarding environmental protection are not seen as a priority and the jurisdiction is usually awarded to the mentioned ministries since there are no technical experts on local levels. The mentioned ministries also lack the capacity of technical expertise to administrate all required EIAs (for instance, only five people in entity of RS are responsible for all EIAs).³⁶

The ruling Slovenian government had contained the TPPs in the ownership of the Slovenian owners. However, throughout time it was discovered that the owners were encouraged to take the national interest into consideration for the well-being of the country's economy. Consequently "gradualist approaches entrench special interest groups, which employ economic resources for redistributive battles rather than to enhance efficiency."³⁷

³³ Spasić V. "EIA study for TPP Šoštanj waste incineration project under scrutiny." *Balkan Green Energy News*. <https://balkangreenenergynews.com/eia-study-for-tpp-sostanj-waste-incineration-project-under-scrutiny/> (accessed on 28 July 2023)

³⁴ BiH is a highly decentralized country consists of two entities, the Federation of Bosnia and Herzegovina (hereinafter: FBiH) and Republika Srpska (hereinafter: RS) that retain some forms of governing autonomy. With such administrative composition, the country faces great difficulties in establishing the central authority over certain policy areas. The competent bodies in FBiH are further fragmented in their jurisdiction, since the entities are divided in ten cantons which have their own governments in charge of various areas.⁴⁵ The other entity, RS is highly centralized entity with little power devolved to lower state units (i.e. municipalities).

³⁵ Ibid.

³⁶ Ibid.

³⁷ Bugaric, B., Kuhelj, A. "Slovenia in crisis: A tale of unfinished democratization in East-Central Europe." *Communist and Post-Communist Studies* 48.4 (2015): 273-279.

The economical gradualism has brought changes and reforms in political strata and inherently had given the Republic of Slovenia an early set to transitional period. In comparison to the following period when Slovenia followed the advices and recommendations of the international organizations, the country was set to the period of the “early transition”. Nonetheless, when thinking of soft transition, there are negative connotations to that very change. It is often marked with the creation of elites due to its speed of development which is greatly abused. In most cases, the so-called elites are the remnants of former communist and social regime that are only adjusted to the new circumstances in order to preserve their position. The consequences are malignant in sense that they produce devastating effects in the economy in the long term – establishment of monopolies in the economic grounds and rent-seeking behavior. This scenario was an interlude to the economic crisis of Slovenia in 2010.”³⁸

Hence, the implementation of the mentioned Directives and reduction of GHG emissions is still questionable in BiH. The coal phase-out will be substantially hard to achieve considering that coal has a particularly high share in electricity generation in BiH, and it reaches nearly 70%.^{39,40} On top of this, the principle “polluter pays” is differently regulated in both entities. In FBiH, owners of TPPs have to deliver reports about emissions from TPPs, which they measured. These reports and the data they consist of are frequently misrepresented at times.⁴¹ The reason for this is that the owners of TPPs are taxed according to level of emissions they produce. In the RS entity, TPPs have to deliver

³⁸ Ibid.

³⁹ Turčalo S. “Energy Geopolitics in the Balkans”. Friedrich Ebert Stiftung, (Bonn), 2020.

⁴⁰ BiH, along with Serbia and Kosovo*, need to renovate 35 TPP in order to fulfill requirements of LCPD and IED, more information available at: Čuta J., Gallop P. “Planned coal power plants in the Western Balkans versus EU pollution standards.” CEE Bankwatch Network, 2017

⁴¹ Moreover, the present process of establishing the national Greenhouse Gas (GHG) inventory is contingent upon the enactment of air protection legislation at the level of individual entities. The RS entity has successfully adopted the legislation for implementing its own entity-specific GHG inventory, while the adoption of the same legislation within the FBiH is currently in progress.

emissions as well, but do not have to pay since this principle is not regulated for pollution from industry. Since BiH is in the process of meeting requirements for entrance to the EU and dealing with different national (entities) regulations and economic challenges, it experiences an unsettling amount of criticism on internal and external level on energy decision-making.⁴²

Thermal power plants: block Šoštanj 6 (TEŠ 6) and Stanari (background information)

TPP TEŠ 6 is a lignite-fired coal power plant, located in the north part of Slovenia, close to Velenje Coal Mine (the largest Slovenian coal deposit) which started commercial operation in 2014. It is the part of TPP Šoštanj⁴³, The proposal for a project construction of the TEŠ 6 first appeared in 2003 in a Resolution on National Development Projects for the period 2007–2023, which suggested to replace the existing five blocks of TPP TEŠ, and more importantly „to ensure a safe and quality supply of energy.”⁴⁴ The first investment plan for suggested project was submitted in 2005, and subsequently adapted in 2006 and later in 2009 in order to be qualified for loans from the European Investment Bank (EIB) and European Bank for Reconstruction and Development (EBRD).

In 2006, Slovenian government decided to make the first investment, ranging from 20 and 25 million EUR, for technical equipment⁴⁵ needed for further construction of the TEŠ 6. After the first investment, the Slovenian government officially started with the analysis of different parameters such as the environmental impact and economical assessment. Later on, the government

⁴² CEE Bankwatch Network. The energy sector in Bosnia and Herzegovina. CEE Bankwatch Network <https://bankwatch.org/beyond-coal/the-energy-sector-in-bosnia-and-herzegovina> (accessed 9 August, 2023)

⁴³ TPP Šoštanj is completely owned by the state of Slovenia (i.e. Holding Slovenske Elektrarne d.o.o.), and it had 5 blocks that started operating between 1956 and 1977

⁴⁴ Sluzba Vlade Republike Slovenije. Resolucija o nacionalnih razvojnih projektih za obdobje 2007-2023 Sluzba Vlade Republike Slovenije 2006. http://www.slovenijajutri.gov.si/uploads/tx_publikacije/061127_resolucija.pdf

⁴⁵ The technological solution was delivered by French Alstom.

had used already invested money as the main justification to continue with the realization of the project. The new TEŠ 6 became operational in 2014, on a trial basis. At the beginning, the EIB is expected to provide 550 million EUR, while the EBRD planned 200 million EUR. However, the costs of the project from 2006 to 2012 were changed from 750 million to almost 1.4 billion EUR, and still supported by both EIB and EBRD⁴⁶. According to the HSE discourse, TEŠ 6 would compensate for the power outage due to the gradual shutdown of other existing blocks⁴⁷ which produce 3,500 GWh of electricity and reduce the prices of electricity by 25-30 percent, and follow all obligations of the EU regarding the reduction of greenhouse gas emissions in the field of energy.⁴⁸

TPP Stanari is also a lignite-fired coal power plant, located in the north part of BiH, close to Stanari coal mine which started with commercial operation in 2016. Stanari is completely owned by private company called Energy Financing Team (EFT). The plan for construction of the TPP is first mentioned in 2004, when the EFT won an international public tender announced by the Government of the entity RS.⁴⁹ The initial project was to build a 400-megawatt TPP that would produce about 3 terawatt hours of energy per year. The technological solution was to be delivered by the French Alstom, and the financier of the project was the European Bank for Reconstruction and Development. However, as these negotiations failed, EFT turned east and agreed on financing in China with the China Development Bank, and accepted Dongfang Electric Corporation as the technology supplier. The total value of the investment in Rudnik and TPP Stanari is about 550 million EUR, of which about 420 million EUR were invested

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⁴⁶ Focus Association for Sustainable Development. TEŠ 6. Ljubljana: Focus, 2014

⁴⁷ The plan during the construction was to close four old blocks by 2014, and block 5 by 2015, which would be used as coal reserves until 2027)

⁴⁸ i.e. CO₂ emissions would be reduced by 34% with the same amount of produced electricity.

⁴⁹ Biočina M. "Velika ofanziva: Je li ovo nova elektrana Hrvatske? Otkrivamo sve detalje oko preuzimanja pola milijarde dolara vrijedne elektrane." Jutarnji list <https://www.jutarnji.hr/vijesti/hrvatska/velika-ofenziva-je-li-ovo-nova-elektrana-hrvatske-elektroprivrede-otkrivamo-sve-detalle-oko-preuzimanja-pola-milijarde-dolara-vrijedne-elektrane-6096348>. (accessed on 11 August 2023).

in the TPP alone, with EFT Group financing about 30% with its own funds, and the rest was covered with a loan from the China Development Bank and several other commercial banks.⁵⁰ The official discourse among the representatives of the EFT was that TPP Stanari will generate 2000 GWh more electricity annually, employ 900 local citizens and use „modern technology, which will fulfill both national and the EU standards.

EIAs in both case was done by consultants employed in companies responsible for construction of TPPs. The report of the consultant analysis was considered by decision-makers in conjunction with their consideration of the development application. All data used in commenting EIA for construction of TPP TEŠ 6 came from the EIA Addendum.⁵¹ According to the EFT official page, EIA for Stanari included more steps such as EIA, as well as obtaining, revision and renewal of environmental permit for construction and further use. However, there are no available documents with data that could be compared and triangulated.

International regulations applicable to the construction of TPPs

The identification of the level of enforcement of international regulations with respect of the construction of TPPs will be done in three main prongs: the first point refers to the presentation of emissions levels; the second point will be assessment of operation of TPP on the environment and living beings and the third important point in relates to solutions suggested by project developers.

Both TPP are defined as “new installation” in IED terms. According to presented emission limits in technical review and EIA Addendum done by HSE, Slovenia fulfills technical standards of the IED for the industrial emissions⁵² following BREFs

⁵⁰ N.N. “Svečano otvorena Termoelektrana Stanari.” Privredna štampa <http://privrednastampa.ba/svecano-otvorena-termoelektrana-stanari/> (accessed on 11 August 2023).

⁵¹ TES Power Plant and PV Coal Mine. Environmental Impact Assessment Addendum October 2009, https://www.eib.org/attachments/pipeline/20060319_eis_en.pdf

⁵² i.e. SO₂, NO_x, risk elements

documents, using BAT technology and stipulate 43% of net thermal efficiency above the relevant limit.⁵³

EIA for construction of TPP Stanari failed to present various parameters and fulfill obligations of the mentioned EU Directives since permitted emission limit values were in accordance with the national law ("The Official Gazette of RS" no.03/15 and 51/15) where the emission limits are 2-10 times higher than those allowed by LCPD and IED. Furthermore, the company did not assure net thermal efficiency (34%) which fulfils obligations set by EU.

Since EIA was not available in any moment since beginning of construction and further use of TPP Stanari, the assessment on direct and indirect impacts on groups referred to in points (a), (b) and (c) by (2011/92/EU) was not possible. Thus, without this information, the correct assessment of environmental impact for a lignite-fired power plant is impossible.⁵⁴

In both projects, there were no alternatives for use of renewable energy sources, as well as there was no serious consideration of 'do nothing' option.⁵⁵

The construction and the operation of TEŠ 6 resulted failure to comply in Slovenia's climate and energy commitments, since CO₂ emission was reduced by 43% (per unit of electricity produced which is from 1,012 kg/kWhe measured in 2009 to 0,782 kg/kWhe after 2032).⁵⁶ This level of reduction does not prevent the emission of CO₂ as a greenhouse gas and TPP TEŠ is still the main polluter in Slovenia.⁵⁷ Thus, further operation of TPP

⁵³ N.N. "Stanari Coal Power Plant." BankTrack. https://www.banktrack.org/project/stanari_coal_power_plant/pdf. (accessed on 5 August 2023).

⁵⁴ For comparison, such data have been listed in details in the respective EIA reports and/or environmental permits for the recently planned Turów, Opole, Polnoc, Koźnice and Leczna power plants (the former using lignite, and the four latter using black coal) in Poland.

⁵⁵ N.N. "Slovenia: Environment issues and economic feasibility of new TPP Sostanj unit 6." Serbia Energy. <https://serbia-energy.eu/slovenia-environment-issues-and-economic-feasibility-of-new-tpp-sostanj-unit-6/?pdf=36108> (accessed on 2 August 2023)

⁵⁶ Focus Association for Sustainable Development. TEŠ 6. Ljubljana: Focus, 2014

⁵⁷ According to the legislation for future climate targets, the emissions per person should reach 2 t CO₂ at the latest by 2050, and the amount of emissions produced by the TPP TEŠ alone is estimates around 4 Mt CO₂ per 2 million population of Slovenia.

TEŠ will provide risk of extended Slovenia's dependency on fossil fuels and make the national renewable targets difficult to achieve.

As a potential candidate of the EU, BiH demonstrated violation in future long-term process for reducing emissions, and also decarbonization by allowing construction of TPP Stanari, along with new eight TPPs in the pipeline. Thus, it is still uncertain whether the Bosnian-Herzegovinian entity governments acknowledge that current measures will not ensure an adequate decarbonization levels and follow signed declarations (e.g. Sofia's declaration)⁵⁸ in future, which would prevent further construction of planned facilities that would entail an increase of GHG emissions.

Regarding that, both projects, from a scientific perspective and environmental standards, did not present a successful solution in energy transition, but rather failed project from both environmental and economic perspective and have already caused long-term consequences for local populations and their human rights. Even if Slovenia used all the best current technologies, it could not provide strategy for a better energy alternative, since construction of TPP never presents an acceptable option for future energy reliability.

Public involvement and lack thereof

According to the Environmental Act of Republic Slovenia ("The Official Gazette of RS" no 39/2006, article 13) and the equivalent legislation adopted in the RS entity ("The Official Gazette of RS", no. 71/2012, 79/2015), the public has the access to data about environmental state of affairs, it has the right to participate in procedures for the adoption of policies, strategies, programs, plans and plans relating to the protection of the environment in both Slovenia and BiH, as well as in other neighboring countries due to cross-national impacts from the emissions.⁵⁹

⁵⁸ Sofia Declaration on the Green Agenda for the Western Balkans (Sofia, 17 May, 2018), available at: <https://www.rcc.int/docs/546/sofia-declaration-on-the-green-agenda-for-the-western-balkansrn>

⁵⁹ Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO Convention) which is in contractors' part since 2010.

Both analyzed projects had similar paths regarding the failure of public involvement in the processes, and failed to maintain the public-procedure and human rights standards. According to suggested time frame,⁶⁰ TEŠ 6 and Stanari projects failed to share insights (i.e. environmental and socioeconomic consequences) and to provide an effective opportunity for public to express their opinion on the effects this project might bring to their well-being.

Beside the questionable interpretations provided by the companies, the public involvement has been considered passive toward the scientific knowledge used in the deliberation process. There were few reasons or indirect factors why the public put different priorities before scientific expertise and/or did not consider their involvement as relevant⁶¹ such as climate skepticism and general cultural model. Climate skepticism, indeed, can be used for lowering public support of decarbonization, which protects the interests of business-driven elites. Moreover, it is also linked with an increasing trend of dissociation from the universal knowledge (i.e. the previous production of energy) and scientific criticism.⁶² According to other theories of risk in economy, citizens will be silent about views of risk and concern regarding local hazards from industry if said industry is a major local employer.⁶³ A general cultural model in a form of an “old-fashion thinking”, was expressed in both countries. Moreover, potential actions against industrial pollution, which could have an impact on the level of local grievances were indirectly silenced

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⁶⁰ Regarding that, Article 6 (2): “The authorities referred to in paragraph 3 and the public referred to in paragraph 4 shall be given an early and effective opportunity within appropriate time frames to express their opinion of the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme or its submission to the legislative procedure.”

⁶¹ Voineau, C. “Controversies, public engagement and scientific expertise in technical-scientific decision-making processes: the setting up of household waste incinerators in France”. PhD diss., European University Institute, Florence, 2010.

⁶² Żuk, P., Szulecki, K. “Unpacking the right-populist threat to climate action: Poland’s pro-governmental media on energy transition and climate change.” *Energy research & social science* 66 (2020): 101-485.

⁶³ Baxter, J., and Lee, D. “Understanding expressed low concern and latent concern near a hazardous waste treatment facility.” *Journal of Risk Research* 7.7-8 (2004): 705-729.

by the residents themselves.⁶⁴ It was a result of lack of successful national strategy which would prevent construction of new TPPs (Slovenia) and a politicized coverage of the job opportunities-induced realities and supportive national strategy in the further construction (BiH).⁶⁵

The “unconditional political support” at the expense of citizens’ rights

The overall narrative presented by politicians in Slovenia and BiH highlighted the issues of national identity, national security and national (entity) sovereignty, and skepticism toward the importance of scientific knowledge and created a social atmosphere in which the issues of environmental protection and successful energy transition were sidelined.⁶⁶

TEŠ 6 project was agreed by two political parties in Slovenia⁶⁷ which are traditionally of completely different views. During the rule of both parties, TEŠ 6 managed to appear in the Resolution, to be supported by new investments (25 mil EUR) even after enormous increase in project costs (by 150%), to proceed with further construction by establishment of Strategic Energy Council and to get an loan of 440 mil EUR without valid arguments.^{68,69}

The official RS Government’s report were successful in highlighting how construction of Stanari is the best project within the energy sector after the end of the war in BiH since TPP Stanari will be the main producer of electrical energy in the entity.⁷⁰

⁶⁴ McGee, Tara K. “Private responses and individual action: Community responses to chronic environmental lead contamination.” *Environment and behavior* 31.1 (1999): 66-83.

⁶⁵ Ibid.

⁶⁶ Ibid.

⁶⁷ Slovenian democratic party SDS and Social democratic party SD.

⁶⁸ N.N. “Prljavi novac i slovenska termoelektrana.” *Aljazeera* <https://balkans.aljazeera.net/news/2012/2/28/prljavi-novac-i-slovenska-termoelektrana> (accessed on 5 August 2023)

⁶⁹ Ibid.

⁷⁰ Cero, H. “TE Stanari: Pokretač ekonomije ili ‘okolinska pošast.’” *Aljazeera*. [https://balkans.aljazeera.net/teme/2016/2/1/te-stanari-pokretac-ekonomije-ili-okolinska-posast](https://balkans.aljazeera.net teme/2016/2/1/te-stanari-pokretac-ekonomije-ili-okolinska-posast) (accessed on 7 August 2023)

Thus, the RS Government was able to ‘sell’ the project, despite the space for concern of citizens due to lack of the official scientific data and possible consequences. In order to facilitate political support for the project, EFT received a number of concessions that included the construction and use of TPP Stanari and exploitation of water and coal.⁷¹ Furthermore, with the RS Government initiative, village Stanari was separated from the municipality Doboj, and became an independent municipality.⁷² A high political support was easily facilitated since there is a low bureaucratic autonomy, and bureaucrats were subordinate to politicians in carrying out their roles.⁷³

The governments in both analyzed cases refocused the discussion from the future economic and environmental consequences, and effectively marginalized experts’ opinions from the public discourse, to achieve the optimum space for propagating the importance of TPP in energy transition.

The marginalized opinions of experts and the impacts of their derailing

The scientific inputs were nominally taken into account, i.e. the inputs themselves did not contradict the interests and political goals that decision makers intended to accomplish. The involvement of different experts, which expressed different opinions regarding decision making, was used as a proof.

In order to show failure of acknowledging the scientific expertise in final decision-making, (i.e. both economic and ecological scientific expertise), environmental justice organizations⁷⁴ in Slovenia have commissioned reviews of the project’s

⁷¹ Maček S. “Slovenia’s coal power plant may shut down earlier than expected.” Euractiv. https://www.euractiv.com/section/politics/short_news/slovenias-coal-power-plant-may-shut-down-earlier-than-expected/ (accessed on 3 August 2023)

⁷² The same initiatives were proposed many times before the construction of TPP Stanari, and the last initiative was rejected by the members of Dodik’s party SNSD

⁷³ Fagan, A., Sircar, I. Compliance without governance: the role of NGOs in environmental impact assessment processes in Bosnia–Herzegovina. *Environmental Politics* 19(4) (2010): 599-616.

⁷⁴ CE Delft is an independent research and consultancy organisation specialised in developing innovative solutions to environmental problems.

investment plans by Dutch CE DELFT and professor from faculty of Economics in Ljubljana.⁷⁵ Beside the impacts on environment (i.e. failure in process of decarbonisation), economic assessments by other experts expressed an adverse outcome were conducted, since predicted prices of coal, carbon and electricity are not stable and project and are not in accordance with the suggested investment costs of 1,4 billion EUR.⁷⁶

The both mentioned sides commented on the arranged lignite prices in the investment plans for TEŠ 6 ranged from € 2.25/GJ in 2015 to € 2.71/GJ in 2054 were not adapted accordingly. The lignite prices cannot be assessed in accordance with the international standards for coal. The main reason for this is the low calorific values of lignite and uneconomic transport (over longer distance). Since there is no previously formed free-market price for lignite, producers and consumers co-exist in a specific form of the market where they tend to form a single economic entity. Also, the price of lignite is also more likely to rise, because the easily accessible parts of the Velenje mine have already been exhausted. Therefore, the forecast cannot be done according international prices but by local specific arrangement. Furthermore, if the carbon price is taken from the scenarios from the EU 2050 Energy Roadmap, the net present value of the TEŠ 6 project remains deeply negative under all scenarios.

Furthermore, according to the data provided by the Slovenian NGO Focus, the economic viability of this project is predicted incorrectly, “with the assumption of a high price of electricity, which is currently very low and will most likely remain so until the end of 2020. If it works at full capacity, TEŠ 6 will produce annual losses of 70-80 million EUR, which will eventually have to be reimbursed from the state budget, since HSE, the owner of TEŠ, is a public company”.⁷⁷ One of the government’s ideas was

⁷⁵ Bruyn S., Warringa G., Afman M., Croezen H. A critical examination of the investments proposals for Unit 6 of the Šoštanj Power Plant Delft, CE Delft, November 2011, commissioned by CEE Bankwatch and Focus.

⁷⁶ Ibid.

⁷⁷ CEE Bankwatch Network. The energy sector in Bosnia and Herzegovina. CEE Bankwatch Network <https://bankwatch.org/beyond-coal/the-energy-sector-in-bosnia-and-herzegovina> (accessed on 9 August 2023)

introduction a special “contribution for TEŠ 6” which would be included in the electricity bill and clearly involve the public to pay the long-term mistakes from the bad assessments of the project. The Slovenian Commission for the Prevention of Corruption issued a statement in 2012 highlighting the project TEŠ 6 as “designed and implemented in a non-transparent manner, lacking supervision and is being burdened with political and lobbying influences. As a result there have been [and still are] high risks of corruption and conflict of interest.”⁷⁸ The projects TEŠ 6 shows Slovenia is susceptible to the “diseases” that afflict all countries in the region: corruption and incompetence.⁷⁹

The projected future emissions from the plant, as well as coal consumption, were obtained from the Environmental report for the Slovenian national strategy for coal.⁸⁰ According to the report, if the plant operates until 2042, with the current emissions of air pollutants, it will cause approximately 1,100 deaths from 2020 onwards. This will also cause economic costs between 1.7–3.9 billion EUR. Better predictions were showed in case if the plant is closed in 2033, which could decrease the number of deaths to 780 and economic damages to 2.0 billion (1.2–2.9) EUR. Therefore, scientific expertize being utilized in this project as unsuccessful, since the presentation of the scientific expertize was completely subordinate to the project goals.

Similar situation has taken place with the construction of Stanari. Due to lack of any information of EIA, which was explained in previous chapters, scientists and representatives of various NGOs⁸¹ did not have the basis to properly comment on the bypass of different regulations. Igor Kalaba⁸² describes project

78 Ibid.

79 N.N “Puštena u pogon Termoelektrana Stanari: Borci protiv zagađenja zabrinuti” Akta <https://www.akta.ba/vijesti/pustena-u-pogon-termoelektrana-stanari-borci-protiv-zagadenja-zabrinuti/69751> (accessed on 11 August 2023)

80 Lauri Myllyvirta. Projecting the health impacts of alternative phase-out timelines for the Šoštanj power plant. CREA https://energyandcleanair.org/wp/wp-content/uploads/2021/04/Health_Impacts_phase-out_Sostanj.pdf

81 i.e. the Center for the Environment and Energy and Climate Change Program

82 Coordinator of the Energy and Climate Change Program

as a total manipulation, since there were no documents from the responsible institutions⁸³ on the basis of which the TPP Stanari could adhere to the any prescribed emission limits.⁸⁴ Later on, in 2013, NGO Center for the Environment in Banja Luka drafted a report in which they explained the irregularities in following the EU directives. According to the second opinion from experts which were not involved in the process, TPP Stanari will cause between 218 and 1,817 deaths and financial damage between 127 million and 1.153 billion EUR during its duration and operation.⁸⁵ Currently, BiH, as a potential EU membership candidate, does not have to follow obligations set by the EC. However, since BiH seeks to approach the EU, and adoption of all directives will be obligatory and it will require high investments.⁸⁶

Consequences of bypassing scientific expertise in public policy decision- making

The technical interpretation of EIA in both countries is in accordance with the origins of EIA practice from the procedures in NEPA, where primary focus is on the use of science to get the best result for environmental management. However, different socio-political backgrounds of the two analyzed countries leads to different interpretation of EIA in decision-making, seen in low public involvement, unconditional support by politicians, and diverging opinions from scientists uninvolved in the process. All analyzed parameters showed that the EIA process is seen as a technical exercise in the delivering scientific expertize in decision-making. Moreover, the use of a convenient 'scientific' language was excluded from the process, since scientists were unable to

⁸³ RS Government and the Ministry of Physical Planning, Construction and Ecology

⁸⁴ Cero. H. "TE Stanari: Pokretač ekonomije ili 'okolinska pošast'." Aljazeera. <https://balkans.aljazeera.net/teme/2016/2/1/te-stanari-pokretac-ekonomije-ili-okolinska-posast> (accessed on 7 August 2023)

⁸⁵ Bankwatch. Analysis on the compliance of the environmental permit for Stanari thermal power plant with EU Directives. Bankwatch <https://bankwatch.org/sites/default/files/analysis-Stanari-compliance.pdf> (accessed on 5 August 2023).

⁸⁶ Ibid.

act as a link between the developers and the public.⁸⁷ Privileging this ‘technical model’ in both projects leads to a long-term failure in operation.

Recorded annual loss due to operation of TEŠ 6 has increased up to 78 million EUR. Furthermore, the estimation from further operation of TEŠ 6 would be around 870 million EUR by 2030.⁸⁸ The Commission for the Prevention of Corruption has requested a formal inquiry into the corruption and lobbying allegations from February 2021, namely, that the French company Alstom was given the contract under heavy political influence and approval the Slovenian government.^{89,90} The change of discourse is also visible among the representatives of HSE. In their view, Slovenia’s energy sector have to be primarily expertize-oriented, and TEŠ 6 is current solution till the next (better) strategy in energy transition.⁹¹

In RS entity, EFT recorded an increase in energy production from operation of TPP Stanari, due to failures to respect the EU regulations. Although TPP Stanari provided job opportunities for many local inhabitants, and was a key driver for establishing a municipality Stanari, TPP gained prominence in all decisions.^{92,93}

⁸⁷ Fagan, A., & Sircar, I. Compliance without governance: the role of NGOs in environmental impact assessment processes in Bosnia–Herzegovina. *Environmental Politics*, 19(4) (2010): 599-616.

⁸⁸ N.D. “Buduće poslovanje TE Šoštanj jako brzo tone u minus.” Energetika-net, available at: <https://www.energetika-net.com/energetsko-gospodarstvo/buduce-poslovanje-te-sostanj-jako-brzo-tone-u-minus-32480> (accessed on 5 August 2023)

⁸⁹ Ibid.

⁹⁰ Due to the high economic losses, Hinko Solinc, head of the Energy Directorate at the Infrastructure Ministry pointed out that the change on the market will forcefully accelerate the process of closing TEŠ 6 which will be according to optimistic predictions by 2029.

⁹¹ i.e. Chief Executive Officer Mitja Talser), more information available at: HSE. „Minister of Infrastructure visits Velenje Coal Mine and Šoštanj Thermal Power Plant”, HSE, <https://www.hse.si/en/minister-of-infrastructure-visits-velenje-coal-mine-and-sostanj-thermal-power-plant/> (accessed 8 August 2023)

⁹² i.e. the municipality needs to consult with company EFT before issuing a building permit or permission for supply since EFT got a concession for water exploration and usage for the area.

⁹³ N.N. Ecologists warn that Residents around Stanari coal-fired Power Plant are regularly affected by Pollution from different Directions <https://www.sarajevotimes.com/ecologists-warn-that-residents-around-stanari-coal-fired-power-plant-are-regularly-affected-by-pollution-from-different-directions/>. Sarajevo Times. (accessed 10 August, 2023)

Furthermore, and due to questionable reduction of industrial emissions explained earlier, citizens of Stanari are also dealing with considerable air pollution.⁹⁴

Conclusions and discussion

This paper has focused on examining the application and the reception of scientific discoveries among the decision-makers, and the role the scientific inputs had in the final outcome. The empirical part of the paper is focused on investigating whether the competent governments of Slovenia and BiH, enable or constrain the role of different types of scientific expertise inputs in environmental policy-making. This paper seeks to empirically contribute to understanding of how scientific knowledge about the 'same issue', analyzed and evaluated from different perspectives and within different contexts, can help the policy decision-makers to fully appreciate the overall findings and take an informed final decision. The backbone of the empirical part of the paper relies on the analysis of the primary sources, while the theoretical part focuses on recognizing similarities and differences between two cases, as important factors in obtaining a distinct and detailed outlook at both decision-making public policy processes.

This paper has revealed that the function of scientific inputs in both processes is marginalized and inhibited by political constraints. In the context of assessing human rights access and violations, this paper has demonstrated that public participation was inhibited and embedded in general cultural models, which are conflicting with citizens' own interests. The relevant decision-makers in both cases have de facto considered the scientific inputs provided to them on the subject matter by different expert communities, but failed to effectively evaluate and use the inputs in the decision-making process. A politicized coverage of the matter had the biggest influence on the formulation public views,

⁹⁴ A Review of the Effects of Particulate Matter Air Pollution on Human Health104 in 2011 showed that the impacts of short-term exposure were no less worrying since it can also increase cardio-pulmonary mortality.

and the public relied on political leaders' explanations more than on scientists when forming impressions of the issue.

The governments in both analyzed cases repurposed the discussion from the economic and environmental consequences that might affect citizens' rights, and effectively marginalized experts' opinions from the public discourse, to achieve the optimum space for propagating the interests they intended to fulfill by constructing the TPPs. In BiH, the entity government worked in tandem with responsible institutions and their friendly allies to generate consent through short and unreliable procedures, while in Slovenia the government prioritized further development of the project over future economic and environmental failures they were warned about by the experts. Such political pressures have shaped discourses that marginalized scientific research, which led to general mistrust and loss in its authority on the subject matter.

In both analyzed cases, the scientific inputs were nominally taken into account, however expert communities' comments were pre-emptively undermined by 'absorbing, reshaping, and bouncing back' the narrative to the spheres of 'abstract' jargon that 'has no better solutions' since the projects are in accordance with the "newest technology" and energy security will be stable or even better. The involvement of different experts, which expressed different opinions regarding decision making, was even used as a proof.

Finally, both projects, from a scientific perspective and environmental standards, did not present a successful solution in energy transition, but rather failed project from both environmental and economic perspective and have already caused long-term consequences for local populations and their rights.

Literature

Bankwatch. Analysis on the compliance of the environmental permit for Stanari thermal power plant with EU Directives. Bankwatch <https://bankwatch.org/sites/default/files/analysis-Stanari-compliance.pdf> (accessed on 5 August 2023).

Bennett, A., Alexander L. G., "Case studies and process tracing in history and political science: Similar strokes for different foci." *Bridges and boundaries: Historians, political scientists, and the study of international relations* 137 (2001): 166.

- Bond, A., Pope, J., Fundingsland, M., Morrison-Saunders, A., Retief, F., & Hauptfleisch, M.** Explaining the political nature of environmental impact assessment (EIA): A neo-Gramscian perspective. *Journal of cleaner production*, 244 (2020)
- Biočina M.** "Velika ofanziva: Je li ovo nova elektrana Hrvatske? Otkrivamo sve detalje oko preuzimanja pola milijarde dolara vrijedne elektrane." *Jutarnji list*. <https://www.jutarnji.hr/vijesti/hrvatska/velika-ofenziva-je-li-ovo-nova-elektrana-hrvatskeelektroprivrede-otkrivamo-sve-detalle-okolo-preuzimanja-pola-milijarde-dolara-vrijedneelektrane-6096348> (accessed on 11 August 2023).
- Bruyn S., Warringa G., Afman M., Croezen H.** A critical examination of the investments proposals for Unit 6 of the Šoštanj Power Plant Delft, CE Delft, November 2011, commissioned by CEE Bankwatch and Focus, available at: <https://bankwatch.org/sites/default/files/SostanjTES6-economics.pdf>
- Bugaric, B., Kuhelj, A.** "Slovenia in crisis: A tale of unfinished democratization in East-Central Europe." *Communist and Post-Communist Studies* 48.4 (2015): 273-279.
- CEE Bankwatch Network.** The energy sector in Bosnia and Herzegovina. CEE Bankwatch Network available at: <https://bankwatch.org/beyond-fossil-fuels/the-energy-sector-in-bosnia-andherzegovina> (accessed on 9 August, 2023)
- Cero. H.** "TE Stanari: Pokretač ekonomije ili 'okolinska pošast'." *Aljazeera*. <https://balkans.aljazeera.net/teme/2016/2/1/te-stanari-pokretac-ekonomije-ili-okolinska-posast> (accessed on 7 August 2022)
- Directive of the European Parliament and of the Council on national emission ceilings for certain atmospheric pollutants** (Brussels, 23 Oct. 2001) 2001/81/EC (2001), available at: <https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:309:0022:0030:EN:PDF>
- Environmental Act the EIA**, available at: <https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=celex%3A31997L0011>
- European IPPC Bureau.** "BAT reference documents". European Commission, available at: <https://eippcb.jrc.ec.europa.eu/reference/>
- European Parliament Environment Policy in Slovenia** (May 1998) no.6, available at: https://www.europarl.europa.eu/workingpapers/envi/pdf/brief6en_en.pdf
- Fagan, A., Sircar, I.** Compliance without governance: the role of NGOs in environmental impact assessment processes in Bosnia–Herzegovina. *Environmental Politics* 19(4) (2010): 599-616.
- Focus Association for Sustainable Development.** TEŠ 6. Ljubljana: Focus, 2014
- Haas, P.** "When does power listen to truth? A constructivist approach to the policy process." *Journal of European public policy* 11.4 (2004): 569-592
- Hasić, J.** "Konsocijacija u političkom sistemu Federacije Bosne i Hercegovine: testiranje teorijskog modela konsenzualne demokracije Arenda Lijpharta u praksi." *Legal Thought/Pravna Misao*, (2015): 46.
- HSE.** "Minister of Infrastructure visits Velenje Coal Mine and Šoštanj Thermal Power Plant". HSE, <https://www.hse.si/en/minister-of-infrastructure-visits-velenje-coal-mine-and-sostanj-thermal-power-plant/> (accessed 8 August 2023)
- Jasanoff, S., Wynne B.** "Science and Decision-making. Human Choice and Climate Change. Vol. 1. Eds. Steve Raynor and Elizabeth L. Malone." (1998).

- Kirkpatrick, S.** "Considering alternatives during the EIA process" IEMA <https://www.iema.net/articles/considering-alternatives-during-the-eia-process> (accessed on 10 August 2023)
- Maasen S., Weingart P.** eds. Democratization of expertise?: exploring novel forms of scientific advice in political decision-making. Vol. 24. Dordrecht: Springer Science & Business Media, 2006.
- Maček S.** "Slovenia's coal power plant may shut down earlier than expected." Euractiv. https://www.euractiv.com/section/politics/short_news/slovenias-coal-power-plant-may-shutdown-earlier-than-expected/ (accessed on 3 August 2023)
- Miller, C.** "Hybrid management: boundary organizations, science policy, and environmental governance in the climate regime." *Science, Technology, & Human Values* 26.4 (2001): 478- 500.
- N.D.** "Buduće poslovanje TE Šoštanj jako brzo tone u minus." *Energetika-net*, available at: <https://www.energetika-net.com/energetsko-gospodarstvo/buduce-poslovanje-te-sostanj-jako-brzo-tone-u-minus-32480> (accessed on 5 August 2023)
- N.N.** "China Regional Snapshot: Western Balkans." Foreign Affairs Committee. <https://gopforeignaffairs.house.gov/china-regional-snapshot-western-balkans/> (accessed on 11 September, 2022)
- N.N.** Ecologists warn that Residents around Stanari coal-fired Power Plant are regularly affected by Pollution from different Directions <https://www.sarajevotimes.com/ecologists-warn-that-residents-around-stanari-coal-fired-power-plant-are-regularly-affected-by-pollution-from-different-directions/>. Sarajevo Times. (accessed 10 August, 2023)
- N.N.** "Energy transition – A challenge with no historical precedence (part one)". Balkan Green Energy News <https://balkangreenenergynews.com/energy-transition-a-challenge-with-nohistorical-precedence-part-one/> (accessed on 14 September 2022)
- N.N.** Investing in clean energy in the Western Balkan. "WBIF. file:///C:/Users/Jasmin%20Hasic/Downloads/WBIF_clean_energy_WB.pdf (accessed on 1 August, 2023)
- N.N.** "Prljavi novac i slovenska termoelektrana." *Aljazeera* <https://balkans.aljazeera.net/news/2012/2/28/prljavi-novac-i-slovenska-termoelektrana> (accessed on 5 August, 2023)
- N.N.** "Puštena u pogon Termoelektrana Stanari: Borci protiv zagađenja zabrinuti" *Akta* <https://www.akta.ba/vijesti/pustena-u-pogon-termoelektrana-stanari-borci-protiv-zagadenjazabrinuti/69751> (accessed on 11 August 2023)
- N.N.** "Slovenia: Environment issues and economic feasibility of new TPP Sostanj unit 6 Serbia Energy. <https://serbia-energy.eu/slovenia-environment-issues-and-economic-feasibility-of-newtp-sostanj-unit-6/?pdf=36108> (accessed on 2 August 2023)
- N.N.** "Svečano otvorena Termoelektrana Stanari." *Privredna štampa*. <http://privrednastampa.ba/svecano-otvorena-termoelektrana-stanari/> (accessed on 11 August 2023)
- N.N.** "Stanari Coal Power Plant". BankTrack. https://www.banktrack.org/project/stanari_coal_power_plant/pdf (accessed on 5 August 2023).
- Pearce, D., Barbier E., Markandya A.** Sustainable development: economics and environment in the Third World. Routledge, 2013.
- Pierre-Benoît J.** "Scientific Expertise in Public Arenas: Lessons from the French Experience" *Journal of Risk Research*, 10:7 (2007): 905-924

- Renn, O.** "Style of using scientific expertise: A comparative framework". *Science and Public Policy*, 22(3) (1995): 147–156
- Spasić V.** "EIA study for TPP Šoštanj waste incineration project under scrutiny." *Balkan Green Energy News*. <https://balkangreenenergynews.com/eia-study-for-tpp-sostanj-waste-incinerationproject-under-scrutiny/> (accessed on 28 July 2023)
- Sofia Declaration on the Green Agenda for the Western Balkans** (Sofia, 17 May, 2018), available at: <https://www.rcc.int/docs/546/sofia-declaration-on-the-green-agenda-for-the-western-balkansrn>
- Strevens, M.** „Economic approaches to understanding scientific norms." *Episteme* 8.2 (2011): 184-200.
- Trench, B.** "Towards an analytical framework of science communication models". *Communicating science in social contexts* (2008):119-135.
- Turčalo S.** "Energy Geopolitics in the Balkans". Friedrich Ebert Stiftung, (Bonn), 2020.
- Voineau, C.** "Controversies, public engagement and scientific expertise in technical-scientific decision-making processes: the setting up of household waste incinerators in France". PhD diss.,
- European University Institute**, Florence, 2010.
- Weinberg, A. M.** *Science and trans-science*. *Minerva* 10 (1972): 209-222.
- Zimmerman, D. E., Akerelrea, C., Smith, J. K., & O'Keefe, G. J.** "Communicating forest management science and practices through visualized and animated media approaches to community presentations: An exploration and assessment". *Science Communication*, 27(4) (2006): 514-539.
- Žuk, P., Szulecki, K.** Unpacking the right-populist threat to climate action: Poland's progovernmental media on energy transition and climate change. *Energy research & social science*, 66, 2020.
- United Nations. Paris Agreement.** Paris: UN, 2015, available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf

Environmental and Energy Safety of Industry in Slovenia

Abstract: The seminar *Environmental and Energy Safety of Industry in Slovenia* deals with the connection of environmental effects of energy production in the Republic of Slovenia and its relation to the European Union (EU) regulation. Energy safety will only become a more important topic in the future and is already an important cornerstone of a successful and sustainable energy policy. Energy safety it is not only about ensuring a reliable energy supply. With connection to environmental safety it is also about providing reliable services that have a long-term impact on the sustainable development of the country. Slovenia's accession to the EU has increased its energy safety. Its future lies in renewable resources. Energy safety issues are linked to many other aspects, such as economic security, environmental safety, food safety and so on. The issue of energy safety is increasingly at the forefront of discussions in international organisations, individual countries and among the public, as we are confronted on a daily basis with issues of energy supply and also energy poverty in many European countries. The introductory chapter of the seminar paper summarises the state of the energy sector in Slovenia and Europe over the last ten years. As well as Slovenia's compliance with EU targets on reducing greenhouse gas emissions. The content then briefly presents: the industry of Slovenia, the EU strategic plans in application, the plans for the transition to a low-carbon economy for the next thirty years, data on the world energy market and energy consumption used in Slovenia. In the conclusion, key findings and future challenges are presented, which show the important link between energy supply and environmental safety to ensure a sustainable development of the industry in Slovenia.

Keywords: environmental safety, energy safety, sustainable development, Republic of Slovenia

¹ Anja Kočman wrote this article under the supervision of prof. dr. Andrej Lukšič.

Introduction

Humanity is in the midst of at least its fourth major energy transformation, with wind and solar energy as the fastest growing forms of renewable energy. The first energy transformation came when our ancestors began to master fire, the second eight millennia ago with the advent of agriculture, and the third with the industrial revolution that brought the use of machines. The fourth transformation comes from fossil fuels, which were the basis of the third energy transformation, and replaces them with renewable energy and some more advanced energy technologies. This transformation is currently taking place all over the world, and it will certainly not be the last. Renewable energy sources, which are no longer as expensive as they once were, will be able to make an important contribution to meeting these needs, while at the same time, unlike fossil fuel energy, achieving ambitious plans to reduce carbon emissions into the environment. By 2050, Europe could have nearly half of all households involved in renewable energy generation of households, of which just under two-fifths could be part of energy communities, as detailed in the European Commission's guidelines on renewable energy and electricity. However, the rapidly growing demand for electricity must be taken into account and the growth of electric vehicles will be a major contributor to this.

Definition of sustainable development

Climate change, related natural disasters, the state of war, the evolution of society, the scarcity of fossil fuels and the consequent rise in gas and oil prices have led to the realisation that the environment, with its natural resources, is crucial for the development of the economy. This has led to the development of the idea of a sustainable economy or sustainable development, and different definitions and versions of sustainability have appeared in the literature. Sustainable growth is most often mentioned in the literature in relation to sustainable development and economic growth. Over time, the definition of sustainable development

has evolved, shaped and expanded. The idea of three dimensions of sustainable development: environmental, social and economic (Figure 1) has become a core of thinking. The European Commission notes that overdependence on fossil fuels such as oil, gas and coal puts consumers and businesses at risk from sudden price changes, threatens economic security and has implications for climate change [1].

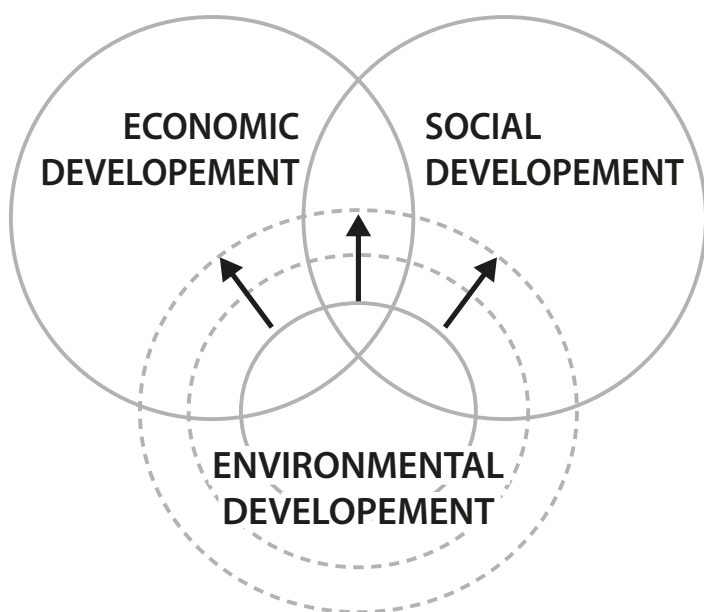


Figure 1: Interconnection between circuits [1]

Objectives of the work

The aim of this seminar paper was to examine the field of environmental safety with a focus on energy production in Slovenia. Through this seminar, I would like to stress the importance of phasing out the use of fossil fuels and the gradual transition to renewable energy sources at the national level in industry of Slovenia, as well as the importance of raising awareness among users and providers about sustainable energy supply and management. I will present the

types and sources of energy used in Slovenia. The advantages and disadvantages of each type of energy will be considered in order to identify the key energy sources for Slovenia in the future.

Methodology

I will use the descriptive method to prepare the seminar as I describe sustainable growth, EU targets and levers for achieving these targets in the Republic of Slovenia. I will also use the comparative method in terms of comparing Slovenia's performance in meeting the EU targets and the compilation method in writing the text based on the summary of other authors. I will collect data using articles from the internet and scientific databases.

Content

Climate change is mainly caused by man-made greenhouse gas emissions. Air pollution is mainly caused by electricity and heat production, followed by pollution from traffic exhaust fumes. Industry, construction, households and the commercial sector also contribute to pollution. With economic development and the associated development of environmentally friendly technologies and greater awareness among individuals, the amount of CO₂ emissions is decreasing [1]. In order to limit global warming and reduce greenhouse gas emissions, the European Commission already several years ago drew up a roadmap for the transition to a low-carbon economy. This is the only way to limit global warming to less than 2 degrees Celsius by 2050. By some estimates, Member States' greenhouse gas emissions by 2009 were almost 16 % lower than in 1990, which is very encouraging. In the future, a great deal needs to be done in this area, as one of the targets set is to reduce emissions by up to 95 % by 2050, compared to 1990 levels. Achieving such a target will require a number of activities, but one alone will not be enough. It will be necessary to take a broader view and involve a wide range of sectors – from transport, industry, electricity, agriculture, etc. [2].

Environmental impacts of industry in Slovenia

The purpose of ensuring environmental safety in industrial environment is to promote development in society that provides long-term, good conditions for human development, healthy and high-quality life and well-being, as well as preservation of biotic diversity [3]. In Slovenia, industrialisation began in the mid-19th century with small, foreign-owned companies. It was most intensified in the post-World War II period under the planned economy. At that time, the dominant industries were iron and steel, glass, metals, chemicals, food, paper, wood, machinery and textiles. Large industrial plants dominated. E.g. Litostroj, TAM, Cinkarna Celje, Iskra, the Vevče paper mill, the iron and steel works in Jesenice, Ravne and Štore, the aluminium plant in Kidričevo, Gorenje, Krka, Lek, Mura, Droga, Kolinska, Žito, Fructal, Slovenijales, Eta, etc. The industry as a whole accounted for more than half of the Gross Domestic Product in the period around 1975; today, only a third. Today, Slovenia's industrial picture is very diverse. Industries are scattered throughout the territory, but there are fewer industrial giants employing thousands of workers. The most important industries are metal, automotive, chemical, pharmaceutical [4] and electrical. The food industry plays a special role in supplying the population. The environmental impact of industry is already extremely high due to the consumption of raw materials and energy. Direct environmental impacts are reflected in the construction of industrial buildings and sites, power plants, and the discharge of waste water, gases and particulate matter into the environment. This results in smog, noise, acid rain, polluted water sources, construction on agricultural land, etc. There are even more indirect environmental impacts: the construction of roads, railways, pipelines, oil and gas pipelines, etc. [5].

Energy security in Slovenia

In 2014, the Republic of Slovenia adopted the Energy Act, which lays down the principles of energy policy, the rules for the operation of the energy market, the methods and forms for the

provision of public utilities in the field of energy, the principles and measures for achieving a secure energy supply, for increasing energy efficiency and energy saving, and for increasing the use of energy from renewable sources, lays down the conditions for the operation of energy installations, and regulates the competences, organisation and operation of the Energy Agency and the competences of other bodies that perform tasks under this Act. The purpose of the Act is to ensure a competitive, secure, reliable and affordable supply of energy and energy services, taking into account the principles of sustainable development [6]. For the energy security of Slovenia, it is necessary to provide additional financial, human and technical resources to accelerate the comprehensive development and management of the electricity distribution network in order to achieve greater capacity, resilience, progressivity, connectivity and adaptability (flexibility), which will enable the accelerated integration of heat pumps, deployment of electromobility, integration of renewable electricity generation and storage facilities, and the adaptation of consumption [7].

Energy concept of Slovenia (ECS)

After months of coordination, the Energy Concept of Slovenia (ECS) was adopted in March 2018. The key objective set by the authors is to co-create or transition to a low-carbon society, where energy will be produced and used sustainably and responsibly. Several scenarios have been developed to meet these objectives. The objectives will be achieved by pursuing some key actions:

- increase energy efficiency and consequently reduce energy consumption,
- phasing out fossil fuels and gradually switching to renewables,
- introducing advanced energy systems and services,
- raising awareness of sustainable energy supply and management among users and providers.

The objectives of the ECS are to achieve the following: one of them was to increase energy efficiency by 20 %, increase the use of renewable energy sources by 25 % and reduce greenhouse gas emissions by 20 % by 2020. In order to meet the target, Slovenia had to ensure the missing share of renewable energy through a mechanism of statistical transfer of renewable energy from another EU Member State. The share achieved for 2020 in Slovenia was 24.1 % and therefore Slovenia carried out a statistical transfer of 465 GWh of renewable energy on the basis of an agreement with the Czech Republic. Taking into account the statistical transfer of renewable energy, the share of renewable energy in gross final energy consumption in Slovenia in 2020 was therefore 25 % [8]. An even more ambitious target is set for 2050. By then, we will have reduced greenhouse gas emissions by 80 % compared to 1990 levels. By 2050, it is estimated that 44 % or 900,000 Slovenians could generate their own electricity using solar and wind power.

By making almost half of Slovenia's population self-sufficient in renewable energy, we would make a huge contribution to the country's energy transition away from fossil fuels. To achieve this fully, we will also need to phase out coal in time. We currently have two other coal-fired power plants, Šoštanj Thermal Power Plant (TEŠ), which emitted 4.07 million tonnes of CO₂ in 2017, and Ljubljana Municipal Thermal Power Plant (Te-Tol), which emitted 0.61 million tonnes of CO₂ in the same year. It is speculated that they will continue to operate until the end of their useful life, which is 2054 [8].

National energy and climate plan (NECP)

On 27 February 2020, the Government of the Republic of Slovenia adopted the comprehensive National Energy and Climate Plan of the Republic of Slovenia (NECP), which has also been submitted to the European Commission, in accordance with EU Regulation 2018/1999 on the Governance of the Energy Union and Climate Action. The NECP is a guide and one of Slovenia's key steps towards a climate-neutral Slovenia and the EU by 2050.

It will set Slovenia's energy and climate goals and the policies and measures to achieve them, up to 2030 and with a view to 2040. The NECP is an action-oriented strategy document that sets out targets, policies and actions in the five dimensions of the Energy Union for the period up to 2030 (with a view to 2040):

1. decarbonisation (greenhouse gas emissions and renewables),
2. energy efficiency,
3. energy safety,
4. the internal market,
5. research, innovation and competitiveness.

The Comprehensive Environmental Impact Assessment (CEIA), which is part of the formal process of preparing the NECP, is essential for meeting the objectives of the NECP (Figure 2). In addition to assessing the environmental impacts, the CEIA also allows for broad stakeholder involvement (ministries and organisations, non-governmental organizations, sectors, interested individuals) and for the identification of an appropriate pathway for Slovenia to achieve its objectives [4].

The NECP is the most ambitious in improving energy and material efficiency in all sectors and consequently reducing the use of energy and other natural resources, which is also the first and key step towards a climate-neutral society. This has important implications for other areas (decarbonisation, energy safety, the internal energy market, research and innovation). Slovenia's target is to improve energy efficiency by 35 % compared to the 2007 baseline. Meeting the NECP leads us to reduce our dependence on fossil fuels and to increase reuse. Through the NECP, Slovenia is also supporting sustainable solutions in transport (sustainable public transport), buildings (heating and cooling, comprehensive renovation) and industry (ongoing to ensure competitiveness). Today, transport in Slovenia contributes to more than 50 % of emissions (outside the EU Emissions Trading Scheme). By taking an active and collaborative approach at national level, we can ensure that energy

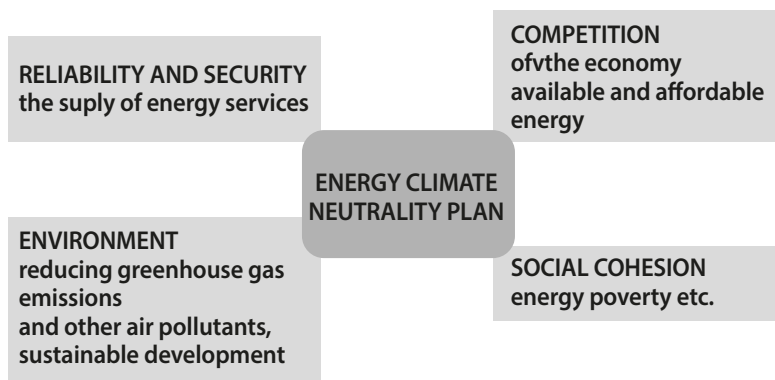


Figure 2: National Energy and Climate Plan (NECP) [7]

costs do not become a major burden. At the same time, this will make an important contribution to dispersed and local electricity generation. This will make it easier for consumers to choose better solutions – they will become active participants and must be properly supported by the state. Sustainable solutions (e.g. deployment of heat pumps, construction of solar power plants) are already proving their cost-effectiveness in the medium term. In the long term, they also bring significant positive environmental impacts, which contribute to fulfilling our responsibility for the next generation [7].

Energy statistics of energy sources (2016 and 2019)

According to data from the Statistical Office of the Republic of Slovenia (2016), Slovenia has several different domestic energy sources (Figure 3). Domestic energy sources include nuclear energy, coal, renewable energy sources (including wood, wood residues, bio-gas and waste), hydropower, geothermal and solar energy. In 2016, these sources provided 42 TWh of energy [9].

Domestic energy sources account for well over half of Slovenia's primary energy supply (53 %), while imported sources account for around 47 % (Figure 4). The largest imported sources are petroleum products, natural gas and coal. The energy produced from all sources accounted for 79 TWh of energy in 2016. In that year, per inhabitant electricity consumption was 6351 kWh,

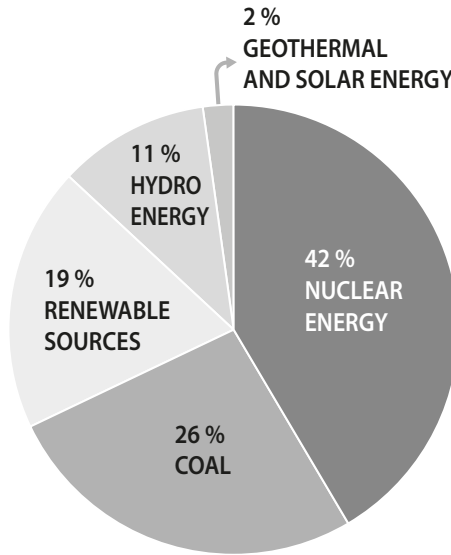


Figure 3: Energy production in Slovenia in 2016 [9]

which means that each user consumed an average of 17 kWh per day [9]. In 2019, petroleum products also dominated, with a share of 33 %, followed by nuclear energy (22 %), renewables and hydropower (18 %), coal (16 %) and natural gas (11 %) [10].

In Slovenia, electricity production is split roughly into thirds. In 2016, 35 % of our energy was produced by nuclear power plants, 33 % by thermal power plants and 30 % by hydroelectric power plants. In 2019, the situation was quite similar, with 43 % produced by nuclear power, 32 % by hydroelectric power and 25 % by thermal power [10]. Comparing the consumption of energy produced in 2016 and 2019, we can see that there are no significant differences in this area either. In 2016 (Figure 4) and 2019, transport accounted for the largest share of energy use, accounting for 39 % of all energy consumed. The second largest user is industry, which accounted for 25 % of energy in 2016 [9] and 30 % in 2019 [10]. Households are the third largest energy user. Households accounted for 23 % of energy consumption in 2016 [9] and 21 % in 2019 [10]. The remaining energy is consumed in other activities and agriculture. It can be assumed that in the

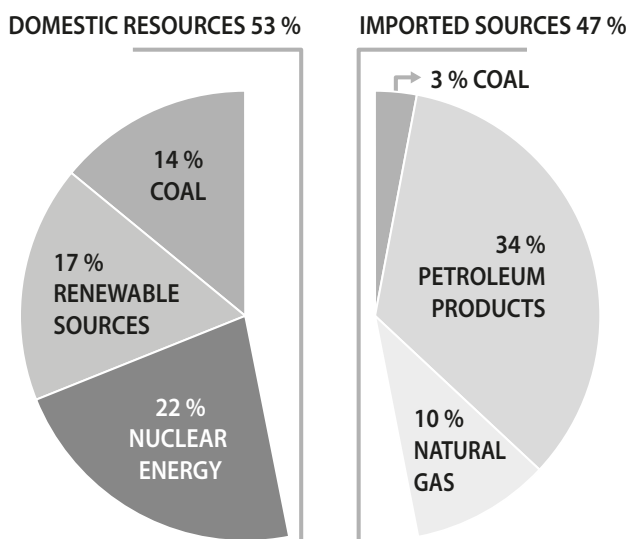


Figure 4: Primary sources of energy supply for Slovenia, domestic/imported (2016) [9]

future we will have to rely on renewable energy sources, solar and wind energy, and look for new ways to generate energy. According to 2019 data (Figure 5), wood fuels dominate household consumption, followed by electricity and natural gas. However, only a small part of energy is generated by fuel oils, district heat, heat from heat pumps and solar energy [10].

Energy from non-renewable sources

The types of non-renewable energy sources used in Slovenia are: nuclear energy, oil, solid fuels (different types of coal), natural gas and non-renewable industrial waste. In 2021, domestic energy supply continued to be based on lignite, hydropower, wood biomass and electricity from a nuclear power plant. As Slovenia's energy needs are larger than its domestic production capacity, Slovenia met about half of its energy needs with imported sources in 2021. Slovenia imported lignite, hard coal and anthracite, coke, petroleum products and natural gas. The successful ecological rehabilitation of blast furnaces and the implementation of

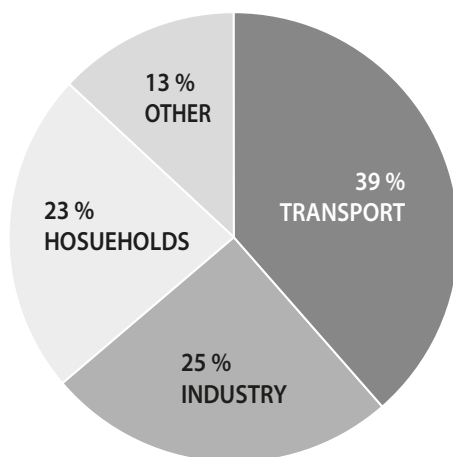


Figure 5: Energy end-use in Slovenia in 2016 [9]

the phasing-out programme for domestic coal mines have over the years led to an increase in the share of imported, more environmentally friendly fuels with a lower sulphur content (Figure 6). The use of coal in transformation is limited to large cogeneration plants equipped with appropriate treatment plants. For major, unexpected disruptions in the energy supply, the minimum required monthly fuel reserves are guaranteed by law [6].

At the primary energy supply level, in 2021, the share of domestic solid fuels in total projected solid fuels demand was 84.8 %. Domestic natural gas accounted for 0.6 % of total natural gas needs and Slovenia imported all petroleum products (Figure 7) [6].

Oil and natural gas

While other sectors have managed to reduce emissions compared to 1990, transport emissions have been increasing in recent years. One of the main reasons for this is the fact that more and more people are increasingly mobile. In addition, progress in achieving better fuel efficiency in car engines has been regressing in recent years. In 2017, new registered vehicles emitted on average 0.4 grams of CO₂ per kilometre more than in the previous year. In

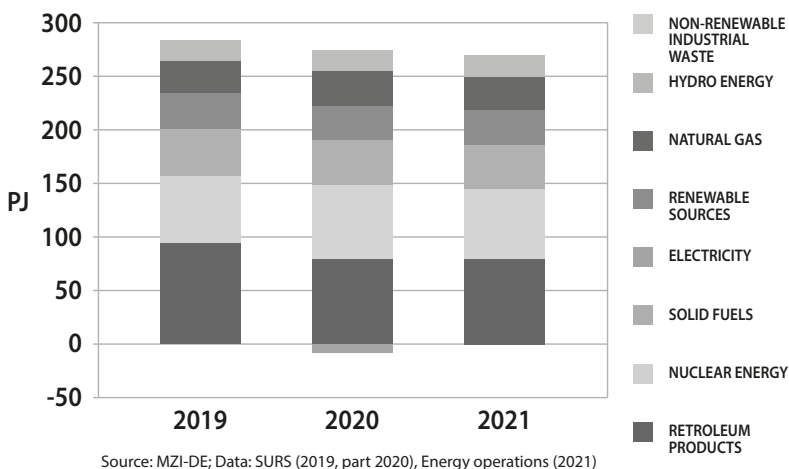


Figure 6: Energy supply by source 2019-2021 [6]

passenger transport, CO₂ emissions vary considerably depending on the mode of transport used. Cars are one of the main polluters, accounting for 60.7 % of all CO₂ emissions from road transport

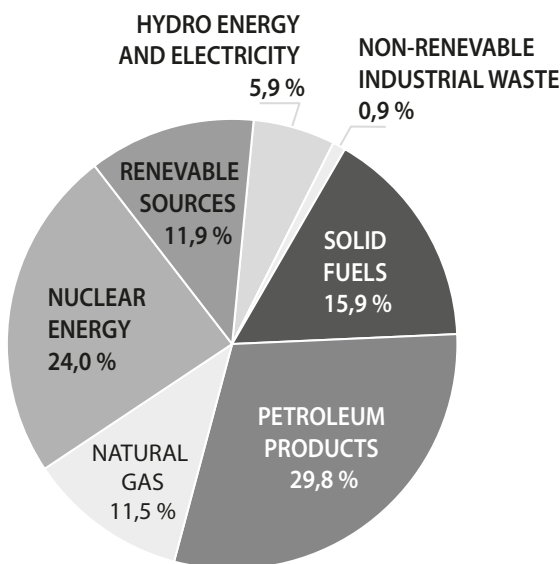


Figure 7: Share of energy sources (2021) [6]

in Europe. The fact that cars are very under-utilised in Europe is a major contributing factor. The average number of passengers per vehicle is only 1.7, which means that many other forms of transport are less harmful to the environment. By sharing cars more, their ecological footprint could be much greener. If four people use a car, it even becomes one of the most environmentally friendly forms of passenger transport [11]. The gasification of Slovenia began in the early 1970s. In 1978, the first trunk gas pipeline was built. Since then, the gas pipeline network in Slovenia has been continuously upgraded and now covers almost 1000 km, while Slovenia currently has no oil pipeline network. Slovenia is entirely dependent on imports for its liquid fuels and natural gas supplies. The main sources of natural gas are Russia and Algeria. Natural gas accounts for around 10 % and oil for around 40 % of Slovenia's total imported fossil fuel energy supply [6].

Krško nuclear power plant (NEK)

The Krško Nuclear Power Plant (NEK) plays an important role for the Slovenian electricity system due to its high power capacity. NEK ensures the stability of the grid and maintains high quality voltage conditions during power transmission. Due to the favourable price of electricity from NEK and its significant share in the Slovenian energy system, it contributes to the stability of electricity prices in Slovenia [12]. The construction of a new nuclear power plant unit is a matter of energy safety and independence from electricity imports. Nevertheless, concerns remain about the cost and environmental risks of building a new unit. A number of studies indicate a certain level of radionuclide air pollution from nuclear power plants [13]. Nuclear power has almost zero greenhouse gas emissions during the power generation phase and can contribute to climate change mitigation objectives. Although the consideration of nuclear energy from a climate change mitigation perspective was therefore justified. It is difficult to draw a definitive conclusion on the potential for significant harm to other environmental objectives, particularly given the lack of

ongoing operational experience at high-level waste disposal sites. Slovenia received 24 % of its total electricity consumption in 2021 from the Krško nuclear power plant, and it is estimated that the construction of a new nuclear power plant unit would provide between 15 and 20 % of Slovenia's total electricity consumption. The energy it consumes, which would significantly reduce energy dependency. This information is difficult to provide accurately as the consent for the construction of Unit 2 has been granted but not all calculations have been made and the situation on the ground and the amount of electricity consumed is constantly changing. In addition to high operational reliability, the main advantages of nuclear power generation include: low carbon energy source, low electricity generation prices, the possibility to operate flexibly and provide ancillary services, a domestic energy source that contributes to reducing import dependency [12]. A nuclear power plant emits no greenhouse gases into the atmosphere during operation. In a full life cycle analysis, covering impacts from fuel production and plant operation to waste disposal [14], the carbon (CO₂) footprint of a nuclear power plant is extremely small compared to other power generation technologies, similar to other renewable energy sources. Therefore, nuclear energy is classified as a low-carbon source with significantly lower CO₂ emissions than fossil fuels. Due to their low CO₂ emissions, nuclear power plants have been classified as green energy sources by the European Commission. The biggest problem with nuclear power plants is nuclear waste [12].

Solid fuels

The production of electricity and heat in conventional thermal power plants is the largest source of NO_x and CO₂ emissions, so reducing emissions in this sector makes an important contribution to reducing them at national level and thus to reducing the burden on the environment. Thermal power plants are the largest consumers of coal in Slovenia.

Thermal power plants in Slovenia:

- Šoštanj Thermal Power Plant (TEŠ),
- Brestnica Thermal Power Plant,
- Ljubljana Municipal Thermal Power Plant (Te-Tol),
- Trbovlje Thermal Power Plant [15].

Most EU Member States are closing their mines and thermal power plants and trying to use green energy sources. Replacing coal as an energy source with less polluting natural gas is facing increasing difficulties due to frequent disagreements between Russia and the EU. Although coal mining has many negative environmental impacts and therefore many dangers for miners, it is difficult to phase it out completely. Coal-fired power plants are one of the most stable sources of electricity. Slovenia has 4 thermal power plants, the largest of which is the Šoštanj Thermal Power Plant, consisting of 2 thermal generators and 2 gas turbines in operation. 4 units of this plant have already been shut down. Some of the negative elements from the point of view of the safety of the Velenje lignite mines and TEŠ 6 are as follows:

- High methane (CH_4) content in the coal mine, which causes explosions and fires, and in the event of breakthroughs, sudden explosions of cave gas - a mixture of CH_4 and CO_2 , usually accompanied by tens of tonnes of coal dust; the Velenje mine is unusually methane-rich due to its lignite-fired thermal capacity. On average, 2 m^3 of CH_4 per tonne of lignite mined must be removed by ventilation. This translates into approximately 8 million m^3 of CH_4 per year. Therefore, very abundant ventilation is required. Lignite spontaneous combustion causes fires in the pit, which are difficult to extinguish.
- High risk coal exploitation for miners; Coal mining has claimed 150 lives and caused hundreds of disabilities in its history.
- The permanent uneven settlement of the terrain, which has caused enormous irreparable damage to (and permanently altered) the landscape, infrastructure, historical and religious sites, the environment and the local population.

- The very questionable price of the Velenje lignite and the questionable lignite reserves.
- Heavy metal air pollution from the Velenje Coal Mine; in addition to dust, the coal mine emits heavy metals into the atmosphere in huge volumes of blown air (12 billion m³/year), at a rate of 35 tonnes/year of lead, 35 tonnes/year of chromium, 3.5 tonnes/year of cadmium and 17.5 tonnes/year of manganese. Of course, mercury is also emitted from the ventilation shafts of the coal mine, but no data are available.
- Heavy metal air pollution from the TEŠ plant; similar amounts of heavy metals are also emitted through the TEŠ plant's stacks, despite electrostatic precipitators and wet flue gas scrubbing to remove sulphur oxides.
- Very high radon emissions from the Velenje Coal Mine and the TEŠ plant. The coal mine emits huge amounts of radon per year through blowing air [16].

Energy from renewable sources

Renewable energy sources include all sources of energy that are captured from ongoing natural processes. These include solar radiation, wind, river flows, the Earth's thermal currents and the currents of the sea. The greatest advantage of these sources is that they are renewed fairly quickly, are fairly evenly distributed and never run out in nature. The most important renewable energy source in Slovenia is wood biomass. Hydropower is the next most important renewable energy source, followed in recent years by solar energy and biogas. In the future, we can also expect an increase in the use of wind and geothermal energy [17]. Slovenia has set an overarching national target of at least 27 % of renewable energy sources in gross final energy consumption by 2030. The NECP also sets sectoral targets for the share of renewables in gross final energy consumption for 2030. In the heating and cooling sector, renewables would account for 41.4 %, in the electricity sector 43.3 % and in the transport sector 20.8 %. In order to reach this target by 2030, Slovenia has set some other targets:

- at least 2/3 of energy use in buildings to come from renewable sources and a ban on the sale and installation of new oil-fired boilers by 2023 at the latest,
- increasing the share (by 1.3 %) of renewable sources in heating and cooling in industry, including waste heat and cold,
- at least a 30 % share of renewables in industry [17].

Hydropower

Water is one of the oldest sources of energy, which man learned to exploit two millennia ago. In the early days, water power was used mainly to power mills, saws, pumps and other devices. Later, however, it was realised that water could be used to generate energy, or hydropower. Hydropower has thus become one of the most important renewable energy sources. More than a fifth of the world's energy is produced by harnessing water power. Most of the energy produced is used to generate electricity. Slovenia has a large water endowment, which is largely exploited for hydroelectric power plants. Around one third of the energy produced in Slovenia is produced in hydroelectric power plants. Slovenia has a well-developed technology and a large number of hydropower plants on small and large watercourses, but the full potential is far from being exploited [18]. One of the advantages over other sources is the possibility of storing energy in the form of accumulated water upstream of hydropower dams and of responding quickly to market demand for energy. Other advantages of hydropower are its long lifetime, low operating costs despite a rather high initial cost. Compared to other energy sources, they release negligible amounts of CO₂ and other pollutants into the environment. The biggest drawback of hydropower is the environmental impact. Hydropower plants have a major environmental and spatial impact by altering the river flow, flooding the area above the dam and reducing the river flow above the dam. The dam prevents the movement of river animals along the river. For this reason, fish paths are built alongside some dams to allow fish to migrate unhindered despite the impoundment.

Hydroelectric power also entails the risk of damaging water structures, in particular the buildings and accompanying embankments that hold back the reservoirs. In addition, the generation of electricity depends on the flow, which depends on the season and the amount of rainfall [19].

Solar energy

Solar energy represents the different ways of generating energy from sunlight. It is a type of renewable energy that promises great potential for electricity generation in the long term. The use of solar energy has been around for centuries, but has become increasingly prevalent in the last ten years as we have become aware that non-renewable energy sources are limited and have a major impact on the environment. Unlike conventional electricity generation, solar energy is clean, renewable and has no harmful impact on the environment. The sun emits energy due to continuous nuclear fusion, which converts hydrogen into helium. Hydrogen makes up

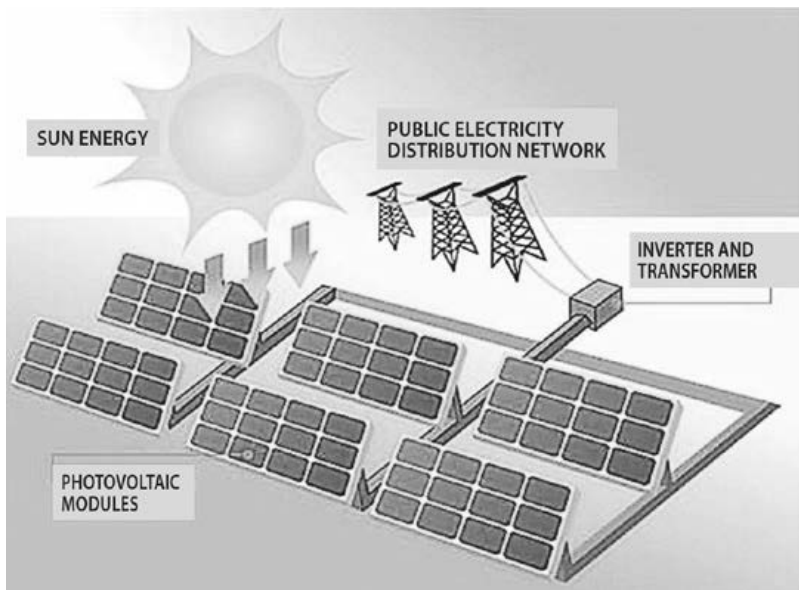


Figure 8: Solar electricity generation [21]

about 60 %, helium about 35 % and all other elements about 5 % of the total mass of the sun. Radiation to the Earth consists of direct radiation (directly from the Sun) and diffuse radiation (indirectly reflected from various particles), the ratio of which varies according to the position of the point on the Earth, the time of year and the weather conditions. The energy conversion occurs when the solar radiation hits the receiver (Figure 8) [20].

In addition to heating buildings and water and generating electricity, we need sunlight to produce biomass through photosynthesis and to grow plants that provide food for humans and animals. So solar energy can be a renewable energy source in its own right and also contribute to other energy sources by affecting biomass and the water cycle. The main advantage of solar energy is that there are no greenhouse gas emissions and no noise during the operation of photovoltaic power plants, as all the installations are silent. While the initial costs are high, the operating costs are low afterwards.

The use of solar cells for small electronic devices is possible everywhere, even in the absence of nearby electricity grids, e.g. in maritime applications, on vessels, in outdoor activities and in remote locations. One of the drawbacks of solar energy is the intermittency of the source. Production depends on solar irradiation, not on current demand, so additional reliable sources are needed to make up the difference and stabilise the power system. In areas with few days of sunshine, availability is low and does not guarantee a reliable supply of electricity. In addition, the location where the panels are installed also increases the potential for fires [22].

Wind energy

Wind power once accounted for less than one percent of global energy needs, but is among the fastest growing electricity generation industries. Slovenia currently has only one major wind power plant with a capacity of 2.3 MW at Dolenja vas, Municipality of Divaca. The biggest problem in our country is the siting of wind power plants. In addition, average wind speeds in Slovenia are

quite low, and only in a few areas do wind speeds exceed 3 to 5 m/s, which is the minimum initial wind speed for the operation of wind power plants. We do have some small wind farms, mainly for self-consumption in hard-to-reach places (e.g. mountain huts). If we wanted to exploit wind energy, we would need to place wind turbines at higher altitudes, such as on mountain ridges, where wind speeds are sufficiently high and fairly constant [22]. The biggest disadvantage is wind variability, especially in poorly ventilated areas where wind power alone will not be sufficient. In addition, wind power supply is also dependent on wind speed and direction, which is constantly changing. Moreover, for once, the price of electricity from wind farms is significantly higher than electricity generated by hydroelectric, thermal and nuclear power plants. In addition, the very operation of wind turbines in the immediate vicinity is very noisy, which can be a problem for nearby residents [22]. The International Energy Agency predicts that wind power will become the main source of electricity in Europe by 2030. No wonder, as this is where renewable technologies are developing fastest. Between 2020 and 2024, more than 348 GW of new wind farms are expected to come on stream around the world, bringing the total global wind power capacity to almost 1,000 GW. That's 54 % more than in 2019. Here too, wind power is helping to reduce our carbon footprint and ease the burden that energy production is placing on our planet. In neighbouring Croatia, for example, it is already possible to build wind farms in a fully competitive way, without financial support for green energy production [17].

Wood biomass

In Slovenia, wood is an important energy source and accounts for the largest share of renewable energy sources used in the country. In recent years, the importance of wood in the energy sector has increased further. We consume almost 2 million tonnes of wood per year. In Slovenia, energy from wood is mainly produced from wood residues from forests and the wood-processing industry.

There are various forms of wood fuels, but firewood still dominates, followed by wood chips and wood pellets. It is precisely because of Slovenia's large forest cover that wood is not only a raw material but also one of the most important renewable energy sources. According to the forest management plans of the Slovenian Forest Service, the stock of wood in Slovenian forests amounts to 337 816 717 m³, or 285 m³ per hectare. The share of coniferous trees in the timber stock is 46 % and of deciduous trees 54 %. Slovenian forests produce 8 419 974 m³ of timber per year, or 7.10 m³ per hectare. Over the last few years, between 3.4 and 3.9 million m³ of trees have been felled annually in Slovenian forests, 55 % of which are conifers and 45 % deciduous. However, although wood is a renewable source of energy, it is important to be careful about consumption and to keep the value of the forest constant. In Slovenia, 57 % of the total annual increment can be harvested for reforestation purposes [23]. Wood biomass is mainly used for heating, but can also be used to generate electricity (Figure 9). As the harvested wood must be used for the production of products, only the residual wood and low-quality wood from the forest is suitable for energy purposes. Thus, the total real potential for energy use in Slovenia is estimated to be around 2 million cubic metres. In Slovenia, wood biomass is used to heat more than 100,000 buildings [24].

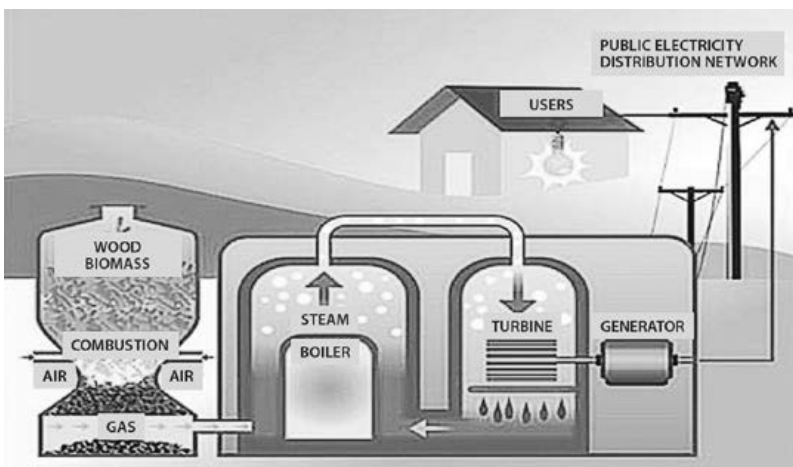


Figure 9: Use of wood biomass [23]

The use of wood biomass contributes to the cleaning of forests and the use of wood waste products from the wood processing industry. It also contributes to reducing CO₂ emissions and reduces the country's import dependency. In addition, it contributes to rural development and provides jobs for people far from urban centres. The storage of wood biomass is also relatively easy and is considered a long-term energy source. The disadvantage of wood biomass is that it has to be replaced by planting new trees and reforestation. This can lead to over-exploitation of land that could be used for food production, which in the long run can make basic foods more expensive [24].

Conclusion

The European Union wants to reduce CO₂ emissions in a way that benefits everyone while reducing costs, and is therefore encouraging innovation and the dissemination of innovative technological solutions in the field of green technologies. In doing so, it has the potential to remain at the forefront of the development of these technologies, to create new jobs, to increase the productivity and competitiveness of the products of the European economy and to become independent from foreign sources of raw materials and commodities [1]. Knowing the statistics and the state of the country's energy supply is essential to understand the environmental impacts of energy production. For the sustainable development of a country and the reduction of environmental impacts, effective strategic plans cannot only cover energy efficiency and the introduction of renewable energy. A circular economy must be introduced for energy parts and materials: when photovoltaic panels and wind turbines reach the end of their useful life, we cannot just throw them on the scrapheap and expect everything to be fine. We need to figure out how to reduce waste and reuse as many materials as possible, and this requires fundamental changes in the way such products are produced. A good example is electric vehicle batteries, which have a useful life of somewhere between seven and ten years. But that's not the end of

the story, as these batteries can be connected outside the vehicle and provide additional energy storage options for grid supply for many more years of service. The shift towards renewables also requires a fundamental redesign of energy networks. We cannot generate solar power at night, and it is important to remember that the fixed costs of thermal power stations make it unviable to reduce their output below a certain level, so sometimes it is more profitable to give up some solar power than to close a thermal power station altogether. Raising citizens' awareness of the benefits of resource efficiency will in turn reduce the consumption of oxygen and scarce resources, which will prevent environmental degradation and biodiversity loss in Slovenia.

Literature

- [1] **U. Krajnc**, 'Achieving the goals of sustainable growth in the EU and Slovenia', University of Maribor, Faculty of Economics and Business, 2011. Accessed: 05/08/2023 [Online]. Available: <https://core.ac.uk/download/pdf/67548224.pdf>
- [2] **'We have the first Slovenian self-sufficient energy community #video - siol.net'**. Accessed: 06/06/2023 [Online]. Available: <https://siol.net/digisvet/novice/imamo-prvo-slovensko-samooskrbno-energetska-skupnost-561513>
- [3] **R. Ukmar**, 'Diploma work: Areas and responsibilities of environmental inspectors and problems in finding solutions', University of Maribor, Faculty of Safety Sciences, Ljubljana, 2017. Accessed: 05/07/2023 [Online]. Available: <https://core.ac.uk/download/pdf/129400266.pdf>
- [4] **J. Vrtačnik**, 'Geographic characteristics of the pharmaceutical industry in Slovenia', University of Ljubljana, Faculty of philosophy Department of geography, Ljubljana, 2020. Accessed: 10/07/2023. [Online]. Available: <https://repozitorij.uni-lj.si/Dokument.php?id=135244&lang=slv>
- [5] **'Industry'**. Accessed: 05/08/2023 [Online]. Available: <https://eucbeniki.sio.si/geo9/2624/index4.html>
- [6] **'Portal Energetika - Annual energy balance of the Republic of Slovenia'**. Accessed: 05/07/2023 [Online]. Available: <https://www.energetika-portal.si/dokumenti/statisticne-publikacije/letna-energetska-bilanca>
- [7] **'Portal Energetika - National Energy and Climate Plan'**. Accessed: 31/07/2023 [Online]. Available: <https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt-2024/>
- [8] **'Renewable sources in gross final energy use, 2020'**. Accessed: 05/07/2023 [Online]. Available: <https://www.stat.si/StatWeb/News/Index/10057>

- [9] **'Energy in Slovenia and the world: statistics - iEnergija'**. Accessed: 08/07/2023 [Online]. Available: <https://www.i-energija.si/ienergija/energetika-v-sloveniji-in-svetu-statistika/>
- [10] **'Energy statistics, Slovenia, 2019'**, Accessed: 02/07/2023. [Online]. Available: <https://www.stat.si/statweb/News/Index/9109>
- [11] **'How much CO₂ emissions in the EU are caused by cars (infographic) | News | European Parliament'**. Accessed: 03/08/2023 [Online]. Available: <https://www.europarl.europa.eu/news/sl/headlines/priorities/podnebnospremembe/20190313STO31218/koliko-izpustov-co2-v-eu-povzrocajo-avtomobili-infografika>
- [12] **'On energy, reliability and flexibility - iEnergija'**. Accessed: 03/08/2023 [Online]. Available: <https://www.i-energija.si/ienergija/o-energiji-zanesljivosti-in-proznosti/>
- [13] **K. Przystupa, I. Vasytkivskyi, V. Ishchenko, V. Pohrebennyk, O. Kochan, and J. Su**, 'Assessing air pollution from nuclear power plants', 2019 Proceedings of the 12th International Conference on Measurement, MEASUREMENT 2019, pp. 232–235, May 2019, doi: 10.23919/MEASUREMENT47340.2019.8780088.
- [14] **M. Bevc**, University of Ljubljana Faculty of social sciences, Sustainable waste management policy in Slovenia, Ljubljana, 2010. Accessed: 26/07/2023. [Online]. Available: http://dk.fdv.uni-lj.si/magistrska/pdfs/mag_bevc-maja.pdf
- [15] **'Category: Thermal power plants in Slovenia - Wikipedia, the free encyclopedia'**. Accessed: 04/08/2023. [Online]. Available: https://sl.wikipedia.org/wiki/Kategorija:Termoelektrarne_v_Sloveniji
- [16] **'Technological and environmental risks TEŠ 6'**. Accessed: 31/07/2023. [Online]. Available: https://www.hse.si/app/uploads/2018/12/izvirni_dokument_Gregoric_Tehnološka_in_okoljska_tveganja_TES_6.pdf
- [17] **'Renewable energy sources | GOV. SI'**. Accessed: 05/07/2023. [Online]. Available: <https://www.gov.si teme/obnovljivi-viri-energije/>
- [18] **'Water energy'**. Accessed: 05/07/2023. [Online]. Available: <https://www.trajnostnaenergija.si/Trajnostna-energija/Proizvajajte/Onovljivi-viri-energije/Vse-o-obnovljivih-virih-energije/vodna-energija>
- [19] **'Water energy | eWorld'**. Accessed: 04/08/2023. [Online]. Available: <https://www.esvet.si/vodna-energija>
- [20] **'Solar energy'**. Accessed: 04/08/2023. [Online]. Available: <https://www.trajnostnaenergija.si/Trajnostna-energija/Proizvajajte/Onovljivi-viri-energije/Vse-o-obnovljivih-virih-energije/son%C4%8Dna-energija>
- [21] **'Solar Energy | eWorld'**. Accessed: 28/07/2023. [Online]. Available: <https://www.esvet.si/drugi-viri-energije/soncna-energija>
- [22] **'Wind energy | eWorld'**. Accessed: 24/07/2023. [Online]. Available: <https://www.esvet.si/drugi-viri-energije/vetrna-energija>
- [23] **'Wood biomass in Slovenia | Portal Sustainable Energy'**. Accessed: 04/08/2023. [Online]. Available: <https://www.trajnostnaenergija.si/Trajnostna-energija/Ohranite-okolje-%C4%8Disto/Lesna-biomasa/Lesna-biomasa-v-Sloveniji>
- [24] **'Biomass | eWorld'**. Accessed: 24/07/2023. [Online]. Available: <https://www.esvet.si/drugi-viri-energije/biomasa>

Industrial Regions and Sustainability in the Context of Greater Energy Self-Sufficiency and Environmental Justice, Due to Growing Resource Conflicts

Abstract: The world, and especially Europe, is currently facing a shift away from sustainable policies due to low energy self-sufficiency and, on the other hand, dependence on foreign energy sources, due to numerous conflicts and lack of energy sources. If in the past the departure from sustainability policies was the result of economic reasons, today, due to various conflicts in the region, it is also the result of increasing political friction. The lack of energy sources from the East, and especially European dependence in both the energy and political fields, are forcing the largest consumers and industries to reuse fossil fuels. Germany, France and the industries of countries that consume large amounts of energy are currently facing the reduction of sustainable, green policies, which until now have led in the direction of alternative sources, because renewable energy sources, due to consumer lifestyles and increasing energy consumption, are not sufficient for the needs of industry. Therefore, the conflict of the present time, and above all the instability of energy production, due to already critical environmental problems, due to the consequences of greenhouse gases, and especially increasing consumption, force us in the direction

¹ Davorin Žnidarič wrote this article under the mentorship of prof. dr. Andrej Lukšič.

of saving, restructuring technologies and different use and production of products, if we want to achieve satisfactory sustainable goals, and at the same time limit conflicts in the space. Due to the conflict of the present moment and the lack of resources, the author's article constructively and critically touches on the segment of the past and present use of fossil fuels, and at the same time offers some solutions, which with the reuse of fossil fuels mean steps towards greater environmental justice, which in the past was due to insistence neglected in just two of them, energy and economy.

Key words: energy self-sufficiency, EU, sustainable supply and development, fossil fuels, negative environmental and social problems, injustice, conflicts

Introduction

The energy crisis, which occurred as a result of the political and military conflict between the EU and Russia, showed that countries' own energy self-sufficiency is important for their development, mainly due to political independence and limitation of external interests.

If in the past regarding the mining and use of coal or the fossil age, due to the negative consequences of the use and consumption of energy sources, in this case coal, EU members followed the trend of reducing and limiting the use of coal, and some, such as Slovenia, also closed their coal mines due to EU requirements, today more and more countries, including the largest industries (Germany, France), due to restrictions on energy products linked to imports from Russia, are once again deciding to extend exploitation or even open new mines and the use of fossil fuels. Although countries are trying to solve the fossil energy crisis by buying energy from other, mainly Arab markets, reducing consumption or buying from free markets, which represents certain additional logistical and financial inputs and costs, the continued use of fossil fuels means not only continued dependence on sources from abroad, but also the continuation of political dependence. From a strategic

and political point of view, all measures point to a lack of long-term energy supply plans, and above all, a deficiency in self-sufficiency.

The problem is also the fact that the reality of the consumer society, or the so-called imperial² way of life (Brand and Wiessen, 2021), especially the consumption of energy products in industry, is currently still mostly tied to the dominant share of fossil fuels and, despite some tendencies to limit their use only this one is still high. Forecasts for the future use of fossil resources also show (Figures 1 and 2. At stand 5) that the consumption of „classical“ resources will only continue to increase and not decrease, as it would according to theoretical discussions about less burdensome use of energy for the environment, and above all increasingly negative consequences of past use, expected.

Green energy - RES, despite bold theoretical and sometimes practical measures, still does not reach an adequate replacement for classical sources. On the one hand, the introduction of RES technologies and measures is associated with costs that poor countries and individuals, despite their desire for cleaner resources, cannot afford. On the other hand, the protection of interests also presents a problem energy lobbies, which would lose part of their profits with greater self-sufficiency. The state has no interest either (at least that's how we can understand its policies considering the sometimes incomprehensible measures towards the use and implementation of RES), as it would lose part of its tax income if truly green, self-sufficient concepts were introduced in practice.

Therefore, due to the lack of energy sources (from the East), industrially developed countries are once again focusing on environmentally „dirty energy sources“³, which in the past cau-

² The imperial way of life is a concept described by Ulrich Brand and Marcus Wissen in their book *The Imperial Way of Life as life in capitalist centers made possible* "by the formation of social relations and relations between society and nature elsewhere" (Brand and Wissen, 2021, p. 59). Or to put it simply, the capitalist system is fueled by the exploitation of resources of various forms from other, exploited environments. The example of colonial exploitation shows that some imperial countries achieved a "starting base" for their development at the expense of exploiting labor and resources outside their own countries. During the industrial revolution, even within their own countries (note by the author of the article).

³ Dirty energy sources include mainly those (primarily fossil fuels in the past) that, due to inadequate technological systems and their composition, caused negative environmental

sed many negative impacts in space due to various reasons. The growing consequence of the use of fossil resources calls into question the trends of sustainable policies and the reduction of global environmental burdens and the effects of greenhouse gases, which are mostly produced by the use of fossil energy sources.

It is precisely because of the lack of energy sources and, on the other hand, their increasing consumption (due to various factors such as the consumer society, the price of technological systems for renewable energy sources, the use of systems and devices to reduce negative environmental impacts, etc.) that the question arises as to what impact modern coal mining in industrial settings. If in the past the industry was associated with many negative ecological, environmental and spatial consequences (Plut 2011, Kirn 2012, Žnidarič, 2015), which also had a long-term impact on the position and fundamental social impacts and consequences on the inhabitants of mining and industrial areas, it is the question of how and in what way to act in the space with activities that represent potential causes for the creation or deepening of environmental and social problems.

Minnings in Slovenia

In recent years, the use of coal mainly for the production of electricity in Slovenia has been limited to only one operating mine, Velenje, for the needs of TEŠ 6, where today the quantities of lignite are said to be too small for the needs of the operating thermal power plant. Even the Zasavje basin has closed, despite the still satisfactory quantities of brown coal, and in both coal mines we cannot ignore the fact that inadequate (political) decisions were made regarding mining, which, viewed from a distance of time, mean nothing more than completely misguided medium-term and long-term decisions. Especially in Zasavje, the closure of the mines meant the stagnation of the region (Žnidarič, 2016, 2019; Žnidarič and Lukšič, 2022),

consequences in the area. PTE is or heavy metals in the soil due to the release of dust particles as metal carriers into the room, the consequences of acidification due to SO₂ releases and binding to H₂O and other...

as the „lost underground jobs“⁴ were not adequately replaced with new ones. As a result, the economic and social crisis deepened, many accompanying activities or companies related to mining have lost their jobs due to the lack of adaptation to new political and economic conditions and changes in the social system. Once the second most successful region in Slovenia (right after the still most successful Central Slovenia) during the newly emerging transition, according to most statistical indicators, it stagnated. TET (Thermal power plant Trbovlje) and RTH (Minings Trbovlje Hrastnik), which in the past represented the largest employers in the region, lost many jobs and additional activities related to the coal mine due to the insistence of company managers, local politics and inadequate state policy only in the field of mining and trends in Europe that closed mining and later energy activity. Despite the fact that the state took adequate care of TET and RTH workers, either through early retirement, financial compensation or through redistribution of workers and retraining, workers in other supporting industries (STT) and workers in so-called women's industries were left to fend for themselves. , without adequate economic and social solutions.

The environmental crisis due to the failure to solve the problems of emissions of pollutants into space (mainly from TET) was thus joined by a crisis in the economic and social spheres. In the period of the last two decades, in addition to existing health problems related to environmental stress, there are also health problems related to long-term stress due to economic and social problems of residents who have lost their jobs or have not found themselves in the new social conditions brought about by the introduction of capitalism and neoliberalism. If the situation in the environmental field has partly improved due to the closure of environmentally controversial activities, especially in TET and Lafarge

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⁴ Underground jobs are imaginary jobs related to mining. Both direct and indirect jobs, as well as support for the mining activity, employed many workers from the domestic and foreign environment.

Cancers associated with mining and energy and industrial activities are common. According to the results of the Ljubljana Oncology Institute (2008), the frequency of morbidity in the region is higher than in other non-industrial regions. Cancers of the lungs, digestive tract, skin, circulatory-urinary tract, psychosomatic diseases and others are on average higher in number of incidences than in other regions and countries.

cement plant Trbovlje, and with the entry into the EU of stricter environmental legislation, past problems due to the lack of resolution in space are still present (PTEs, degradation of non-living nature). Another problem is ignorance of the concept of sustainability, or sustainable development and ecological modernization, which is interpreted differently by economists, the state and environmentalists. Neoliberal followers as the continuation of growth and thus exploitation and degradation in space, environmentalists on the contrary, the functioning of the system within the framework of the self-renewing abilities of the environment and nature.

Problems of coal use in the past through the concept of sustainable development

The use of coal for industrial and individual purposes has been a burdensome factor in some areas in the past. In London, its use in furnaces and blacksmith shops was already restricted in the 13th century, and with the development of society, the increase in the number of people and the development of new technologies, the load with emissions increased significantly during the industrial revolution and continued in the 20th century (Špes, 2008). In Zasavje, (Slovenia), the specific geographical and weather conditions and the number of factories in a small area also contributed to the loads, where the loads in the space had an even greater impact (inversions in winter, narrow unventilated valleys) (Žnidarič and Lukšič, 2023).

Even in industrial mining areas, such as Zasavje in Slovenia, we can directly see and feel the consequences of non-ecological and non-environmental use of domestic energy with all the negative consequences for nature, people and space. Insistence on the ever-increasing consumption of coal, the production of ever-increasing amounts of electricity due to the needs of industry and consumer satisfaction, and the conscious disregard of environmental and spatial limitations have pushed some environments into a subordinate position compared to other, non-industrial areas. The social, economic and social crisis due to

the past non-ecological orientation shows that care for people and space in the period before the entry of individual countries into the EU (Slovenia, in the EU in 2004) was neglected at the expense of profits, human health and environmental degradation. Insisting on only two Ejs, energy and economy, and neglecting the third important E-ecology, was inadequate from today's point of view due to the consequences in space and society.

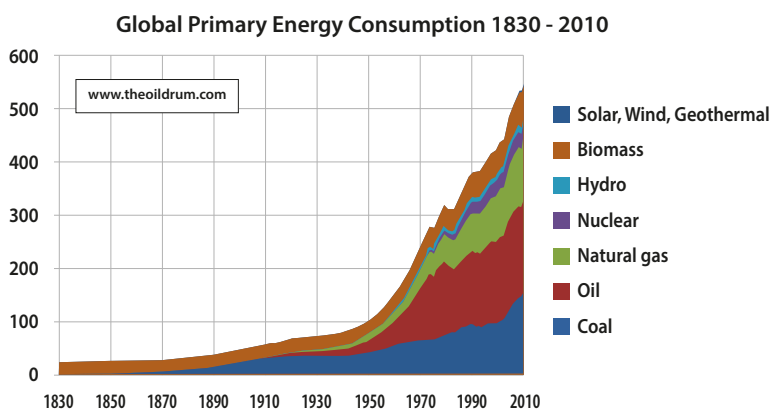


Figure 1. Global primary energy consumption between 1830 and 2010

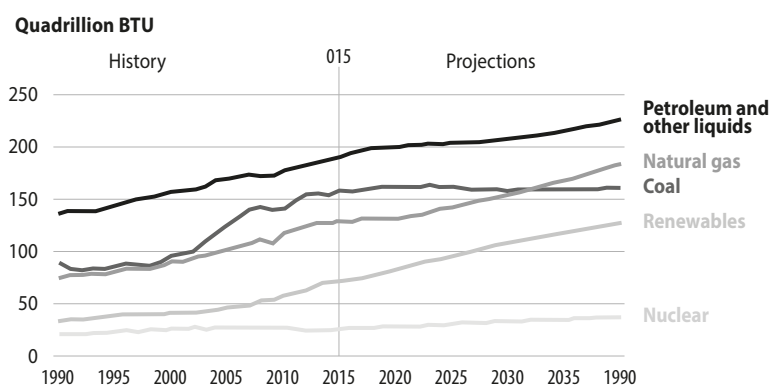


Figure 2. Consumption of energy products since 1990 and projection of their consumption until 2040

Coal has an even greater strategic share today (2023), as the projections were made before the Ukrainian-Russian conflict, which significantly changed relations and the use of resources.

From the point of view of self-sufficiency and the strategic role of energy resources, and especially of political dependence, mines and coal mining are once again interesting for exploitation. If the use of coal in the past, mainly from the point of view of defective technological processes during burning and due to the release of dust and particles into the room and their deposition in the ground, was ecologically and environmentally objectionable, and in the room, with ecological, environmental and social-social consequences, large burdens that in some areas had a significant impact on the quality of life (Vudrag, 2008, Žnidarič 2009, and Žnidarič, 2012, 2014). Today, with modern ones. technologies, we can significantly limit negative impacts. With this, we are placing the production and use of coal in a different role than in the past, especially in the light of greater energy self-sufficiency.

Even the desire for a sustainable policy, which due to the many negative environmental and social impacts and consequences (due to the use of fossil fuels and inadequate technological systems in the past) has become the dominant environmental discourse of modern society, can be realized with a greater role of green technological processes and measures in practice. Modern technologies, optimization of systems, lower energy consumption, monitoring can have a significant impact on the operation and image of „modern“ mining in space.

However, the expansion or new mining activity must not represent an additional load on the space. In changed technological and environmental conditions, it can represent the potential for an easier, time- and financially more acceptable transition to renewable energy sources and the reduction of social friction in the area.

The positive experiences of other countries that faced the restructuring of mining regions decades ago can help us make the transition easier. If some regions and countries introduced greater environmental engagement upon joining the EU and thought about the time after the transition from the fossil age (for

example, Slovenia), some, including Germany, began to deal with the problems of the transition of mining areas. and rehabilitation of conditions after mining more than sixty years ago (Ruhr and Saar region of DE). Therefore, their good practices should be transferred to our environments, adapted to our conditions and introduced as soon as possible, so that, on the one hand, mistakes from the past would not be repeated and the much-needed time to transition to systems and procedures that are already established and tested would be reduced , but taking into account the fact that possible mining does not add to the burden on the environment. At the same time, with potential new mining processes, it is necessary to invest in green technologies and processes and think about the time after the fossil age. However, the implementation procedures and possible new mining interventions in the area should be aligned with the interests of the public and enable them to directly participate in decision-making, which in some places is still limited, inadequate or non-existent.

Especially since people in (degraded) mining environments, due to the long-term denial of the environmental-ecological problems they were exposed to, are rightly skeptical and distrustful of „new“ technologies in space. Therefore, when implementing new activities in the area, it is necessary to first obtain the consent of the local community. To take into account their (community) legitimate demands, which most often include the right to a healthy and clean environment, which contains requirements for adequate quality of drinking water, air and soil. It is particularly important to enable active participation and fair treatment of the community when deciding on potential projects in the area. In the past and even today, it unfortunately happens that the key interests of the community, which in practice most often collided with the interests of capital with the aim of generating as much profit as possible, were at most limited or by various legal measures (exemption from the decision), limiting the influence of the public, lack of of information, the co-opting of capital and politics, not least the threats to critics of non-ecological behavior that hindered decision-making. The case from Zasavje on the part of foreign capital showed (the

case of the Lafarge cement plant) that the public was misled by rigged control of emissions from factories, rigging of relevant data on the operations of the factory and legal support for those responsible (burning hazardous waste without proper permits, etc.). Instead of supporting the state and its institutions, official institutions, due to various interests (including political and economic ones), turned their backs on the residents of degraded areas and preferred to support the burdeners (Žnidarič, 2012, 2014, 2022).

The role of the community and its participation in the space

The role of the community is therefore important in the case of setting up industrial facilities in an area where mining may also be involved, as cooperation between contractors and the community can limit or eliminate potential conflicts. Where the main thing is mutual trust, empowerment of all relevant decision-making actors, full information and appropriate communication channels, without any obstacles. In some countries of the Western - developed world (Netherlands, Scandinavian countries), where there is a high social consensus regarding the solution of environmental and social systems, examples of good practices of cooperation between all actors in the area (government, industry, public and NGOs) already exist. However, elsewhere, even in the so-called developed Western world, where we can also include Slovenia, the aforementioned positive practices are mostly carried out too little due to capital's interests in maximizing profit and operating according to the NIMBY principle (Brand and Wissen, 2022). Examples in Slovenia show that negative environmental practices are mainly carried out by foreign companies (Lafarge-Holcim, Magna Steyer, Salomit Anhovo-Alpcem and others). Even more critical is the operation of foreign companies in developing countries or, last but not least, in the countries of the EU and the Western Balkans, where profits flow abroad, but ecological and social problems remain for locals (Kirn, 2014). An additional problem is the already mentioned support for corpo-

rations by politicians, who, while ensuring their own, mostly narrow political and economic interests, forget the interests of society, which has placed them in the role of decision-maker.

A major problem of the current, consumerist and profit-oriented way of life is also the apparent introduction of sustainability concepts in practice, which are mostly green only through green theoretical attachments, which in practice are often less green than classical existing systems.

Green and sustainable policies

The implementation of green, sustainable policies today needs to be reformed in a way that prevents any different interpretation of sustainability. Precisely defined sustainability, which today between economists (mainly neoliberal) and environmentalists, where sustainable development is first interpreted as the continuation of growth and orientation towards the greatest possible profits, and environmentalists as limitations in space based on self-renewal abilities of animate and inanimate nature. Another important segment is represented by truly green technologies, which, unlike the current ones, mean less pressure on people and the environment. A good example of misleading green technology is green mobility or Mere marketing greening does not represent effective sustainable policies that would enable the balance of the 3E indicators, but on the contrary increases the burden on the planet.

The third segment represents the reduction of consumerism and waste, both on a personal, national and global level. According to Bogataj (2020), households in Slovenia should reduce resource consumption by half in order to achieve planetary self-sufficiency or reduce their carbon footprint. Countries should also implement appropriate, self-sufficient energy policies, which should include measures to reduce inequality and poverty. Both (poverty and inequality) significantly affect sustainability through energy use and resource consumption. Degraded areas, such as the example of Zasavje, are also in an unenviable position in

the area of co-investment in the protection of buildings or the introduction of new, more ecological and energy-saving technologies. Despite the possibility of receiving subsidized items, people who are on the social fringes cannot afford them due to the lack of funds for participation, as they only deal with basic survival. Due to inequality and poverty, which grow into various forms of injustice, according to Kaplan (1994 in

Brand and Wissen, 2022 p. 24), are increasingly deepening shortages, crime, overpopulation and tribalism in some places, as well as diseases that destroy the social structure of the planet and outline the darkest scenarios of the 21st century.

Measures

The disparity between industrial-mining degraded environments and non-industrial regions should be reduced. Fix past environmental problems. Implement environmental projects and disable any non-environmental activity in degraded areas. Larger state contributions for rehabilitation of degraded areas and appropriate supervision and control over the implementation of measures. In the past, funds were used uncontrollably and inappropriately, and the problems in the space remained. Involvement of the public and non-governmental organizations in matters of importance to the public, which will eliminate potential conflicts in the space and limit the role of capital in politics.

Therefore, greater environmental justice must be achieved, especially because industrial mining areas have suffered many negative environmental, economic and social consequences due to past non-ecological and non-environmental behavior (due to the pursuit of the two e's, economy and energy).), which they are unsuccessfully dealing with today. The solidarity and empathy of the non-industrial areas, together with the appropriate political justice, must allow the degraded regions at least a decent survival.

With inadequate development and ecological measures and rehabilitation, such as the case of Zasavje (EU), such local and national inefficiency in solving problems and an even narrower politi-

cal interest enable „dirty capital and investments“ to the detriment of people, which by operating according to the NIMBY principle, make it easier pursue their interests. Examples both in some less influential EU countries and in the Balkans show that dirty technologies move from the base countries to the periphery, where the social and economic hardship of certain areas is exploited, and it works according to the principle of shifting benefits and profits. for the homelands, for the inhabitants, the areas remain degraded areas and many problems (Kirn, 2014, 2016, Žnidarič, 2021).

Conclusion

Today's times require fast and efficient sustainable concepts that must follow truly green concepts. In addition to technologically sophisticated and upgraded concepts, socially, socially and economically modified measures to reduce friction in space must also follow at the same time. Which are aimed at greater equality, which, without the help of developed poor, industrially underdeveloped regions, less developed and non-mining regions enabled mining to reduce inequality in space. Energy self-sufficiency, in addition to energy self-sufficiency, represents a step in reducing inequality and injustice, which crises such as natural disasters, wars or various health problems only deepen and instead of easing the situation, cause even greater friction over time. and space. Due to energy dependence and the crisis in the world (war in Ukraine), the potential of mining regained its validity, but at the same time it also showed the vulnerability of existing systems, on the other hand, new possibilities for the use and exploitation of resources, which must follow the goal of continuation (mining-coal mining), it is necessary to look for technological systems that will not cause additional friction and conflicts in the space.

Literature

- Brand, U. in Wissen M.** (2022). Imperialni način življenja. Vsakdanje življenje in ekološka kriza kapitalizma. Inštitut za ekologijo 2022.
Imperial way of life. Everyday life n ecological crisis of capitalism. Institute of Ecology 2022.
- Deep Resource** (2015). Rembrandt Koppelaar on World Energy Consumption 1830-2010 Dostopno prek: <https://deepresource.wordpress.com/2012/02/18/rembrandt-koppelaar-on-world-energy-consumption/> (8.3.2021)
- Kajfež Bogataj, L.** (2020). Val 202. Radijska oddaja o vplivih človeškega razvoja na okoljske probleme. Februar, 2020.
- Val 202.** A radio show about the impact of human development on environmental problems. February, 2020.
- Kaplan, R. D.** (1994). The Coming Anarchy: How Scarcity, Crime, Overpopulation, Tribalism, and Disease Are Rapidly Destroying the Social Fabric of Our Planet, *Atlantic Monthly*, 273(2), 1994, str. 44–77.
- Kirn, A.** (2012). Družbeno ekološki obrat ali propad. Ljubljana: Znanstvena založba FDV. Socio-ecological turnaround or collapse. Ljubljana: Scientific publishing house FDV.
- Kirn, A.** (2014). Ekosocializem kot alternativa. *Teorija in praksa* 51(6), 1021- 1056. Ecosocialism as an alternative. Theory and practice 51(6), 1021- 1056.
- Kirn, A.** (2016). Ekosocializem kot povezava družbenosti in sonaravnosti: realna alternativa ali utopija. *Varstvo narave*, 29(2016) 49-72.
Ecosocialism as a link between sociality and sonarity: a realistic alternative or a utopia. *Protection nature* 29 (2016) 49-72.
- Researchgate.net** (2016). EIA anticipates 48% rise in world energy consumption by 2040. Dostopno prek: <https://www.drillingcontractor.org/eia-anticipates-48-rise-world-energy-consumption-2040-39524> (18.2.2020)
Ecosocialism as a link between sociality and sonarity: a realistic alternative or a utopia. *Nature Conservation*, 29 (2016) 49-72
- Špes, M.** (2008). Pomen okoljske ozaveščenosti in sodelovanja javnosti za trajnostni razvoj, *Dela* 29, 2008, 49-62.
The importance of environmental awareness and public participation for sustainable development, *Dela* 29, 2008, 49-62
- Žnidarič, D.** (2009). Prah in prašni delci. Seminarska naloga pri predmetu fiziologija na FOV Kranj. Študijsko leto 2009-2010. 64 strani.
Dust and dust particles. Seminar assignment in the course of physiology at the Kranj FOV. Academic year 2009-2010. 64 pages.
- Žnidarič, D.** (2014). Ekoremediacijski postopki metode reševanja nastalih ekoloških problemov. 3. Konferenca z mednarodno udeležbo. Konferenca VIVUS – s področja kmetijstva, naravovarstva, hortikulture in floristike ter živilstva in prehrane »Prenos inovacij, znanja in izkušenj v vsakdanjo rabo« 14. in 15. november 2014, Biotehniški center Naklo, Strahinj 99, Naklo, Slovenija.
Eco-remediation procedures, methods of solving emerging ecological problems. 3.

Conference with international participation. VIVUS conference - from the fields of agriculture, nature conservation, horticulture and floristry and food and nutrition „Transfer of innovations, knowledge and experience into everyday use“ November 14 and 15, 2014, Naklo Biotechnology Center, Strahinj 99, Naklo, Slovenia.

Žnidarič, D. (2015). Reševanje okoljskih problemov v Zasavju na trajnostno naravnan način; 34. Mednarodna konferenca o razvoju organizacijskih znanosti; Internacionalizacija in sodelovanje, Marec 2015, Portorož. Predstavitev članka in objava abstrakta v zborniku konference. Zbornik izdan: Kranj, Fakulteta za organizacijske vede, Kranj, 2015.

Solving environmental problems in Zasavje in a sustainable manner; 34th International Conference on the Development of Organizational Sciences; Internationalization and cooperation, March 2015, Portorož. Presentation of the article and publication of the abstract in the conference proceedings. Proceedings published: Kranj, Faculty of Organizational Sciences, Kranj, 2015.

Žnidarič, D. (2016c). Vpliv gospodarske krize na socialne razmere v Zasavju (diplomsko delo) Dostopno prek <https://dk.um.si/Iskanje.lang=slv&stl0=Avtor&niz0=Darja+%C5%BDnidari%C4%8D>
The impact of the economic crisis on social conditions in Zasavje (graduate thesis) Available via, <https://dk.um.si/Iskanje.php?type=napredno&lang=slv&stl0=Avtor&niz0=Darja+%C5%BDnidari%C4%8D>

Žnidarič, D. (2021); Online konferenca. Doktorski študenti FDV „Moč in pravičnost v energetskih tranzicijah“. Aktivni udeleženec s predvanjem in PPT prezentacijo na temo: Problemi sodobne družbe v prostoru ali pot do novega družbenega sistema. Mednarodna poletna šola politične ekologije / International summer school of political ecology, 29.6-3.7.2021. <https://www.politicalecology-ljubljana.si/>
Online conference. Doctoral students of FDV „Power and justice in energy transitions“. Active participant with lecture and PPT presentation on the topic: Problems of modern society in space or the path to a new social system. International summer school of political ecology, 29.6-3.7.2021. <https://www.politicalecology-ljubljana.si/>

Žnidarič, D.; Lukšič, A. (2023). Zasavje in trajnostnost-v smeri večje pravičnosti in enakosti v regiji. Zbornik politična Ekologija na delu. Teorija v vsakdanji praksi in vsakdanja praksa v teoriji. Zbirka Oikos. Ljubljana 2023.
Zasavje and sustainability - in the direction of greater justice and equality in the region. Collection of political Ecology at work. Theory in everyday practice and everyday practice in theory. Oikos Collection. Ljubljana 2023.

A Just Energy Transition in the Rented Housing Sector in Austria: Identifying Barriers and Leverage Points from a Systems Perspective

Abstract: The building sector, as a key contributor to greenhouse gas (GHG) emissions, warrants particular urgency and attention in the transition to low-carbon and more efficient energy systems. Yet the challenge of decarbonizing the residential building sector, is fraught with complexities and socio-political tensions. Even in wealthy regions such as the European Union, a considerable proportion of the population is affected by energy poverty, i.e. unable to afford basic domestic energy services such as heating. This issue becomes even more pertinent in light of the substantial investment costs required to decarbonize heating systems and thermally retrofit buildings. Policies governing the transition risk exacerbating existing inequalities with regard to housing and energy poverty. This raises the question of how to achieve a socially just energy transition in the residential building sector. This paper investigates this question using Causal Loop Diagrams (CLD) as an analytical tool to map out the problem structure, identify the most relevant barriers and potential leverage points for fostering a just transition. Focusing on the Austrian context, this contribution discusses the particular challenge of decarbonizing the rented apartment sector. We find that the current system exhibits structural barriers for enabling emissions reductions while at the same time improving social equity. Structural adjustments are necessary to curb energy poverty and accelerate housing renovation and heating exchange rates. Potential leverage points go beyond market-based interventions and should aim at structurally changing incentive structures so that the benefits and burdens of the transition are shared more equally between tenants, landlords and owners.

Keywords: greenhouse gas emissions, decarbonization, energy systems, building sector, energy poverty, policy governing, socially just energy transition, Austrian context.

¹ Daniel Gerdes wrote this article under the supervision of prof. dr. Andrej Lukšič.

Introduction

Relevance and motivation

As the adverse impacts of global warming on human well-being and the ecological integrity of the Earth's ecosystem intensify, the imperative to rapidly decarbonize all sectors of the economy becomes increasingly pressing. Transitioning to low-carbon, less polluting, and more efficient energy systems is essential for achieving a more sustainable future. The building sector, as a key contributor to greenhouse gas (GHG) emissions, warrants particular urgency and attention. In 2020, buildings, encompassing both residential and commercial usage, accounted for 21% of global emissions and 31% of global final energy demand (Cabeza et al., 2022). This includes emissions from operational activities within buildings, such as heating, cooling, lighting, and appliance use, as well as embodied emissions arising from construction and building materials. Residential buildings alone contribute to 70% of global final energy demand within the building sector, underscoring the significance of the housing sector in the transition towards a low-carbon future (Cabeza et al., 2022; Cabeza and Ürge-Vorsatz, 2020). Among the various energy services met within residential buildings, space heating (32%), cooking (29%), and water heating (24%) constitute the bulk of final energy use (Lucon et al., 2014).

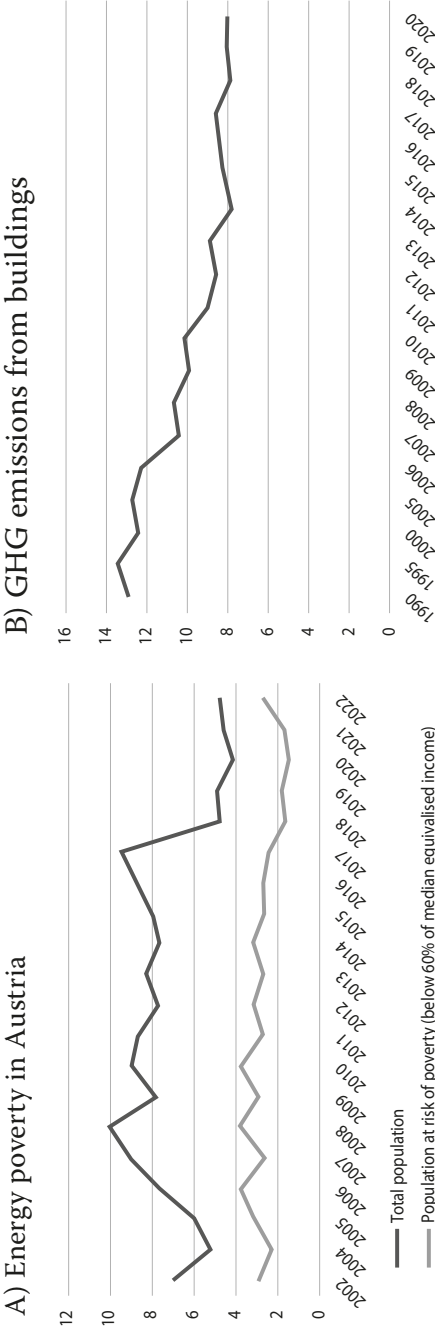
These figures indicate that a considerable portion of final energy use and the associated GHG emissions can be attributed to meeting fundamental human needs. People rely on energy for their daily lives and well-being, requiring adequate levels of heating, cooling, and lighting in their homes to ensure a decent standard of living. Yet, even in affluent regions, a significant share of the population falls short of this basic standard. Brenda Boardman (1991) introduced the concept of 'fuel poverty' to describe a situation in which households cannot afford to adequately heat their homes at a reasonable cost given their income. Fuel poverty is driven by low incomes, high fuel (and housing) prices, and poor building energy effi-

ciency. Today, the term ‘energy poverty’ is more commonly used outside of the Anglophone world to describe the phenomenon at the intersection of income poverty and energy use as conceptualized by Boardman. It is commonly measured by considering a household energy poor if their energy-related expenditures exceed 10% of their net income (Schuessler, 2014). According to data from the European Union Statistics on Income and Living Conditions (EU-SILC) in the European Union (EU), 9.3% of the EU’s population, approximately 50 million households, reported experiencing energy poverty² in 2022 (Eurostat, 2023). In recent years, the situation has worsened for many individuals due to the COVID-19 pandemic, subsequent energy price surges, and the Russian invasion of Ukraine, which has further elevated energy prices. In this convergence of energy poverty and the imperative to rapidly transform the residential building energy sector, critical concerns related to justice and equity emerge.

The concepts of ‘energy justice’ (Jenkins et al., 2016; Sovacool and Dworkin, 2015) and ‘just transition’ (Healy and Barry, 2017; Heffron and McCauley, 2018; Newell and Mulvaney, 2013) have gained prominence, underscoring the significance of embedding justice considerations at the core of the energy sector’s necessary transition. As highlighted by Williams and Doyon (2019), there exist normative and instrumental arguments for the crucial role of justice in the energy transition. From a normative standpoint, an „unjust transition is not sustainable,“ while from an instrumental standpoint, the “failure to consider justice erodes political support for transition efforts” (p. 144).

Against this backdrop, this study aims to explore the multifaceted challenge of fostering a just energy transition in the residential building sector, focusing specifically on the Austrian context.

² Rather than using the 10%-threshold suggested by Boardman, the EU-SILC questionnaire uses self-reported indicators. Survey participants are asked whether their “household can afford to keep its home adequately warm” (E-Control, 2013).



Share of population (in %) unable to keep their homes adequately warm

Source: own depiction based on data from (Eurostat, 2023)

GHG emissions in million tons CO₂-equivalents

Source: own depiction based on data from (Umweltbundesamt, 2021, 2019)

Figure 1: References modes

Austrian context

The Austrian case provides a pertinent illustration of the challenge outlined above. Ranking among the countries with the highest per capita emissions globally, the Austrian government has made a commitment to achieve climate neutrality by 2040. Fulfilling this objective demands ambitious and comprehensive measures across various sectors. Within this context, the housing sector poses a distinctive challenge. As of 2020, Austria still had over 910,000 gas heating systems, more than 508,000 oil heating systems, and 8,200 coal-powered heating systems in operation (Statistik Austria, 2023). Furthermore, nearly 1.2 million households are connected to district heating systems, which, to varying degrees, also rely on fossil fuels (up to 65% in Vienna, e.g.) (Strobl, 2022). Overall, achieving climate neutrality necessitates the replacement of over 1.4 million heating systems with lower-carbon alternatives by 2040. The task of decarbonizing the housing stock in Austria is further complicated by the diverse ownership structure. Approximately 42.9% of Austrians reside in rented accommodations (Statistik Austria, 2022), limiting their influence over the selection of heating systems and the energy efficiency standards of the buildings they inhabit. Consequently, tenants are particularly susceptible to energy price hikes, as evidenced by the fact that in Austria energy poverty primarily affects households in rented accommodations (E-Control, 2013).

Method and data

To comprehensively examine the challenge of fostering a just energy transition in the residential building sector, this study utilized the method of Causal Loop Diagrams (CLDs). CLDs serve as a valuable tool for visualizing and comprehending intricate systems, their interconnections, and feedback loops (Pruyt, 2013; Sterman, 2000). They facilitate a holistic exploration of the dynamics and causal relationships within a system, offering insights into the drivers, barriers, and potential interventions.

In this study, CLDs were used to delineate the complex interactions among various factors influencing the energy transition in the residential building sector. By focusing on two key variables – energy poverty and GHG emissions from the residential building sector – as proxies for a just energy transition, the aim was to identify leverage points and impediments. To guide the development of the CLD, data was collected for these proxy variables and generated behavior over time charts as reference modes. Figure 1 illustrates the behavior over time of energy poverty and GHG emissions from the residential building sector in Austria.

Considering the intricate nature of the „heat transition“ (Abbasi et al., 2021) challenge, this work focuses on the perspective of tenants within the rented apartment sector. Tenants in Austria typically have very limited influence over their heating systems and the energy efficiency standards of the buildings they inhabit — two critical determinants of energy poverty and GHG emissions in the housing sector. Consequently, addressing the situation of tenants through policies such as subsidies for heating system changes is more challenging than in the owner-occupied housing sector. Additionally, tenants are directly affected by measures like carbon pricing, leading to increased household energy costs. Thus, the rented apartment sector presents a relevant focal point for the analysis presented here.

The construction of the CLD is based on desk research and refined through several rounds of discussion and feedback with colleagues. The system dynamics software VENSIM PLE, available in its free version, facilitated the creation of the CLD.

Results

Trends in energy poverty and GHG emissions

Based on the reference modes depicted in Figure 1, a causal loop diagram (CLD) that aims to map the most important dynamics pertaining to both energy poverty and GHG emissions within the building sector was developed. Over the past two decades, the

prevalence of energy poverty has shown some fluctuations, albeit at a relatively low level. Approximately 2% to 4% of Austrian households have reported being affected by energy poverty. Notably, in the period spanning 2018 to 2021, this proportion has declined to less than 2%. However, recent data indicate an upward trend, likely attributable to strong inflationary pressures, particularly in energy prices, following the COVID-pandemic and the Russian invasion of Ukraine. Among individuals within the Austrian population deemed at risk of poverty (defined as living on an equivalized income below 60% of the median income), energy poverty has shown similar oscillatory patterns, albeit at a higher magnitude. Between 2003 and 2017, the percentage of households at risk of poverty unable to adequately heat their homes has ranged from 5.2% (in 2004) to as high as 10% (in 2008). Since 2018, this share appears to have stabilized at a lower level, fluctuating between 4.2% and 4.9%.

In contrast to the oscillatory pattern characterizing energy poverty, GHG emissions attributable to the building sector, which are considered here as a proxy variable for the environmental dimension of the just transition challenge, have exhibited a consistent decline following a peak of 13.5 million tons of carbon dioxide equivalent (CO₂-eq) in 1995. Despite minor fluctuations along the trajectory, emissions have since declined by 40%.

Description of problem structure using the CLD

The aim of this section is to provide an in-detail description of the CLD shown in figure 2. In line with the focus of this research interest in identifying leverage points and barriers within the residential building sector to facilitate a socially equitable energy transition, two target variables were defined, indicated by green boxes encompassed by dashed lines in Figure 2: energy poverty and GHG emissions from the building sector. Exogenous variables are denoted by a purple font color, while selected policies and policy proposals are rendered in red font color. All remaining endogenous variables are represented in black font color. Selected

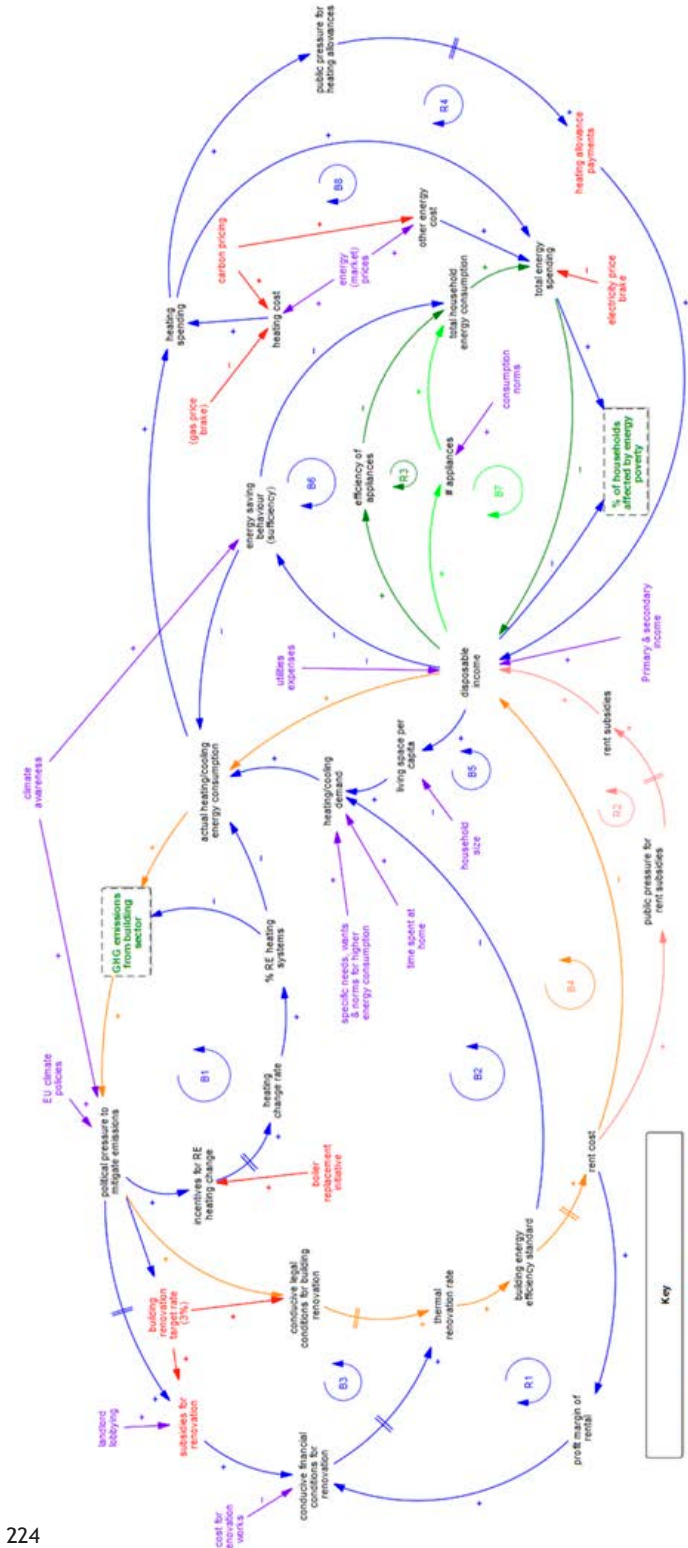


Figure 2: Causal Loop Diagram

feedback loops have been highlighted with color-coded visual indicators to improve readability.

The CLD can be broadly partitioned into two primary components. On the left-hand side, the variables and feedback loops predominantly relate to the policy realm, capturing the principal dynamics associated with building energy efficiency standards, the adoption of energy efficient technologies, and rental levels. In contrast, the right-hand side aims to encompass the most relevant variables influencing household energy consumption patterns and expenditure. Household disposable income has been identified as a central variable connecting the two main components. Following conventions within the field of system dynamics, feedback loops are designated with either an „R“ to denote reinforcing feedback loops or a „B“ to signify balancing feedback loops, followed by a numerical label to facilitate identification. A comprehensive summary of all identified loops, alongside relevant evidence sourced from the literature, is presented in Table 1.

Patterns illustrating the problem

With reference to section 3.1, which provided a short overview of the primary trends, the following section aims to discuss the underlying dynamics which generate these trends. Starting with the policy level, several feedback loops have been identified. Feedback loops B1-B3 illustrate how emissions, along with exogenous factors such as the growing recognition of the imperative to address climate change and the corresponding policies implemented by the European Union (EU), increase political pressure to mitigate emissions. This, in turn, prompts political measures aimed at incentivizing the replacement of fossil-fueled heating systems with renewable alternatives (B1), as well as the enhancement of both legal (B2) and financial (B3) conditions conducive to higher building energy efficiency standards. These will affect actual heating (and cooling) demand and consumption and thus emissions, constituting a balancing feedback loop.

Loop B4 further connects the dynamics described in loops B2 and B3 with rent price dynamics. Landlords will try to shift costs from investments in improving the building's energy standard to tenants by increasing rents. While this cost shifting may be justified (and to some extent even necessary) to refinance the modernization works, it creates an upward pressure onto rents, which negatively influences disposable incomes and thus energy consumption and emissions. However, the complicated and relatively restrictive Austrian laws regulating the legal admissibility of rent increases may act as an obstacle to modernization investments. Overall, this loop displays a balancing effect.

The public sector, encompassing federal and state governments, plays an important role in the decarbonization of the building sector through their roles as landlords (in the case of council housing) and regulatory authorities. Various government funding and subsidy schemes, such as the domestic environmental funding scheme (*Umweltförderung im Inland, UFI*), diverse housing subsidy programs (*Wohnbauförderung*), the housing renovation offensive (*Sanierungsoffensive*), and the boiler replacement initiative (*Raus aus Öl-Bonus*), have contributed to the decline in GHG emissions within the building sector (BMK, 2023). However, it is worth noting that these programs appear to be predominantly driven by factors exogenous to the CLD presented in figure 2, particularly the increasingly stringent climate policies implemented by the EU. In the context of the rental apartment sector, only one endogenous dynamic was identified, represented by the reinforcing feedback loop (R1), which could account for the steady increase of building energy efficiency standards and the subsequent reduction in GHG emissions. The reinforcing dynamic primarily stems from landlords' profit interests, as higher energy standards can potentially justify rent increases, thereby raising landlords' profit margins. Associated with this dynamic is R2, which posits that rising rents are likely to prompt public demands for increased rent subsidies.

Loop	Loop description	Evidence discussed
B1	Higher emissions lead to increased political pressure to take climate action, amongst other things by means of creating incentives for replacing fossil-fueled heating systems with renewable heating technologies.	Legal and financial measures taken by the Austrian federal and state governments to incentivize heating system changes, and building renovation (BMK, 2023) GHG emissions from the building sector have declined over the past 20 years (Umweltbundesamt, 2021, 2019)
B2	Higher emissions lead to increased political pressure to take climate action, amongst other things by means of creating conducive legal conditions for building renovation.	
B3	Higher emissions lead to increased political pressure to take climate action, amongst other things by means of creating financial legal (e.g. via subsidies) conditions for building renovation	
B4	Increasing energy efficiency of buildings by renovation and thermal insulation is associated with displacing low income, energy poor households due to rent increases.	Displacement effects following building renovation due to increased rents have been observed in Germany (Mellwig and Pehnt, 2019) and Austria (Berger and Höttl, 2019)
B5	Displacement effects following building renovation due to increased rents have been observed in Germany (Mellwig and Pehnt, 2019) and Austria (Berger and Höttl, 2019)	Overcrowding is higher in low-income households (OECD, 2022) Average living space per person is higher in households that live in in their own house or flat (Statistik Austria, 2022)
B6	The higher the disposable income the higher overall energy consumption which induces a balancing effect on disposable income.	Income correlates negatively with the frequency of engaging in energy curtailments (Umit et al., 2019)
B7	The higher the disposable income the higher the number of energy consuming appliances, which increases total energy consumption, causing a balancing effect on disposable income.	income is a key predictor of appliance ownership (Poblete-Cazenave and Pachauri, 2021)
B8	The higher disposable income, the less frugal energy consumption behavior, which increases total energy consumption and spending, creating a balancing feedback onto disposable income.	Less well-off households adopt restrictive behaviors regarding space heating; the level of service consumed for space heating is almost double in the best well-off households compared to the least well-off (Cayla et al., 2011)

R1	Landlords may invest in building renovation to improve energy efficiency out of profit interest, as higher energy standards may justify and enable rent increases, which, ceteris paribus, also increases profit margins of rentals	Renovation strategies are at least to some extent profit-driven, as renovation justifies and enables raising rents (Mjörnell et al., 2019)
R2	Rent subsidies, as income support scheme, are assumed to increase energy consumption and emissions, which will reinforce pressures for building renovations, which will increase rents and thus public pressure for rent subsidies	No peer-reviewed evidence identified. However, Gabriel Felbermayer, head of the Austrian Institute of Economic Research, criticized the Austrian governments recent decision to raise rent subsidies instead of capping rent increases, arguing that it will further drive inflation (Putschögl and Krutzler, 2023). We take this as a basis for our assumptions underlying R2.
R3	Rising incomes lead to steadily increasing average energy efficiency of appliances, as savings may be re-invested to upgrade appliances	income correlates positively with the likelihood of buying energy efficient appliances (Umit et al., 2019) lower income households exhibit lower adoption propensity for energy-efficient technologies (Schleich, 2019)
R4	This loop assumes that rising incomes will go hand in hand with increasing space heating consumption and expenditures, which will reinforce public demand for heating allowances, which may create a reinforcing dynamic.	Haas and Biermayr (2000) provide evidence for the existence of a rebound effect for space heating in Austria. We use this evidence as a basis to assume that income support schemes like heating allowance payments will drive heating spending, which will in turn increase public pressure for raising the level of heating allowance payments.

Table 1: Loops description

Loops B5-B8 map the key dynamics influencing household energy consumption and expenditure. Multiple balancing feedback loops govern the relationship between household energy consumption and disposable income. It was deemed appropriate

to differentiate, at least to some extent, between electricity and heating/cooling energy, given that they are influenced by partially distinct dynamics. Rising incomes typically coincide with an increase in per capita living space (B5), the number of electricity-consuming appliances (B7), and overall heating/cooling energy consumption. All of these factors contribute to augmented total energy expenditure, which subsequently feeds back into disposable income. Furthermore, a balancing loop (B6) pertaining to energy-saving behaviors has been identified, indicating an increased engagement in energy-saving practices as incomes decline. A minor reinforcing loop (R3) is observed concerning the efficiency of appliances, as higher incomes often correlate with the purchase of more energy-efficient appliances. Finally, similar to the patterns described in R2, escalating heating expenses trigger public pressure to augment income support (R4). Various policies have been identified that impact heating costs (such as carbon pricing and the 'gas price brake') or electricity costs (such as the 'electricity price brake'), as well as provide income support (heating allowance payments). The so called 'electricity price brake' (*Stromkostenbremse*) was implemented by the Austrian federal government in spring 2023 in response to sharp increases in household electricity prices. The policy caps the electricity price for a defined basic contingent (BMF and BMK, 2023). A similar policy for gas prices was discussed but not implemented. The German government, however, did implement the gas price brake in December 2022 (Die Bundesregierung, 2022). We included it in the analysis to illustrate at which point it would intervene and which impacts may be expected from it. Austria also recently introduced a national carbon pricing mechanism as a part of the so called 'ecosocial tax reform act' (Parlament Österreich, 2022). The pricing mechanism is designed as a tax charged onto distributing companies, and will later be transitioned to a type of national Emissions Trading Scheme (ETS). As shown in the CLD, the policy will affect energy costs but will most likely fail to achieve a steering effect onto housing renovation and heating system exchange rates.

Discussion

Barriers for a socially just energy transition

One main barrier for accelerating the energy and heat transition in the rented apartment sector is the structural disconnect between the financial and legal means to make decisions over the heating system on the one hand, and the pressures to decarbonize heating systems and improve the energy efficiency of buildings on the other hand. Currently, the main measures aimed at speeding up the energy transition are market-based, i.e. they rely on taxing “bads” (via carbon pricing) and subsidizing goods like heat pumps, rooftop solar PV or thermal renovation works. However, while tenants incur the full additional cost caused by carbon pricing, they are not eligible to receive any of the subsidies, since they are not able to make investment decisions regarding the heating system or building envelope. In most cases, their only option to contribute to GHG mitigation and react to rising energy costs is to lower domestic energy consumption. Yet the scope of action there is severely limited, since certain minima for heat and electricity energy consumption are simply necessary for a decent living. For landlords, on the other hand, there is no direct incentive to improve the building’s energy standard or switch to lower-carbon heating systems. Essentially, these measures depend upon the landlords’ goodwill, which may explain the slow pace of building renovation and heating exchange rates. Since 2009, the overall renovation rate of buildings has declined from 2.1% to 1.4% in 2018 (Amann et al., 2020). According to most recent estimates, the renovation rate is at 1.7%, way below rates of 2.5% and more which are deemed necessary to meet Austria’s climate goals (renowave.at, 2023). This situation makes the challenge of a just energy transition in the rented apartment sector distinct and even more challenging compared to the owner-occupied housing sector or the commercial building segment, where affected actors directly benefit from subsidies and/or are affected by taxes.

This disconnect described above also explains why current policy approaches address symptoms rather than the causes underlying the problem. Increases in both rent and energy cost are

counteracted by via income support schemes (notably heating allowances and rent subsidies). However, these fail to address the underlying roots which cause the problem of energy and housing poverty. In addition, they may fail to achieve their intended purpose due to “rebound effects”, i.e. heating allowances may discourage energy efficient behaviors and lead to higher overall energy consumption. This dynamic bears resemblance to the ‘fixes that fail’ archetype, which describes situations in which interventions address symptoms rather than causes of problems, thus failing to permanently remedy the situation (Kim, 1995)

Achieving a just energy transition in the rented apartment sector becomes even more challenging due to the complicated and fragmented governance structure. As a federal state, the responsibilities and competences regarding housing policy are distributed between the federal and the state levels, which frequently leads to tensions between different government levels over legal or financial considerations, often delaying decisions. In addition, there is no unified legal framework for rented accommodations. Depending on the construction date of the building, different laws regulate the rent contract (BMSGPK, n.d.). The fragmented policy landscape in Austria is also illustrated by the fact that there is no ministry which bundles competences regarding housing. Various ministries are responsible for different aspects of housing policy, which further adds to the complexity of speeding up the energy transition in a socially just way.

Potential leverage points

We identified several leverage points for national politics to reduce the emissions as well as retaining the affordability of energy. One way to achieve this is described in loop B3 that is dealing with the renovation of objects to a possible sustainable building standard through subsidizing the costs that arise for landlords. The other, more direct way would be to set mandatory legal standards that cope with the question of the building standards itself and the cost that arise through their implementation and realization. Both ways affect the thermal renovation rate of building objects.

A third possibility is introduced as a policy by the EU, demanding a sanitization rate of 3% of building stock and by this generating opportunity costs as incentive for national legislation to legitimize measures in order to cope with the topic (BMNT, 2019).

Another opportunity is presented by the large social housing stock. There are some 276,000 council flats (*Gemeindewohnungen*) in Austria (Statistik Austria, 2022), which means that the public sector is the landlord. Given the size of this stock and the fact that energy poverty dis-proportionately affects low-income households (Wegscheider-Pichler, 2021), a large-scale thermal renovation and heating system change initiative in the council flat sector could accelerate a just energy transition in the housing sector.

Changing the overall incentive structures may represent the potentially the most powerful lever. This could, for instance, be achieved by switching from the current convention of paying rent excluding heat (*Kaltmiete*) to setting rent amounts *including* heat (*Warmmiete*). This would mean that rising energy cost would not be (exclusively) borne by tenants but also by landlords (Agora Energiewende, 2021). An important implication of such a change would be that landlords would financially benefit from switching to lower-carbon heating systems and from measures improving the energy efficiency of the building. This incentive effect would be further reinforced by carbon pricing. The effectiveness of this system can be seen in Sweden, where this policy contributed to a 85% reduction in fossil-fueled heating systems since 1990 (Klussmann, 2019).

Another example of effectively changing the incentive structure is a recent reform in Belgium. Following the reform, landlords may only adjust indexed rents if the building exhibits a relatively high energy standard (VSZ, 2023). This creates an immediate and strong incentive for landlords to invest in the building's energy standard by increasing the opportunity cost of not doing so. Transferred to the Austrian context, this could be implemented by adapting the scope of application of indexed rents to depend not only on the construction date of the building but also the energy standard.

Limitations

The CLD presented and discussed in this paper has several important limitations and caveats. Due to the complex and multifaceted nature of the (globalized) energy market and associated price buildings mechanisms were omitted from the the analysis. Instead, the focus was on the system structure which is of immediate policy relevance at the Austrian federal level. Restricting the analysis to the federal policy level represents another major limitation, since, as discussed above, Austria's housing governance is fragmented and distributed between federal and state levels. A multi-level governance perspective could yield important additional policy-relevant insights. Furthermore, the analysis did not differentiate between different (renewable) heating technologies such as heat pumps or district heating, for instance. The appropriateness, cost and emissions intensity of specific technologies strongly depends on the buildings' physical properties and the (local) energy mix; all these factors are beyond the scope of this analysis. Despite these limitations the CLD and the analysis presented in this paper can yield important insights into the general problem structure and potential ways forward.

Conclusions

This paper aimed to discuss the challenge of achieving a socially just energy transition in the rented apartment sector in Austria using CLD as a tool to map out the problem structure as well as potential leverage points. A major insight from this process is that in the current system structure, effective interventions increasing both social equity and the energy efficiency of the building stock simultaneously are very difficult to implement. The current system structure is characterized by structural inequalities and institutional inertia. One main reason for this is the complete disconnect between incentives to decarbonize and decision-making power over heating systems and energy standards in the rented apartment sector.

Against this backdrop, achieving a socially just energy transition in the residential building sector requires structural adjustments that address energy poverty and accelerate housing renovation and heating exchange rates in an integrated manner. This paper identified and briefly discussed promising leverage points, which can contribute to the transformation of the sector towards sustainability and equity.

One important leverage point relates to adjusting the incentive structure to ensure that the externalities and rising costs associated with fossil energy use are not solely borne by low-income tenants but shared more equitably between tenants, owners and landlords. This necessitates major changes in Austria's housing sector's legal framework, shifting the burden of energy transition costs from vulnerable households to those who have the financial capacity to bear them. By aligning incentives, such as implementing mechanisms that encourage energy-efficient renovations and penalize carbon-intensive heating systems, a more equitable distribution of the transition's costs can be achieved.

Furthermore, regulatory measures, including bans on and mandatory phase-outs of fossil heating systems or legally binding renovation rate targets, appear inevitable for an effective and rapid decarbonization of the housing stock. These measures would provide a clear signal to the market, encouraging the rapid adoption of lower-carbon heating technologies. By setting specific targets and deadlines for phasing out fossil fuel-based heating systems, Austria could accelerate the transition to renewable and low-carbon alternatives, thereby reducing GHG emissions from the residential building sector.

However, it is important to acknowledge that such regulatory measures must be accompanied by supportive policies and mechanisms to ensure that the transition is socially just. This includes providing financial assistance, technical support, and capacity building to support the renovation and retrofitting of buildings. Additionally, measures should be implemented to address potential social impacts, such as the increase in rental prices resulting from renovations, to prevent further exacerbation of housing affordability issues.

In conclusion, a comprehensive and transformative approach is required to foster a socially just energy transition in the residential building sector. This involves structural modifications, such as adjusting the incentive structure and implementing regulatory measures, to address energy poverty, accelerate housing renovations, and phase out fossil fuel-based heating systems. By embracing these measures, Austria can pave the way for a sustainable and equitable future, ensuring that the benefits and burdens of the energy transition are shared equitably across society.

Literature

- Abbasi, M.H., Abdullah, B., Ahmad, M.W., Rostami, A., Cullen, J., 2021.** Heat transition in the European building sector: Overview of the heat decarbonisation practices through heat pump technology. *Sustainable Energy Technologies and Assessments* 48, 101630. <https://doi.org/10.1016/j.seta.2021.101630>
- Agora Energiewende, 2021.** Ein Gebäudekonsens für Klimaneutralität. 10 Eckpunkte wie wir bezahlbaren Wohnraum und Klimaneutralität 2045 zusammen erreichen. Agora Energiewende, Berlin.
- Amann, W., Storch, A., Schieder, W., 2020.** Definition und Messung der thermisch-energetischen Sanierungsrate in Österreich. IIBW-Institut für Immobilien, Bauen und Wohnen GmbH; Umweltbundesamt GmbH, Vienna, Austria.
- Berger, T., Höltl, A., 2019.** Thermal insulation of rental residential housing: Do energy poor households benefit? A case study in Krems, Austria. *Energy Policy* 127, 341–349. <https://doi.org/10.1016/j.enpol.2018.12.018>
- BMF, BMK, 2023.** Allgemeine Informationsseite zur Stromkostenbremse [WWW Document]. oesterreich.gv.at - Österreichs digitales Amt. URL https://www.oesterreich.gv.at/themen/steuern_und_finanzen/sonstige_beihilfen_und_foerderungen/entlastungspaket/allgemeine-informationsseite.html (accessed 7.12.23).
- BMK, 2023.** Treibhausgasreduktions-Maßnahmen im Gebäudesektor Österreichs 2009-2021. Bericht des Bundes und der Länder nach Artikel 16 der Vereinbarung gemäß Artikel 15a B-VG über Maßnahmen im Gebäudesektor zum Zweck der Reduktion des Ausstoßes von Treibhausgasen (BGBl. II Nr. 213/2017). BMK, Vienna.
- BMNT, 2019.** Langfriststrategie 2050 – Österreich gemäß Verordnung (EU) 2018/1999 des Europäischen Parlaments und des Rates über das Governance-System für die Energieunion und den Klimaschutz. Bundesministerium für Nachhaltigkeit und Tourismus, Vienna.
- BMSGPK, n.d.** Anwendungsbereich des Mietrechtsgesetzes [WWW Document]. Konsumentenfragen. URL https://www.konsumentenfragen.at/konsumentenfragen/Bauen__Wohnen_und_Versorgungsleistungen/Wohnen/

- Rund_um_die_Miete/Anwendungsbereich_des_Mietrechtsgesetzes.html (accessed 7.12.23).
- Boardman, B.**, 1991. Fuel poverty: from cold homes to affordable warmth. Belhaven Press, London.
- Cabeza, L.F., Bai, Q., Bertoldi, P., Kihila, J.M., Lucena, A.F.P.**, 2022. Buildings, in: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (Eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA.
- Cabeza, L.F., Ürges-Vorsatz, D.**, 2020. The role of buildings in the energy transition in the context of the climate change challenge. *Global Transitions* 2, 257–260. <https://doi.org/10.1016/j.glt.2020.11.004>
- Cayla, J.-M., Maizi, N., Marchand, C.**, 2011. The role of income in energy consumption behaviour: Evidence from French households data. *Energy Policy, Clean Cooking Fuels and Technologies in Developing Economies* 39, 7874–7883. <https://doi.org/10.1016/j.enpol.2011.09.036>
- Die Bundesregierung**, 2022. Preisbremsen für Strom, Gas und Wärme | Bundesregierung [WWW Document]. Die Bundesregierung informiert | Startseite. URL <https://www.bundesregierung.de/breg-de/aktuelles/energiepreisbremsen-2145728> (accessed 7.12.23).
- E-Control**, 2013. Energy Poverty in Austria. Definitions and indicators. Energie-Control Austria, Vienna.
- Eurostat**, 2023. Inability to keep home adequately warm - EU-SILC survey [WWW Document]. URL https://ec.europa.eu/eurostat/databrowser/view/ILC_MDES01/default/table?lang=en (accessed 7.5.23).
- Haas, R., Biermayr, P.**, 2000. The rebound effect for space heating Empirical evidence from Austria. *Energy Policy* 28, 403–410. [https://doi.org/10.1016/S0301-4215\(00\)00023-9](https://doi.org/10.1016/S0301-4215(00)00023-9)
- Healy, N., Barry, J.**, 2017. Politicizing energy justice and energy system transitions: Fossil fuel divestment and a “just transition.” *Energy Policy* 108, 451–459. <https://doi.org/10.1016/j.enpol.2017.06.014>
- Heffron, R.J., McCauley, D.**, 2018. What is the ‘Just Transition’? *Geoforum* 88, 74–77. <https://doi.org/10.1016/j.geoforum.2017.11.016>
- Jenkins, K., McCauley, D., Heffron, R., Stephan, H., Rehner, R.**, 2016. Energy justice: A conceptual review. *Energy Research & Social Science* 11, 174–182. <https://doi.org/10.1016/j.erss.2015.10.004>
- Kim, D.H.**, 1995. Systems thinking tools: a user’s reference guide, The toolbox reprint series. Pegasus Communications, Cambridge, Mass.
- Klussmann, B.**, 2019. BEE-Briefing:CO2-Bepreisung in Schweden und der Schweiz. Bundesverband Erneuerbare Energie e.V. (BEE), Berlin.
- Lucon, O., Ürges-Vorsatz, D., Ahmed, A.Z., Akbari, H., Bertoldi, P., Cabeza, L.F.**, 2014. Buildings, in: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani,

- S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (Eds.)). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Mellwig, P., Pehnt, D.M.**, 2019. Sozialer Klimaschutz in Mietwohnungen. Kurzgutachten zur sozialen und klimagerechten Aufteilung der Kosten bei energetischer Modernisierung im Wohnungsbestand. ifeu - Institut für Energie- und Umweltforschung Heidelberg, Heidelberg.
- Mjörnell, K., Femenías, P., Annadotter, K.**, 2019. Renovation Strategies for Multi-Residential Buildings from the Record Years in Sweden—Profit-Driven or Socioeconomically Responsible? *Sustainability* 11, 6988. <https://doi.org/10.3390/su11246988>
- Newell, P., Mulvaney, D.**, 2013. The political economy of the ‘just transition’: The political economy of the ‘just transition’. *The Geographical Journal* 179, 132–140. <https://doi.org/10.1111/geoj.12008>
- OECD**, 2022. Affordable Housing Database [WWW Document]. URL <https://www.oecd.org/els/family/HC2-1-Living-space.pdf> (accessed 7.11.23).
- Parlament Österreich**, 2022. Ökosoziales Steuerreformgesetz 2022 Teil I – ÖkoStRefG 2022 Teil I | Parlament Österreich [WWW Document]. URL <https://www.parlament.gv.at/gegenstand/XXVII/I/1293> (accessed 7.12.23).
- Poblete-Cazenave, M., Pachauri, S.**, 2021. A model of energy poverty and access: Estimating household electricity demand and appliance ownership. *Energy Economics* 98, 105266. <https://doi.org/10.1016/j.eneco.2021.105266>
- Pruyt, E.**, 2013. Triple Jump towards Real-World Dynamic Complexity. TU Delft Library, Delft.
- Putschögl, M., Krutzler, D.**, 2023. 225 Millionen Euro Wohnkostenzuschuss statt Mietpreisbremse [WWW Document]. DER STANDARD. URL <https://www.derstandard.at/story/2000144759112/gezerre-um-mietpreisbremse-gruene-attackiert-oevp-verhandler> (accessed 7.12.23).
- renowave.at**, 2023. Erreichung der Klimaziele im Gebäudesektor in Gefahr [WWW Document]. OTS.at. URL https://www.ots.at/presseaussendung/OTS_20230524_OTS0071/erreichung-der-klimaziele-im-gebaudesektor-in-gefahr-bild (accessed 7.14.23).
- Schleich, J.**, 2019. Energy efficient technology adoption in low-income households in the European Union – What is the evidence? *Energy Policy* 125, 196–206. <https://doi.org/10.1016/j.enpol.2018.10.061>
- Schuessler, R.**, 2014. Energy Poverty Indicators: Conceptual Issues - Part I: The Ten-Percent-Rule and Double Median/Mean Indicators. *SSRN Journal*. <https://doi.org/10.2139/ssrn.2459404>
- Sovacool, B.K., Dworkin, M.H.**, 2015. Energy justice: Conceptual insights and practical applications. *Appl. Energy* 142, 435–444. <https://doi.org/10.1016/j.apenergy.2015.01.002>
- Statistik Austria**, 2023. Energieeinsatz der Haushalte [WWW Document]. STATISTIK AUSTRIA. URL <https://www.statistik.at/statistiken/energie-und-umwelt/energie/energieeinsatz-der-haushalte> (accessed 6.11.23).

- Statistik Austria, C.**, 2022. Wohnen 2021, Zahlen, Daten und Indikatoren der Wohnstatistik. Statistik Austria, Vienna, Austria.
- Sterman, J.**, 2000. Business dynamics: systems thinking and modeling for a complex world. Irwin/McGraw-Hill, Boston.
- Strobl, G.**, 2022. Fernwärme kommt derzeit in Wien ganz ohne Gas aus [WWW Document]. DER STANDARD. URL <https://www.derstandard.at/story/2000136760173/fernwaerme-kommt-derzeit-in-wien-ganz-ohne-gas-aus> (accessed 7.11.23).
- Umit, R., Poortinga, W., Jokinen, P., Pohjolainen, P.**, 2019. The role of income in energy efficiency and curtailment behaviours: Findings from 22 European countries. *Energy Research & Social Science* 53, 206–214. <https://doi.org/10.1016/j.erss.2019.02.025>
- Umweltbundesamt**, 2021. Klimaschutzbericht 2021 (No. REP-0816). Umweltbundesamt, Vienna, Austria.
- Umweltbundesamt**, 2019. Klimaschutzbericht 2019. Analyse der Treibhausgas-Emissionen bis 2017 (No. REP-07). Umweltbundesamt, Vienna, Austria.
- VSZ**, 2023. Indexierung der Mietpreise – VSZ [WWW Document]. URL <https://vsz.be/indexierung-der-mietpreise/> (accessed 7.10.23).
- Wegscheider-Pichler, A.**, 2021. Erweiterte Betrachtung der Energiearmut in Österreich. Statistik Austria, Vienna, Austria.
- Williams, S., Doyon, A.**, 2019. Justice in energy transitions. *Environmental Innovation and Societal Transitions* 31, 144–153. <https://doi.org/10.1016/j.eist.2018.12.001>

Renewable Energy in East Germany: New and Old Dynamics of Land and Value Grabbing

Abstract: The east German new federal states are considered a key region for the German energy transition, via implementation of wind and large-scale solar energy. The increased demand for suitable land is met with debates about land grabbing, historical transformation processes in the agricultural sector and inequalities between east and west. This paper contributes to the debate on inequalities in the energy transition in the global north, by exploring the role of rent and its uneven distribution. As lease models are utilized within these projects, rent is placed at the centre of the analysis, by leaning on the concept of value grabbing. This opens up rentier ship as a social relation and expansion of capitalist relation through rent as a complementary analysis in the current land grabbing discourse. Methodically the analysis is informed by qualitative interviews with industry actors on one side and literature on the other. The results show that rent relations are impacted by historical transformations and lead to current struggles over rent as well as ownership titles, which influence the renewable projects and lead to exclusion of local farmers from rent relations. The state influences rental relationships, especially at national and municipal level. National liberalisation and agricultural policies favour financialization processes on the one hand. On the other hand, the law on renewable energies influences and controls the dynamics of land use. Local governments are involved in rental relationships and can benefit from them through current regulations. Further studies may focus on this in the social dimension of rent and the influence on rent relationships and land owners as well as farmers perspective on renewable energy projects.

Key words: East Germany, energy transition, solar PV, value grabbing, land grabbing

¹ Jan Van Heek wrote this article under the supervision of prof. dr. Rose Lehmann.

Introduction

The German energy transition, also referred to as the *Energiewende* pursues a long term sustainable overhaul of the national energy system. With the phase out of nuclear energy in 2023 and upcoming phase out of coal in 2038 the focus shifts towards renewable resources such as wind and solar energy (Bridge 2018). The transformation of the energy systems entails far ranging spatial and socio-technical reconfigurations, due to shifting energy demands and physical properties of renewables such as wind or solar energy (Bridge 2018). Large scale free area photovoltaic and wind energy are key components within this transformation and surrounded by a debate of land use conflicts and suitable sites. The new federal states (NFS) in east Germany have been ascribed a key role in these ambitions and have seen a rush for land during large scale expansion of wind and free area solar photovoltaic (PV) parks in recent years (Pape and Geiger 2023). These dynamics however, are further steering ambers of ongoing debates on German east-west inequalities and land grabbing in the agricultural sector. Nowadays, with the reunification and industrialisation, the comparatively weak rural economy shows comparatively higher unemployment rates of 9.4% in eastern Germany than West Germany (6.2%) as of in 2016, increased peripheralization, rural-urban migration and loss of infrastructure (Bunkus and Theesfeld 2018). The inequalities are further embedded in structural change in agriculture through financialization and policy. Bunkus and Theesfeld (2018: 7) define these as long-term transformations of structures such as the organisation and size of farms, employment in the sector as well as structurally-induced changes in land use patterns. Land grabbing in east Germany presents a special case. After reunification, socialist land structures interact with privatisation policies and high pressure to adapt to capitalism, which have enabled a first of land grabs in the 1990s (Bunkus and Theesfeld 2018). The dynamics have seen accentuation, since further market oriented policies as well as multiple crises, such as the 2008 financial crisis as well as

the climate and energy crisis. Within Europe, particularly in the eastern European states, similar dynamics can be described, with types of international investors and an international run for green growth and finance as well as development of renewable energy (Palšová et al. 2021; van der Ploeg et al. 2015).

The discourse around solar PV parks, differs from the former iterations of land grabbing, due to the unique social dimension of the energy transition (Miller et al. 2013). Comparatively few areas are suited for project development, increasing the demand. Factors restricting these are physical as well as social, such as legal frameworks on several scales, territorial restrictions such as nature conservation areas, making these technologies highly contested. While investments into agriculture entail the takeover of farms and purchases of land, renewable energy projects are often times based on long term lease contracts between the energy company and land lord, hence evoking conflicts around land relations.

While definitely categorising the current structural processes in the German energy transition it beyond the scope of this paper the overreaching goal is to contribute to debate on inequalities in the energy transition in the context of the global north, by exploring the role of rent and it's uneven distribution in the solar PV sector. I lean on the notion of value grabbing by Andreucci et al. (2017) to analyse the expansion of capitalist relation through rent as a complementary analysis in the current land grabbing discourse. As institution of property rights are viewed as central, not just in the reproduction of new commodities but also in the valorisation through land relation, I focus on struggles for the distribution on rent as well as the creation of property titles during past structural changes. Empirically the analysis is informed by interviews from industry actors and literature analysis. Here the NFS present an interesting case, as the agricultural sector has a historical large lease ratio and highly contest rent relations. These expansions of capitals relations are particularly important to observe, as inequalities and their historical origins play a role in the wider current debate around political development, which tends to be overlooked in the narrative of the *Energiewende* as success

story. Secondly, dynamics of large scale appropriation of land have been predominantly analysed in the context of the global south. As the global land rush occurs within the global north as well, with dynamics being recognised for instance in Germany or eastern Europe, they are important to understand (Palšová et al. 2021). Going further, structural inequalities play a crucial role in the wide political debate in Germany around structural inequalities, in NFS, their historical roots and the current connected political development.

The concept of value grabbing

The land grabbing literature covers a wide variety of land uses, which can be separated in the following types. Firstly landgrabs related to agriculture and the food sector, secondly the water grabbing and lastly green grabbing, processes within an environmental conservation or sustainability contextualisation (Borras et al. 2012). The latter category includes processes such as renewable energy projects, biodiversity conservation projects or the bioeconomy which are distinct by a sustainability agenda and framing as a core driver and discursive implementation strategy (Fairhead et al. 2012). A wide range of research covers the global land rush, with focus on the global south in the context of global inequalities within north – south relations or south-south relation, in particular under Chinese involvement. As inequalities manifest globally across different scales, further studies examine large scale land acquisition and ownership concentrations within the global north, for instance in the context of bio fuels or forest conservation projects within eastern Europe (van der Ploeg et al. 2015). Harvey (2004) describes four possible ways of capital expansion: 1) New resources are discovered and hence claimed, leading to establishment of property rights and integration into valorisation 2) Labor is transferred from non-capitalization into production and reproduction via problematization 3) Financial processes over different scales such as debt or trade lead to expropriation of assets 4) Commodities are socially constructed

as socio-ecological assets and integrated into private property regimes (Harvey 2004).

The idea of *grabbing* is used to underline to appropriation of resources, which has been point of interest of political ecology and political ecology. Marxist theories of primitive accumulation and Rosa Luxemburg's works on imperialism have been extended by David Harvey conceptualisation of Accumulation by disposition (Harvey 2004). This broadly describes a "combined process of enforcing the establishment of exclusive private property relations to assets that were previously not inserted within social relations of ownership and nonownership" (Andreucci et al. 2017). As he argues, this represents a further continuation of neoliberal accumulation, resulting in the further enclosure of public capital and exacerbation of inequalities (Fairhead et al. 2012). The concept of accumulation by disposition has been widely used and proven to be a powerful tool to analyse power struggle over property rights, the expansion of capital circulation and how spatial fixes to capitalist crisis are facilitated to enclose new spaces of production as well as consumption (McCarthy 2015). With neoliberalism as a entrenching theme within global inequalities, a lot of focus has been shifted towards processes of privatisation and financialization of nature as well as it's governance. Despite its merits, the concept is criticised to be more descriptive then analytical as well as indifferent towards different forms and heterogeneity of appropriation (Schutter 2011).

Andreucci et al. (2017) argue, that the analysis of capital circulation, e.g. financial, productive capital or land fails to sufficiently capture the social relation between the asset owner and the productive capital. As capitalist production necessitates prior institutionalization, regulation and enforcement of property rights, they foreground the notion of rent and it's social dimension. Thereby a geographical analysis on rent allows to specify socio-economic inequalities and power dynamics (Andreucci et al. 2017). Critical approaches on economic rent offer several different conceptualisations (see Birch and Ward 2023), which are informed by Marxist theory. Herby "rentiership is understood as

a particular class position defined by its relationship to surplus value extraction” (Birch and Ward 2023: 3). Rent can be described as a surplus from capitalist production as well as a mechanism that serves not as production but redistribution of capital (Birch and Ward 2023). Firstly, spatial heterogeneity rent generation influences the allocation of production, the spending capabilities of consumers and hence the financial circuits. Secondly rent represents a social relation between the land owner and the one who wants to vaporize the land, leading to relationship between rentier capital and productive capital show to be complex. The compensation demanded depends on the owner opportunity costs and the perceived value, posing a obstruction of capital expansion with increasement (Andreucci et al. 2017). Swyngedouw and Ward (2022) suggest the institution of property rights as political processes, under involvement by the state, corporations and civil society in complex relation with land owners. This process of land mobilization is to be understood as highly contest – socially, culturally or ecologically - and potential entry point for capital circulation and the valorisation of nature. The significant role of the state can also observed, with rent viewed as a historical and social space ordering processes (Alonso Serna 2022).

The notion of value grabbing, coined by Andreucci et al. (2017) refer to “the inter-and intra-class struggles around property regimes and asset ownership that unfold as part of the conflicts over the appropriation and distribution of rents” (Andreucci et al. 2017: 4) and serves as an understanding of rent as social relation complementary towards Harvey’s accumulation by disposition. Andreucci et al. (2017) to rent as pseudo commodities, to reflect that property titles and land ownership have no inherent value but generate exchange value and surplus generated to rent relations. They present two analytical entry points towards socio-ecological conflicts and struggles over appropriation and distribution of value. The first lies with conflicts leading to inter capitalist struggles, which may or may not be articulated as rent centred, as class struggles over redistribution of value enabled by rent relations. The second focuses on pseudo-commodification in form of struggles over the

creation of property right. This encompasses for instance the enclosure of land and resources as well as the struggle for public assets such as genetic material, appropriation of knowledge or state-owned property (Andreucci et al. 2017; Felli 2014).

The state is placed as a key actor within their analysis on value grabbing. Firstly, the state provides property rights and institutions that allow rent extractions and therefore facilitates the conditions for value grabbing. Secondly, it functions regulatorily by the distribution of titles, laws and intuitions around debt and rent as well as spatial planning and land development strategies or agendas. Thirdly, the state itself can act as an owner of land or resource and thereby influence control over infrastructure, land and financial flows over land and resources as an owner itself can act as the owner of land and resources (Andreucci et al. 2017). Critical approaches enrich these function by the notion of the rentier state; which assume the an erosion of social and economic development policies by neoliberal and elitist ideals, in favour of capitalist accumulation (Birch and Ward 2023). With these multiple roles, the state organizes control over land ownership and economic dynamics as well as simultaneously influences rentier dynamics including the appropriation and extraction of rents (Andreucci et al. 2017).

In this paper, I focus on rent-relations as part of the energy transition in the NFS. While land grabbing dynamics in the new federal state have been described previously (Brunner 2019), the understanding of value grabbing opens up the analysis over the contested leases around solar and wind energy projects and the role of the state as enabler, by historical land organization policies on one side and current encouragement through decarbonisation policies on the other (Pape and Geiger 2023; Tietz 2015).

Methodical approach

The study is based on literature analysis and qualitative interviews. Firstly a literature Analysis was conducted to inform the structure of land ownership and rent relations within Germany as well as processes on the energy transition. Secondly two nar-

rative qualitative interviews with acquisitionists were held, two complement the results of the literature analysis. Herby the focus lies on the professional function and experience. This knowledge is assumed to be representative towards a certain group and should give insights into occurring processes within the German renewable energy sector (Reuber 2013). Acquisitionists play a key role in the development of renewable energy projects and leasing the required land. While the interpretation of the role between organizations can vary, the main task consists of convincing the landholder to enter the lease of the land and to take part or lead talks with local governments. As they usually don't make decisions on the operational level, they are part of the construction of rent as well work closely to the state as a central actor, thereby they play a key role in the contest negotiation of rent contracts and can act as a mediator between conflicting actors. As part of the value chain, it has to be acknowledged, that the business model also largely benefits from the lease of energy project and the surplus generated by rent relations.

The scope of the interviews is clearly defined and limited towards the professional experience, yet they have to be acknowledged as subjective and influenced by other experiences, which can influence their statements. In general multiple interviews should be conducted, to adequately represent the frame of reference (Reuber 2013). The interview partners for this study work in the federal states of Sachsen Anhalt as well as Brandenburg, primarily in the free area PV sectors and additionally in the in Wind energy industry as well as large scale battery storage projects. The company is situated in western Germany and functions as a service for land acquisition nationwide as well as geospatial analysis and sustainability consulting, for different German national, European and global private customers as well as local governments. The focus on the interview lies on rent relations, related conflicts and the role of the state. As common within the industry, both participants are subjected to non-disclosure agreements in their work contracts. Therefore, several parts were deleted upon request.

Structural changes during the GBR and post reunification

The ownership structure of the NFS is shaped by a multitude of political processes and socio-economic changes, still crucial to contemporary property rights and rent relations (Schöne 2005). This can be broadly categorized into three historical phases. Firstly the policies and changes during the German Democratic Republic (GDR) from 1945 to 1980. Secondly the unification period from 1989/1990 and lastly privatisation policies around 2007, which are connected to land grabbing dynamics by western investors (Jaster and Filler 2003).

The overall ownership structure in Germany before the WWII can be described as heterogenous, consisting of smaller families farm predominantly in the western and southern parts and larger farms in northern-eastern parts (Schöne 2005). Justified by denazification, land reforms in the GDR between 1945 and 1952 led to expropriation of around 2.5 Million acres without any compensation, of farms larger than 100 acres and several smaller ones (Rothe and Lissitsa 2005). While the sector represented a major labour market, productivity remained relatively low. Forced collectivization during following years till 1960 transformed the sector in its entirety and led to average farm sizes of 4.000 to 5.000 acres (Rothe and Lissitsa 2005). Under protest by farmers and rural civil society, individual farms were transformed into collectives, called agriculture production collective (*LPG, ger. Landwirtschaftliche Produktionsgenossenschaft*). They vary by degree of private property and expropriation, however the decision-making power were withdrawn from all private farms, while ownership stayed with former farmers. This was further accelerated by the migration of profitable farmers to west Germany and structural weakness in rural areas (Schöne 2005).

The inclusion into the institutions of the republic and simultaneously EU showed wide ranging consequences in the agrarian sector and societal structures in rural areas. The reforms were intended to make the sector more environmentally frien-

dly, market-oriented and thus competitive. The transformation of collective and state property into private property as well as institutional decoupling from the state played a central role. The processes were characterized by conflicts over property titles and capital distributions, political struggles, as well as faulty, transparent and unprecise legal framework (Rothe and Lissitsa 2005). As well as influenced by lack of transparency and experience with market oriented capitalism (Schöne 2005). In particular, cooperative boards exploited their position of power to profit in the distribution of capital and property rights. Although the legal form could be freely chosen, the cooperatives survived structurally and benefited from privatisation policy. Despite political promotion, the establishment of small family businesses failed to materialize due to a lack of economies of scale and an ideal towards large-scale farms. Instead former structures persisted, with LPG survived as registered cooperatives or cooperations and furthering their political influence and accumulating further capital or lease contracts (Brunner 2019).

Reforms included rapid liberalisation of the land market. The German Land Administration and Privatization Agency (BVVG, ger. *Bodenverwertungs- und -verwaltungs GmbH*) was established to privatise state property over time and showed to be highly influential on land and lease price building. Land prices below market values and compensation policies benefiting mostly former LPGs held prices on a relatively low level, despite the same legal conditions as in the old federal states. At the same time, the lease ratio, at around 97.7% in 1997, remained, due to low levels of liquidity or capital in the farms, of which most was bound in labour or machines and long term releases by the BVVG (Jaster and Filler 2003). Comparatively low land prices, high shares of legal entities²¹ instead of natural persons and large land parcels led to an increased amount of investments in the form of entire farm take overs from the old federal states, mostly targeting former

² With 'legal entities' the German *juristische* Person is described, which includes limited liability- or stock companies or collectives, referring to public law as well as civil law (Bunkus and Theesfeld 2018).

GDR LPGs (Rothe and Lissitsa 2005). Therefore Brunner (2019) describes these Land grabbing processes as *farm grabbing*. Here, investors come from the agriculture or related sector as well distant industries or private-equity-fonds. The takeover via share deals allows the conversion from collectives into cooperations and excludes employees from the decisions processes. Thereby all property titles, all forms of capitals as well as lease contracts are kept in the cooperation and simultaneously legal status as agricultural farm (Brunner 2019). This first cycle of investments and reorganisation resulted in 57% of the area leased by legal person, 30% by farmers re-entering the sector and 30% by newly established frames (Rothe and Lissitsa 2005).

The second cycle of land grabbing is by multiple further factors, next to the established privatisation policy, further enforcing unequal property and rent structures (see table 1). Estimates from 2017 show a 34% share of legal entities with investors (Rothe and Lissitsa 2005). Led by EU policy, the BVVG levelled the price policy towards market conditions and thereby increasing the need for liquidity for farms. In addition, the framework conditions that making investments profitable and enhancing economics of scale profitable only exist due to EU and state subsidies. On the one hand, EU subsidies established in 2003 are awarded by hectare, regardless of land-use and social context. On the other hand, the Renewable Energy Law (EEG, ger. Erneuerbare Energien Gesetz) of 2000 and promotion of bio-fuels with long term long-term acceptance guarantees increases the attractiveness of investments, if the high investment requirements were met (Brunner 2019). The following demand for stable investments resulting from the 2008 economic crisis was then met by the previously developed conditions in the land market as well as overall structural weakness in the sector. Small farms and shareholders of cooperatives are faced with a change of generations without successors, rising land prices and hence, the need to sell (Brunner 2019).

Type of Farm	Total	Share %	Area (hectar)	Share %	Hectar/farm (FDS)	Hectar/farm (west Germany)
No. farms	24.660	100	5.520.094	100	224	44
Nat. persons	20.990	85,1	2.750.094	49,8	131	44
Legal entities, priv.	3.626	14,7	2.764.792	50,1	762	56
Legal entities, public	44	0,3	5.208	0,1	118	94

Table 1: Size structure of agricultural holdings in eastern Germany, as of 2016 (Brunner 2019: 3)

Rent relations in free area solar PV projects

Both interviews show experiences with legal entities, land owners, farmers and local governance. Depending on lease arrangements radiation input and other site specific factors, solar PV leases offer annual payments of 2.000 and 5.000 Euro (Interview 02), drastically exceeding annual lease rates and agricultural profitability, regardless of agricultural soil quality. This rates, play unsurprisingly a key role in rental agreements, for every type of land owner alike (Interview 1, Interview 2). This general positive perception of the projects, may also be increased by the overall political condition of the German energy transition. Interestingly, interview 1 states that land owner have entered a lease agreement due to the financial incentive, despite contrary political believes (Interview 1).

While agriculture presents a profitable sector, these fixed rates appear particularly financially attractive to farmers operating on smaller scales, impacted by yield variants, e.g. due to drought or socio-economic factors (Interview 2). This is exacerbated by the structural weakness in the sector, due to unprofitable farms and lack of expert staff in the rural regions. Particularly land owners farms lacking successor during generational shift, see the lease as opportunity to profit from the land without a definitive sale

(Interview 2). Free area PV parks have neither maximum nor minimum size, but become more profitable with scale. Still, most projects have a minimum size to reach profitability, depending on site factors, such radiation, terrain and local infrastructure (Interview 2). Hence, a land owner refusing to enter a lease agreement may result in project failure. Thus, land owners or farmers may use local influence to promote or hinder the project. Firstly, these power dynamics are concentrated by the relative property size of a land owner, as the projects depends on the agreement (Interview 2). Secondly, local social relations play an important role. Land owners may promote the projects to profit, by convincing others. As wells as farmers, not owning their land have used their influenced to stop other local land lord from entering the lease, to stop their own exclusion (Interview 2). Moreover, interview 1 reveals a case, of a land lord, who possess a smaller land portion, yet threatened a project using his social influences, if his financial demands, described as extraordinary, were not met (Interview 1).

Conflicts for rent distribution arise between land owners on one side and farmers on the other side. Here, the interview shows differences in the negotiation positions and connected power dynamics, between collectivises or other large scale farms and small holder land lords. Interview 1 describes, several occasions of land being withdrawn from ongoing leases, to profit from renewable energy projects, in part under protest from the leasing farmers. To do so, land lords may limit the lease towards two years or have found legal ways of exclusion, which weren't specified (Interview 1). A compromise accepted by some farmers consists of green keeping agreements of the PV-facility between the farmer and project developer, with an annual incentive of around 1.000€ (Interview 1). Moreover conflicts over property are influenced by incentives for land lords, its perception and economic importance of the farmers. Conflicts arise particularly over high land with high quality climatic and soil conditions, proximity towards the farm facilities, accessibility as well as scalar operational importance (Interview 1, Interview 2).

While the monetary incentives appeal to all types of land owners alike, the interviews reveal differences between the ones

living in the new and old federal states. Here, their experience relates to land owners who inherited land - land that was either purchased or reinstated by the BVVG or land owner using land as an investment strategy. On one side, these owners are mostly detached from the local social context and power dynamics. On the other side, they appear a different personal relation towards the land (Interview 1). While not being able to specify, interview partner 1 describes a certain rural *Brandenburger mentality*, which land lords in old federal states lack and interview partner 2 describes a certain connectedness towards land agriculture, that was reflected in local landowners negotiations and would influence the rent agreements (Interview 1). A further common strategy employed by legal entities and natural persons, consist of stressing the current demand for renewable energy and necessary areas, thereby leveraging their negation position as well as power dynamics. Relations with collectives and corporations are described as more pragmatic, viewing solar PV parks foremost as an economic opportunity, if adequate financial incentive was offered (Interview 1). Several collectives and corporations have expressed and leveraged their confidence in being able to develop their own projects, due to political influence, institutional capacities and capital. It's stressed, that farms operating on large scale, don't view areas needed for PV projects as big enough to be viewed as decisive in their operations. Which was expressed in patience during negotiations as well as lack of overall interest. Also, they have taken advantage of their local political influence and scale in negotiations as well as their capacity to uphold lease deals (Interview 1).

Governance processes across all scales impact rent relations in the development of free area PV, with the communal, national and EU governance level being important themes during the interviews. Planning sovereignty for solar PV parks lies with local governments. This makes them a key factor in the struggle for rent, for project developers as well as land lords (Interview 2). Local governments may limit or promote the development of new parks and define areas for development. Whereby, however, they are subject to superior planning specifications (Interview

1). Local government can continue to benefit directly from PV projects of increasing size. The EEG allows a fixed participation of 0.2 cents per kwh, which can amount to 1.600€ per acre annually, which seems to be particularly imported in economic weak regions (Interview 1). Eligible areas of the subsidies allow for secure financial planning, which is reflected in the rents and the demand for the corresponding areas and thus around conflicts. These include so-called disadvantaged areas, such as areas along railroads and highways or concession areas from open-cast mining. Projects outside are operated through power-purchase agreements, which are more strongly influenced by the energy price and its political framework (Interview 2). In addition, land areas negatively impacted by changes in European subsidies and environmental protection law, hence influencing the perspective of farmers and landlords in favour of renewable energies (Interview 2). Going further, relatively large land parcels and areas owned by a single or few land lords, simplifying lease negotiation and development processes, with fewer actors involved and simultaneously putting the land lords in advantages positions. Still, these structures make the FD particularly attractive for large scale project development. (Interview 1).

Discussion

By viewing rent as social relations, the perspective of value grabbing allows an complementary understanding in addition to disposition by accumulation (Andreucci et al. 2017). The social dimension of rent between asset owner and tenant in the NFS becomes evident in the obstruction of capital circulation through private and exclusive ownership (Swyngedouw and Ward 2022). Land owners have applied strategies, to advance their own financial surplus and risked the failure of the project. These strategies in return are enabled by the political ways, land is made *eligible* and *valuable* for the development of PV-parks. Furthermore, the roles of land owners and tenants are constantly evolving (Andreucci et al. 2017). Collectives and investors have benefited from financi-

alization of land through the purchase of land and farms or long term leases. On the one hand, the stakeholders now act as lessors vis-à-vis project developers or prevent the capital circulation in the energy transition through assertion of their own interests.

Going back to the theoretical question towards the key actors in land value problems, the state acts as a creator of property titles, regulator and land owner in the rent relations in the east German energy transition (Andreucci et al. 2017). The creation of property titles, which establish rent relations become evident in the multiple transformations of owner-ship structures. Firstly during the GDR towards collectivisation and secondly towards privatisation. Both of these are driven by different political agenda, but have led to the further manifestation of large scale agricultural organisations and their institutional capacities. These structures have enabled large scale land acquisitions as well manifested inequalities and led to concentration of power, that impact rent relation of the current rush for renewable energy development. Going further, power dynamics are impacted to the spatial organisation of land parcels, facilitated by the state. The historical development large parcels (see Brunner 2019) enable the land owner a decisive position in the development in of solar PV parks on one side and influences the acquisition and development process on the other.

Underlined by Halia's (2016) notion of the *property state* the role of the state in the mobilization of rent becomes evident through the BVVG as instrument of privatisation policies (Swyngedouw and Ward 2022). Historically prior land acquisition cycles have been enabled by the conditions of long term leases, their price policies and collectives as beneficiaries as well as market condition sales in the mid 2000's. The BVVG strategies around solar and wind energy projects however are still highly debated and not yet approved. Thus land is withheld from the financialization of through these energy sources and enabling capital circulation through other land uses, such as bio-fuels or agriculture. Hence the BVVG has functioned as a creator of property rights as well as a key actor in the struggle for rent distribution (Andreucci et al. 2017).

The state acts on several regulatory levels, of which the national and communal level as well as European governance have been dominant in the interviews. European policy influences rent relations by restricting the profitability of conflicting land uses and hence making the leases to solar-PV projects more desirable. The EEG in return encourages these projects on a national level. This not only influences the surrounding political framework but also which areas are prone to financialization due to more reliable financial conditions and simplification of planning processes. Local or communal governments take a special role in rent relations. Firstly, they act as the final regulatory body, permitting or obstructing rent relations. Secondly, they directly benefit from financialization, via a national fixed participation clause. This influence in rent relations put them in a key position in the struggle for rent distribution, making a relationship towards them is an important factor in accumulation strategies of land lords and project developers. Here, these are particularly influenced through historically development political connections to collectives, who benefitting from power concentrations.

The struggle for rent distribution can be observed in previously mentioned social dimension of rent, as land lords use mobilize strategies to create a larger financial surplus (Andreucci et al. 2017; Alonso Serna 2022). The struggle can be observed amidst conflicts between land lords and farmers, which are embedded in the structurally large ratio of leased agricultural land. Lease rates for agriculture lie at 375€ for field and 185€ for green land are far exceeded by rents offered by renewable projects (Statistisches Bundesamt 2021). Here, rent relations lead to exclusion of farmers and thus further increasement of inequalities. Going further, the conflicts are solved through financial incentive furthering the capital circulation. Lastly the struggle is influenced by prior land acquisitions and west-east inequalities. Here land owners residing in west Germany view rent relations through a culturally different lens. While all owners show a pragmatic capitalist perspective on property, owner residing in the respective area show a cultural attachment towards the land.

As described by Swyngedouw and Ward (2022) rent relations have enabled the accelerating financialization of rent-based returns and thereby the further manifestation of inequalities. For the case of the NFS one cycle of land transformation such as collectivisation and privations in the GDR, after reunification and in the mid 2000's have further impacted inequalities within the NFS as well as west-east German inequalities, while at the same time setting condition for further financialization (Brunner 2019). In the NFS these can be observed by on the base of structural weakness in the agriculture sector, distribution of wealth or capital and migration towards west Germany (Bunkus and Theesfeld 2018). Going further, these issues also function as an enabler for rent relation in the case of renewables. Firstly, they outreach historically low profit margins of the agriculture by large sums. Secondly, they are favoured by generational changes without successors and labour shortages. Third, they represent a valuable opportunity for communal governments with shrinking industries that rely on additional the revenue (Brunner 2019).

Besides literature analysis, this term-paper was informed empirically by qualitative interviews, which are to be discussed in a reflective manner. Approaches using qualitative interviews benefit with a larger number of interview partners, since they are based on subjective experience (Reuber 2013). As two interview partners represent a rather low amount, it as has be assumed, that more interviews would deliver different as well as more reliable results. Moreover it's important to acknowledge that the two interviewed persons personally gain from rent relations and have been bind be a non-disclosure agreement. Thus it may be assumed that they have withheld information. Interviewing different actors such as land lords or excluded farmers may help to verify and diversify the results (Brunner 2019; Reuber 2013). Acquisitionist were chosen as interview partner, as the function as a mediator in rent relations and thus overall several aspects of the research interest. However choosing different types of partners such as, land lords, farmers or cooperatives may yield deeper insights into specific aspects. In particular the topic of

cooperatives and investors fell short, due to the non-disclosure agreements and could be advanced through further studies. Also, the interviews were conducted via video and audio only calls. It's to be assumed that a face-to-face interaction could have yielded better dialog (O'Malley et al. 1996).

Conclusion

The development of renewable energy has generated a new perception on agricultural land in east Germany, which was already highly political contested. The literature has understood past land transformation as land grabbing, a concept that is employed by the wider public discourse toward renewable energy (Kreysler 2023). I argue that the expansion of solar PV parks is not only about land grabbing, but also the circulations of capital and distribution via rent relations as well as struggle over property. In these dynamics of value grabbing, the production of rent and the appropriation by landowners have become a key mechanism in the transformation of land ownership and social struggle for land. The ownership structure and access to land has been transformed by ongoing, wide ranging structural changes. Land owners employ their own strategies for capital accumulation and hence influencing rent relations, which emphasize the social dimension of rent. The struggle for rent leads to further accentuation of inequalities which can be seen by the exclusion of farmers in favour of renewable projects. Here the capitalists' logic towards is employed by several types of actors. This becomes even more evident, with conflict solutions based on financial incentives. The state should be viewed as a key actor, with governance frameworks across multiple scales, that regulate rent relations and grant legitimacy to property structures. In the German context, particularly local governments are embedded in the struggle for rent. The structural weakness and inequalities in the rural region appear as a reoccurring mechanism as externality as well as enabler of value grabbing. Several further research directives can be derived from this term-papers results, as well as its short-

tcomings. Owning farm land encompasses a social dimension and emotional ties to the land (Bunkus and Theesfeld 2018), as showed by the Brandenburger mentality in the interviews.

Further studies may focus on this in the social dimension of rent and the influence on rent relationships and land owners as well as farmers perspective on renewable energy projects. Focusing further on actors negatively impacted by the energy transition, the focus could be shifted to protest movement, alternative solutions towards energy development and energy justice (see Becker et al. 2020, McCauley and Heffron 2018). Legal entities, in such as collectives and resulting corporations, present key stakeholders. The literature and interview show that the concentrations of power connected to them. With closer examination of these actors, further studies could examine their influence on the current dynamics in the energy transition and further the understanding of power concentrations (Palšová et al. 2021). Past land grabbing processes have been proven to increase land prices. Further analysis should statistically quantify the economic impact of renewable energy projects on the land market, as they could increase dynamics of inequalities. Further studies also may examine differences and commonalities, as well a risk of these dynamics, to further understand rentiership in green grabbing and derive policies to prevent negative consequences.

Literature

- Alonso Serna, Lourdes** (2022): Land grabbing or value grabbing? Land rent and wind energy in the Isthmus of Tehuantepec, Oaxaca. In *Competition & Change* 26 (3-4), pp. 487–503. DOI: 10.1177/10245294211018966.
- Andreucci, Diego; García-Lamarca, Melissa; Wedekind, Jonah; Swyngedouw, Erik** (2017): “Value Grabbing”: A Political Ecology of Rent. In *Capitalism Nature Socialism* 28 (3), pp. 28–47. DOI: 10.1080/10455752.2016.1278027.
- Becker, Sören; Angel, James; Naumann, Matthias** (2020): Energy democracy as the right to the city: Urban energy struggles in Berlin and London. In *Environ Plan A* 52 (6), pp. 1093–1111. DOI: 10.1177/0308518X19881164.
- Birch, Kean; Ward, Callum** (2023): Introduction: Critical approaches to rentiership. In

- Environ Plan A*, 0308518X2311623. DOI: 10.1177/0308518X231162363.
- Borras, Saturnino M.; Franco, Jennifer C.; Gómez, Sergio; Kay, Cristóbal; Spoor, Max** (2012): Land grabbing in Latin America and the Caribbean. In *The Journal of Peasant Studies* 39 (3–4), pp. 845–872. DOI: 10.1080/03066150.2012.679931.
- Bridge, Gavin** (2018): The map is not the territory: A sympathetic critique of energy research's spatial turn. In *Energy Research & Social Science* 36, pp. 11–20. DOI: 10.1016/j.erss.2017.09.033.
- Brunner, Jan** (2019): Land Grabbing in Ostdeutschland: Ursachen, Auswirkungen, Widerstand. GLOCON Country Report, No. 3, Berlin, Berlin, <https://doi.org/10.17169/refubium-2772>.
- Bunkus, Ramona; Theesfeld, Insa** (2018): Land Grabbing in Europe? Socio-Cultural Externalities of Large-Scale Land Acquisitions in East Germany. In *Land* 7 (3), p. 98. DOI: 10.3390/land7030098.
- Fairhead, James; Leach, Melissa; Scoones, Ian** (2012): Green Grabbing: a new appropriation of nature? In *The Journal of Peasant Studies* 39 (2), pp. 237–261. DOI: 10.1080/03066150.2012.671770.
- Felli, Romain** (2014): On Climate Rent. In *Historical Materialism* 22 (3–4), pp. 251–280. DOI: 10.1163/1569206X-12341368.
- Haila, Anne** (2016): Urban land rent. Singapore as a property state. Chichester, West Sussex, UK: Wiley Blackwell (Studies in Urban and Social Change).
- Harvey, David** (2004): The 'New' Imperialism: Accumulation by Dispossession. David Harvey. In *The Socialist Register: The new Imperial Challenge* (40).
- Jaster, Karl; Filler, Gunther** (2003): Umgestaltung der Landwirtschaft in Ostdeutschland. Edited by Humboldt-Universität zu Berlin, Wirtschafts- und Sozialwissenschaften an der Landwirtschaftlich-Gärtnerischen Fakultät. Berlin (Working Paper No. 68/2003).
- Kreysler, Peter** (2023): Erneuerbare Energien. Kampf ums Ackerland. Edited by Tagesschau. Arbeitsgemeinschaft der öffentlich-rechtlichen Rundfunkanstalten der Bundesrepublik Deutschland. Available online at <https://www.tagesschau.de/wirtschaft/technologie/solar-landwirtschaft-ackerland-100.html>, updated on 6/5/2023, checked on 8/15/2023.
- McCarthy, James** (2015): A socioecological fix to capitalist crisis and climate change? The possibilities and limits of renewable energy. In *Environ Plan A* 47 (12), pp. 2485–2502. DOI: 10.1177/0308518X15602491.
- McCauley, Darren; Heffron, Raphael** (2018): Just transition: Integrating climate, energy and environmental justice. In *Energy Policy* 119, pp. 1–7. DOI: 10.1016/j.enpol.2018.04.014.
- Miller, Clark A.; Iles, Alastair; Jones, Christopher F.** (2013): The Social Dimensions of Energy Transitions. In *Science as Culture* 22 (2), pp. 135–148. DOI: 10.1080/09505431.2013.786989.
- O'Malley, Claire; Langton, Steve; Anderson, Anne; Doherty-Sneddon, Gwyneth; Bruce, Vicki** (1996): Comparison of face-to-face and video-mediated interaction. In *Interacting with Computers* 8 (2), pp. 177–192. DOI: 10.1016/0953-5438(96)01027-2.

- Palšová, Lucia; Bandlerová, Anna; Machničová, Zina** (2021): Land Concentration and Land Grabbing Processes—Evidence from Slovakia. In *Land* 10 (8), p. 873. DOI: 10.3390/land10080873.
- Pape, Carsten; Geiger, David** (2023): Regionalisierung des Ausbaus der Erneuerbaren Energien. Fraunhofer-Institut für Energiewirtschaft und Energiesystemtechnik IEE. Kassel.
- Reuber, Paul** (2013): Methoden der empirischen Humangeographie: Westermann Schulbuch.
- Rothe, Andrea; Lissitsa, Alexej** (2005): Der Ostdeutsche Agrarsektor im Transformationsprozess - Ausgangssituation, Entwicklung und Problembereiche.
- Schöne, Jens** (2005): Die Landwirtschaft der DDR 1945 - 1990. Erfurt: Landeszentrale für Politische Bildung Thüringen.
- Schutter, Olivier de** (2011): How not to think of land-grabbing: three critiques of large-scale investments in farmland. In *The Journal of Peasant Studies* 38 (2), pp. 249–279. DOI: 10.1080/03066150.2011.559008.
- Statistisches Bundesamt** (2021): Eigentums- und Pachtverhältnisse Landwirtschaftszählung. 2020 (Fachserie 3 Reihe 2.1.6). Available online at <https://www.praxis-agrar.de/service/infografiken/wie-hoch-sind-die-pachtpreise-fuer-landwirtschaftliche-flaechen>.
- Swyngedouw, Erik; Ward, Callum** (2022): Land as an Asset. In Mika Hyötyläinen, Robert Beauregard (Eds.): *The Political Economy of Land*. London: Routledge, pp. 40–55.
- Tietz, Andreas** (2015): Überregional aktive Kapitaleigentümer in ostdeutschen Agrarunternehmen: Bestandsaufnahme und Entwicklung. Braunschweig: Johann Heinrich von Thünen-Institut (Thünen Report, 35).
- van der Ploeg, Jan Douwe; Franco, Jennifer C.; Borrás, Saturnino M.** (2015): Land concentration and land grabbing in Europe: a preliminary analysis. In *Canadian Journal of Development Studies / Revue canadienne d'études du développement* 36 (2), pp. 147–162. DOI: 10.1080/02255189.2015.1027673.

Part III:

SOCIAL

DIMENSION

Indigenous Peoples' Inequalities in Brazil: A Political Ecology Analysis

Abstract: Most of the global environmental debate openly recognizes the urgency in protecting biodiversity hubs like the Amazon rainforest, a large amount of which is situated on Brazilian national territory. Brazil is regarded a country rich in potential and leadership-qualities for environmental conservation strategies in the ever more present scenario of a climate and biodiversity crisis that endangers the livelihoods of peoples, communities, and other species on planet earth. Nevertheless, the mutual constitution of inequalities and processes of environmental degradation is often doomed irrelevant or neglected by global conservation strategies. The research paper analyses in which ways the inequalities of Indigenous peoples in Brazil are the product of historical and contemporary processes of colonialism, marginalization, nation-state formation, and neoliberal politics, all of which heavily intervene in the natural environment. Issues of Indigenous identities, territorial meanings, and legal frameworks will be taken into account when contextualizing modernity, hegemony, and power, to better understand the role of the environment in shaping Indigenous inequalities. By applying specific emphasis on the construction, the transformation and the appropriation of the natural environment, current perspectives for reducing inequalities will be assessed. The nature-society dialectic builds the basis for a critical analysis that rests on a historical perspective, in order to portray the interplay between human and environmental inequalities and discrimination. Hereby, the Brazilian case stands emblematic for the challenges and struggles of the global society toward justice and prosperity in a state of planetary wellbeing.

Keywords: Indigenous inequalities – Brazil – Political ecology – Environmental justice – Extractivism and environmental appropriation – Colonialism – Planetary wellbeing

¹ Raphael Streit wrote this article under the supervision of prof. dr. Andrej Lukšič.

Introduction

When United Nations secretary general António Guterres addressed the Permanent Forum on Indigenous Issues (PFII) on the 18th of April of 2023, he reminded the assembly of the fact that Indigenous peoples (IPs) around the world are being affected by “marginalization and exclusion, the denial of human rights, illegal exploitation of resource rich territories, dispossession and eviction from ancestral lands, even physical attacks and violence. Around the world, millions of Indigenous peoples are losing their lands, their rights, and their resources” (Guterres). The remarks by the highest representative of the UN during the opening ceremony of the 22nd session of the PFII are a message to the world which indirectly also points to the necessity to comprehend the “staggering inequalities” faced by IPs around the world in the context of the climate emergency, at the “frontlines” of which IPs are often among the first to experience the effects of environmental destruction, as Guterres attests.

The intersectional approach of this year’s session of the forum, coined “Indigenous Peoples, human health, planetary and territorial health and climate change: a rights-based approach” is also well reflected in this paper. Followingly, in current times of failure of political decision-making regarding the mitigation and adaptation to environmental degradation processes, it seems adequate to take a step back and investigate the conditions that leave marginalized people as the most vulnerable to such processes.

Picking up on Guterres symbolic influence as the highest representative of an institutionalized body of global governance, the United Nations (UN), it is this institution which has brought forward an ambitious agenda in 2015. The 17 sustainable development goals (SDGs) as the normative framework of the 2030 agenda of the UN, a continuation of the previous millennium development goals (MDGs), aims at guiding the global community in making the world a better place: in social, agricultural, economic, and environmental dimensions. This research paper is specifically interested in SDG 10, which formulates the reduction of inequalities “within and among countries (United Nations Department of

Economic and Social Affairs). SDG 10.2 advocates for the political, economic, and social inclusion of all peoples, disregarding age, sex, disability, race, ethnicity, origin, religion, or any other status.

Framing the goal onto Indigenous peoples (IPs) in Brazil, it becomes quickly evident that SDG 10 is unable to properly address their struggles. Research indicates that there is an important environmental gap in defining inequalities in SDG10, what might eventually intensify Indigenous inequalities (Ghosh et al. 2) and neglect or even damage already existing and locally rooted practices of environmental sustainability by not recognising how land conflicts endanger their livelihoods (Basnett et al. 322). By failing to recognize the systemic dynamics that link inequalities and environmental degradation, environmental justice and climate equity frameworks receive a pushback (Ghosh et al. 18), which particularly affects IPs. It is this gap in the SDG agenda which inspires a closer analysis of environmental inequalities and the processes that sustain them, against the formulated “political, social, and economic inclusion” of IPs in SDG 10.2.

Within the presented context, the paper argues that the inequalities of IPs in Brazil are embedded in colonial and hegemonic structures, and the various environmental crises are the outcome of exploitative actions underpinned by inclined power relations. It is recognized that ongoing forms of colonialism are the result of the accumulative nature of capitalism, which has evolved into a persistent ideology that articulates the ability to address inequalities and environmental degradation. In a 21st century context, where inequalities have been rising for decades, and an irreversible environmental collapse is one step away, it becomes ever more apparent that systemic changes are needed to promote justice for Indigenous Peoples in Brazil, peoples worldwide, and the home that mother earth represents to us.

The case study advocates that the pursuit of a different systemic paradigm, *planetary wellbeing*, is worthwhile and necessary. Beyond Brazil, it stands emblematic for the global challenges and hints at how planetary wellbeing would address historically made inequalities instead.

More concretely, the paper looks forward to approaching the following research questions:

1. What is the role of the natural environment in shaping Indigenous inequalities? Perspectives from Latin American Political Ecology.
2. What are the dominant patterns of land appropriation and how do these relate to the global narrative of ‘sustainable development’?
3. What are the Brazilian initiatives to counter inequalities and what could be a systemic approach to reduce inequalities and increase wellbeing in the long term? Is the SDG agenda a useful tool for incentivizing and assessing the reduction of inequalities?

The design of the investigation follows a systems-oriented approach, while recognizing that IPs’ struggle is always unique in experience. The focal point is the investigation of systemic dynamics that create and exacerbate Indigenous struggle, from a Brazilian perspective, in a globalised world. Consequently, the research is interdisciplinary and resembles a critical paper in the humanities. It fits into a developing paradigm to overcome traditional and artificial boundaries of research categories and aims to establish a better understanding of the working mechanisms of inequalities, contributing to an increasing width of research on the conditions of transformation.

To do so, the essay first establishes a methodological framework by illustrating the thematic and analytical emphasis on Political Ecology (PE). Then, insight from the field of Indigeneity (or: Indigenous political approaches) guides the focus of the PE framework and the two are eventually complemented in a brief section on environmental justice (EJ) in Brazil. The section on the global perspectives adds an integral layer to my analysis, articulating how inequalities are not only regionally rooted, in the Brazilian case study, but also globally perpetuated. Followingly, the paper provides a comprehensive analysis of the state of IPs’ inequalities in Brazil and the respective perspectives to reduce them in the short

and long term. For a proper assessment, a historical perspective is the guiding element for maintaining the big picture. This is the main practical body of the investigation, in which the political dimension of the natural environment, the *politicized environment*, represents the main category of analysis and sheds light on the power relations it entails. More precisely, the conflicts that occur in the *frontiers*, understood as given geographical spaces, are used as an important point of reference in highlighting how inequalities are reproduced in praxis. In this context, IPs' intrinsic relation to the natural environment and the land and different forms of appropriation are subject of the analytical focus, combining material and discursive factors of the construction and reproduction of inequalities. The evaluation of the analysis tries to synthesize the structural challenges for the reduction of inequalities, by situating current Brazilian political perspectives in a context between critical scholarship, the SDG agenda, and the concept of planetary wellbeing, giving case-specific recommendations that bridge these perspectives. The final conclusions provide a brief reflection on the overall approach to the case study and point towards the fundamental questions that need to be addressed for reducing Indigenous inequalities in Brazil and elsewhere.

Methodology

The aim of better understanding IPs' inequalities in Brazil is immediately being confronted by a methodological challenge: How should the multifaceted research questions be addressed in an adequate manner?

While inequality is mostly determined by factors such as gender, ethnicity, class, or geography, the case study is relevant in the way that inequalities are conditioned: something that could be coined as a *historical condition*. A state that is characterised by long processes of inequalities which comes to inform the analytical focus of this work: The phenomenon of unequal distribution of resources and opportunities, i.e., power relations, exercised through the natural environment.

Followingly, three important procedures guide the analysis. First, establishing an understanding of the main concepts applied in this paper: PE and Indigeneity. Second, approaching the case study in a historical context and analyse contemporary dynamics by synthesizing elements which are persistent in the past and the present. Third, with a view to the future, articulate important ideas for reduced inequalities on the pathway toward planetary wellbeing in the specific realm of the paper. The interdisciplinary character in this approach is dominant. The relational and historical characteristics of inequality can be better understood by bringing together critical perspectives from distinct disciplines. This is why the research design aims to apply cross-disciplinary investigation in which resources are drawn from the fields of politics, ecology, anthropology, history, and geography, to articulate a well-informed understanding of the determinants of Indigenous inequality in Brazil. The paper is composed of secondary research and builds on bringing together different concepts and arguments into dialogue with each other, to question dominant narratives about wellbeing and development, bringing forward a critical and coherent argument. To do so, relational components between unequal societies and unequal environments are highlighted. The analysis combines quantitative and qualitative elements, whereas the latter assumes most of the responsibility in the undertaking of the paper.

A discursive rationale considered for this research is the relationship between nature and society as mirrors of each other, which means that outcomes of the analysis could be transferred or tested in other contexts. This does not suggest that environmental and Indigenous theories are always in positive correlation with each other or that there is a clear consensus of how emancipation with Indigenous struggle is best lived, but an important notion is the global necessity to rethink nature-society relationships in a fundamental way, in which wellbeing cannot be understood in isolated terms, and where IPs have a central role to play. This positions the research also in the context of emerging transformation research, departing from important social and ecological

struggles. The paper tries to balance the obtained results and give short- and long-term perspectives for change. Due to the pressing environmental crises and the inequalities that characterize their experience, this becomes a critical and challenging task.

The method is an expression of the need to highlight parallel processes which concern the imagination of new systemic paradigms and the evaluation of perspectives starting from the status quo. In doing so, they enter in direct dialogue with each other and allow for a constructive understanding of the reality and the pathways towards a common future, understood in terms of wellbeing, respect, and dignity. Regarding the sensitive nature of the issues treated in this analysis, the author is conscious about patterns of Eurocentric stereotyping and the victimization of IPs as passive or powerless. In this paper, the author writes from a white, male, European, global minority, or 'global north', perspective. Most of the sources used in this paper have been authored in English, Portuguese, or Spanish, while some of them include Indigenous authorship. The objective of this investigation is not to compare itself to site-specific and community-based research, but rather to complement it with a holistic analysis of the relationships between local or regional dynamics, and global processes. As the paper might occasionally cause confusion for covering a lot of ground, the reader is advised to come back to the research questions formulated in the introduction.

Literature review

The literature review is structured in three parts, establishing the relation between the relevant concepts, and building the basis for the analytical section. In the process, it also engages in a theoretical dialogue from different perspectives. First, literature from the field of PE will be presented in the light of its conceptual and content-based relevance to the paper. Second, important notions of Indigeneity are highlighted, and third, both sections will be brought together in the context of a Brazilian EJ perspective.

Political ecology: Establishing the nature-society dialogue

In the realm of PE, important elements of IPs' struggles in Brazil and their direct relation to processes of environmental degradation are brought together. It does so by acknowledging a mutual dependence between dimensions of inequality and processes of environmental degradation. Hereby, environmental degradation can be regarded as the sum of dynamics which cause environmental disturbances, understood as an undesired threat to planetary ecosystems ("Economic and Social Commission for Western Asia"), and therefore detrimental to planetary health and wellbeing. PE unites a diversity of methods and approaches that conceptualize the relation between the environment and society. As a matter of fact, it can be understood as the "concerns of ecology and a broadly defined political economy" (Blaikie and Brookfield 17), and in a more applied way as an "inquiry into the political sources, conditions, and ramifications of environmental change" (Bryant, *Putting Politics First* 165). In relation to the above-mentioned processes of environmental degradation, PE is a toolbox, mapping "the prospects for green and sustainable alternatives" (Watts 259). In doing so, PE embraces the exploration of "power relations and political conflict over ecological distribution and the social struggles for the appropriation of nature" (Leff 33). As these understandings illustrate, the paramount importance attributed to the politicized environment is grounded in the constant interrelation between the ecological and the political through their overlapping socio-environmental implications (Harvey 25). Due to the increasing number of complex and manifold interactions of such character, PE has evolved into a mature field capable of conducting rigorous analyses in this regard.

As an academic field with the objective of transforming the apolitical character of ecology (Bryant, *Power, Knowledge and Political Ecology in the Third World* 80; Bryant, *Putting Politics First* 164) into a relevant realm that redesigns and integrates the relations between the social and the ecological spheres, PE is essentially

a critical reflection of contemporary societies' relation with the environment. It originated from the linking of culture and the environment in anthropology and geography (Watts 260) and the dialogue between cultural ecology and radical development geography (Bryant, *Power, Knowledge and Political Ecology in the Third World* 80), gaining global momentum in the 1970s, when environmental activist movements started to systematically question the prevalent economic-development model.

Tetreault's approach allows to better understand and locate the diversity of PE. He differentiates between mainly two epistemological approaches in the field for understanding socio-environmental conflicts, one of materialist nature linked to Marxist political economy and one based on post-structuralist methods (1). The first phase of PE was informed by the Marxist analysis (5), in which place-based factors of local resource exploitation are linked to non-place-based factors found in the structures of the global economy (Blaikie 132). The second phase of PE took off in the 1990s and came about to criticize the lack of attention to discursive elements in the ways in which nature and the environment are constructed and appropriated (6). In this sense, the post-structuralist school of PE "advocated the need to act locally, to recuperate traditional ecological knowledge and to strengthen local institutions for collective resource management" (7). Followingly, PE embraces the "examination of the political dynamics surrounding material and discursive struggle over the environment" (Bryant, *Power, Knowledge and Political Ecology in the Third World* 79), especially relevant in a Latin American context.

The paper at hand embraces the Latin American current of PE exactly because it reconciles materialistic and post-structuralist approaches in constructing a political ecology which recognizes the regional relevance of histories of colonialism and imperialism. The political construction and command of the environment is a common theme (See generally Escobar; Alimonda, *Una Introducción a La Ecología Política Latinoamericana*; Alimonda, *The Coloniality of Nature*; Leff). In simple words, the focal points of the analyses evolve around the study of power relations in the con-

text of socio-ecological relationships. As seen in Leff's definitional approximation, the appropriation of nature is of special relevance in these relationships. Escobar (1) advocates for a poststructuralist understanding of PE, while Alimonda positions himself to reconcile both approaches. On the one hand, he puts emphasis on the colonial and hegemonic dimensions of environmental use and distribution (Alimonda, *The Coloniality of Nature* 129). On the other hand, he also emphasizes the coloniality of nature through "different systems of knowledge and topological devices" (129). In general terms, PE in Latin America naturally entails a critique of development and modernity, by highlighting the coloniality intrinsic to these patterns of thought (103-105). But beyond this, it is situated in the histories of oppression, colonization, and European paternalism in science and thought. Deviating ecologies serve as a form of resistance, in an environment where conflict is an "expression of restlessness ... and the affirmation of life" ("o conflito é expressão de inquietude ... e a afirmação da vida"; trans.; *Conflitos no Campo Brasil* 2019 7).

In acknowledging that dynamics of coloniality and the construction of unequal power relations play an important part in the analysis of human-environmental interactions in the global south, the majority world, it can be argued that PE emerges "from a politics of difference rooted in the ecological and cultural conditions of its peoples; from their emancipation strategies for decolonization of knowledge, reinvention of territories and reappropriation of nature" (qtd. in Leff 34). Following this finding, it becomes necessary to consider non-materialistic relations in the analysis of environmental inequalities of Indigenous peoples in Brazil. As already indicated, the Latin American current of PE draws one of its main dimensions, power relations and coloniality, from decolonial scholars (See generally Lugones; Mignolo; Quijano). Nevertheless, it does not achieve to build an intersectional perspective, taking into account the coloniality of gender (See generally Lugones) in explaining the patriarchy behind the concepts of power and knowledge (Ulloa 430). Since coloniality is an important element in the constitution of inequalities within and expressed through the environment

and its resources, a historical perspective becomes integral to a PE approach in the case study (Bryant, *Power, Knowledge and Political Ecology in the Third World* 85; Watts 239).

In relation to ‘sustainable development’, the Latin American current of PE recognizes the process of merging environmental conservation attempts with economic growth to have failed. Therefore, PE wants to understand the “political and economic obstacles to meaningful change” (Bryant, *Power, Knowledge and Political Ecology in the Third World* 80). For this purpose, PE wants to focus on political analysis instead of assuming that the necessary actions “‘will be formulated and implemented’”, as suggested by ‘sustainable development’ dogma (Bryant, *Putting Politics First* 164). The author points out that these narratives are based on conflictive theoretical assumptions about state and society (164). The transformative character of PE, then, allows to point towards perspectives of environmental justice in times of pressuring environmental crises. This attempt is undermined by forming an understanding of the underlying social relations of past and current societies’ subjugation of other cultures and nature and the crucial task of “decolonizing knowledge and legitimizing other knowledges-savoirs-wisdoms” (Leff 29).

IPs are well referenced in PE literature, awarding it with the ability to approach their specific struggles of systemic relevance in Brazil. Its focus on the environment and land is vital in this proposition, as access to land and resources play a vital role in the matrix of inequality that reproduces the “violation, destruction, and oppression of native and traditional peoples” (Empinotti et al. 4). Finally, PE captures hegemonic depictions which reduce IPs to “wise stewards of the environment” (Bryant, *Power, Knowledge and Political Ecology in the Third World* 86) and “ecologically noble savage[s]” (Cunha and de Almeida 315).

Indigeneity and indigenous identities

For an investigation into the inequalities that Indigenous peoples have historically been facing in Brazil, *Indigeneity* is an insightful and identitarian concept which allows to better comprehend the

dimensions and intensities of inequalities. While indigeneity is not a specific tool to determine the factors of inequality in Brazil on its own, it delivers a conceptual basis to inform the analysis which centres Indigenous inequalities around the proposed nature-society nexus. In locating Indigenous cultural-historic heritage, Indigeneity does two important things. First, it highlights the importance of relationships (Gomez), e.g., with settler states or the more-than-human worlds, and second, it situates IPs in their realities, or “Indigeneities”, within what Gomez coins as “futurity”, an indigenous articulation of collective imaginations to move beyond the oppressions of capitalism and hegemony, despite constant attacks on their sovereignty and rights. In such way, Indigeneity becomes a movement of resistance.

To better understand the origins of institutional Indigeneity, it is worthwhile to recall that Indigeneity became an active articulation of identities and resistance in the 1980s, whereas before that time, the term was not used to identify ‘Indians’, ‘Natives’, or ‘Tribal peoples’ (Niezen 3; Clifford 14). This does by no means imply that IPs were not fighting and resisting dominant structures (See generally Roller, 2021 for an account of Indigenous autonomy and resistance in Brazil), it rather points to the problem of definition.

As different approaches try to locate Indigeneity and the concept of ‘Indigenous peoples’ more precisely, Corntassel points out that any definition runs the risk of being incomplete (65). Before falling into the trap of conceptual relativism, it is worthwhile to recall Tauli-Corpuz’ recognition of Indigeneity as a social construct. The question about the objectives of Indigeneity is never unidimensional and includes differing historical and cultural narratives about identity, survival, and resistance. Perhaps its biggest strength is to not define, but to de-construct and re-construct.

Brazil and environmental justice

The main elements of Indigeneity point to the political dimensions of Indigenous resistance. Political ecology, similarly, articulates the politicized vectors of inequalities as they are imposed through environmental use and distribution. In the context of

the case study, this leads to the role of Indigenous peoples in the Brazilian environmental justice (EJ) movement.

The Brazilian Collective of Researchers about Environmental Inequality affirms that in the production of inequality, the de-politization of environmental questions plays a crucial role (Acsehrad et al. 167). Following their argumentation, it opens the gates for the appropriation of nature as part of the capitalist mode of production. The extractive and resource-based industries of agribusiness, mining, logging, and energy production are projected in hegemonic terms with disregard of the social and environmental impacts, which are primarily externalized into the livelihoods of local communities, and more broadly, into global processes of environmental degradation.

Thus, the realization is that the relationship between nature and society reflects the asymmetries in the political, social, or economic spheres in Brazil, to the point that these asymmetries become naturalized in the public dialogue and perception (Herculano 8).

As IPs lose access to land and the abundance of its resources to sustain themselves, the structuralism of these events links the Indigenous agenda with political ecologies of extractivism, as their common arguments disembody into the claims for *Justiça Ambiental* (Portuguese for EJ). The Brazilian Environmental Justice Network (RBJA) starts in a practical way by characterizing its understanding of environmental justice from a state of environmental injustice. Injustice is being understood as “the enormous concentration of power in the appropriation of natural resources, which characterizes the history of the country” (“[A] enorme concentração de poder na apropriação dos recursos ambientais que caracteriza a história do país”; my trans.; Herculano, appendix).

Section 5.1 looks closer at this aspect of historical conditioning of the natural environment in specific regard to Indigenous inequalities. The outcome of this process of inequality materializes in the form of disposing environmental costs of ‘development’ practices towards intersecting groups of socially marginalized people, including IPs (Herculano, appendix). Followingly, EJ emerges as a practical response to historically rooted practices of injustice. As the

conflict map for environmental injustice shows, there are currently 191 conflicts that endanger IPs' livelihoods, which can be consulted to obtain case-specific information ("Mapa de Conflitos"; see generally Porto et al. for a detailed account of the conflict map and its methodology). Some of the demands and proposals of the RBJA as an integral element of EJ in Brazil mirror the structural demands made by IPs. These include the construction of alternative development models (or alternatives to development), the democratization of just and equitable access to natural resources under the premise of their sustainable use, and the abolition of systems that stand for the disproportionate disposal of environmental externalities (Herculano, appendix). As these common demands show, any fruitful adaptation and mitigation strategy for climate and biodiversity crises must address a reduction of inequalities in the first place (Pricce). Similarly, Pacheco brings forward the idea of an intersectional understanding of injustices, by claiming that inequalities "not only share the same origins but feed off each other" (717). She argues that IPs, in comparison to most proponents of social movements, recognize the inherent connection between social and environmental injustices, "because nature is the basis of their very survival, be it material, cultural, or spiritual" (718). In her case for the adoption of environmental racism as an intersectional category, she highlights the role of IPs in pointing to inequality as the root cause in the growing organization of Brazilian EJ. In the following sections, the paper investigates the historical establishment of the unequal power dynamics over the environment, as well as contemporary forms of appropriation as a continuation of this trend. But first, a global comparative perspective, building on some notions brought forward in this section, will expand on the hegemonic foundations of global inequalities, also relevant to IPs in Brazil.

The globalization of inequality

"The ecological crisis is shot through with inequalities, and these inequalities have clear colonial dimensions" (Hickel 324). This reference to the ecological crisis needs to be seen in a global

context. It is an ecological crisis caused by few, by those who have planted a global economic system that follows their interests, as Hickel (324) argues. The paper's approach to inequalities rests on the analysis of local implications among Indigenous communities in Brazil. But for a moment, the author proposes to revert this perspective and focus on global implications, since both matter. A relevant question to ask in this context is the following: What are the systemic preconditions that make inequalities such a globally interconnected phenomenon?

As already indicated, the enmeshment of globalization with 500 years of colonial history has clearly not been untied by formal decolonization (319-320). The critical notion that the 'success story' of globalization, written in terms of the global north, is based on ongoing colonial relations of power, has been articulated in various spaces and in various ways. Brand and Wissen (*Zur Ausbeutung von Mensch und Natur im globalen Kapitalismus*) coin the term *imperial mode of living* to describe the relationship between economic poles, mostly referring to it within the global north/global south dichotomy. As they claim, the organization of life in capitalist centres rests on a certain type of productive and labour organization elsewhere, characterized by the exploitation of people and the natural environment (44). As it will be brought up in the main analysis, the imperial mode of living also embraces narratives of economic and development 'catch-up', characterizing national power dynamics in countries like Brazil (44-45), and therefore intensifies the struggle for rights and citizenship in the case of IPs. Hickel, as well as Brand and Wissen, aim at theorizing these inherent inequalities in the globalized capitalism. In this context, PE assumes the role of deconstructing this global system of inequalities and modes of appropriation to propose alternatives (Brand and Wissen, *Imperiale Lebensweise* 396).

Following the recognition of a global system of inequalities, where does the global Indigenous movement stand and what are its perspectives to challenge the prevailing structures? To get a better understanding, a short look at some of the major achievements of the movement is proposed. One of the early and

most important achievements for IPs at the global level is the International Labour Organization Indigenous and Tribal Peoples Convention No. 169, better known as ILO 169, the first binding agreement which grants important rights to IPs, passed in 1989. Importantly, it establishes the full appliance of human rights to IPs, obligatory consultation mechanisms, and autonomy over their lands. Since the passing of ILO 169, 24 countries have ratified the document (ILO). Another milestone is the proclamation of the Universal Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007, after a three-decade long process of negotiating the document. As a declaration it is non-binding for the respective countries but rearticulates the importance of Indigenous issues and can be seen in the context of an ongoing norm-setting process in international politics, also coined as “*transformational norm vector*” (Lightfoot, *Global Indigenous Politics* 4).

On the one hand, these and other global achievements point towards the undeniable presence of Indigeneity as a political movement, as mentioned before. On the other hand, its real-world impacts are difficult to measure, considering non-compliance with legislation and the ongoing colonial violations and injustices embedded in legislations (United Nations 64). In this context, it is important to keep in mind that the institutionalized dimensions of Indigenous politics take place in the spaces which are still governed through hegemony and historical relations. Therefore, the transformative character of Indigenous politics in the international sphere rests on conquering the discourse and forging slow but structural change. This is not necessarily to be seen in contradictory terms, but in the reality of complexities within global politics.

In the current context of various and simultaneously intensifying environmental crises, global climate change is by far the most popular in coverage and discussion. One of the challenges for the global Indigenous movement and the fight against inequality, will be to prevent the hegemonic system from appropriating Indigenous knowledge and lifestyles for its own reproduction. This concern is not very present in the attempts to find solutions for a changing climate, but it is indeed visible in the pursued goal

of decarbonization, or the ‘green transition’, commanded through the monetarization of nature (Acseirad et al. 178-179), what will be looked at more in detail in section 5.2. Against solution pitches full of top-down approaches designed in terms of hegemony, to properly address inequality, the Indigenous political movement cannot merely focus on climate change but must retain its structural critique of the entire system that caused these crises.

Indigenous inequalities in Brazil

“For a colonized people, the most essential value, because it is the most meaningful, is first and foremost the land: the land, which must provide bread and, naturally, dignity” (Fanon 9).

This section conducts an analysis of the primarily environmental nature of inequalities which IPs face in Brazil. I use PE’s focus on the environment in order to draw a comprehensive and critical framework in which Brazil’s perspectives of reducing Indigenous IPs can be assessed. To do so, sections 5.1 and 5.2 employ the concept of *frontier*, to give more visibility to past and present conflicts and to the socio-political implications of governance within the expanding frontiers (Thaler et al. 59-60), and how they affect IPs specifically. Section 5.1 does so by briefly explaining the *historical condition* of IPs in Brazil, while section 5.2 investigates how historical ties of inequality are present in contemporary Brazil and materialize power relations through material and discursive governance of the frontiers.

The concept allows to transition between past and present and highlight repetitive patterns, contributing to a more holistic understanding of the nature of conflict and inequality in the case study. Miki characterizes frontiers as “spaces with a contested relationship with the nation-state” (6), as she investigates the making of citizenship in postcolonial Brazil. Following this understanding, it can be recognized how frontiers also represent the essential conflict of worldviews, knowledge, and meaning in relation to human-environment relations. This notion of frontiers as the contested spaces for the appropriation of nature (See

generally Borrás Jr. and Sauer) and the possibilities of existence (See generally Kröger) will be especially relevant in section 5.2.

Rooted in history

Post-colonial narratives about Brazil have often been informed by *racial democracy*, a concept that describes the Brazilian society as “free of racial prejudice because of its long history of race mixture” (Miki 5). It is a powerful concept which has been publicly used to frame a doctrine of “racial nationalism” in 19th and 20th century Brazil (5). In this process the imaginary of a racial paradise based on the narrative “that Brazil was the land of harmony between white people, Black people and Indigenous people” (“Nakoda: Strategies for Modern Art”), while miscegenation and eugenicist politics were gaining national relevance. This stereotyping remains persistent throughout societal representations in culture and art and can be regarded as a radical narrative which attempts to deny the historical condition of Indigenous inequalities. This historical condition also entails three centuries of colonial subjugation by the Portuguese, including histories of invasion, disease, enslavement, and genocide (Ferrari-Nunes 188-189), through which the Indigenous population shrunk dramatically from an estimated 5 million before the Portuguese invasion (Ribeiro 142).

Miki uses the logic of frontiers to show that the reality behind the constructed ‘racial democracy’ was much rather grounded in anti-indigenous violence and prejudices, forging the exclusion of IPs and their identities from the process of building societal homogeneity, the *povo brasileiro*, which Ribeiro tries to comprehend from an anthropological standpoint. Frontiers became “the very space in which the relationships between race, nation, and citizenship were daily tested and defined” (Miki 8), as showcases the example of miscegenetic politics, highlighting the ambiguities that came to constitute “Indian inclusion and exclusion” (Miki 251) in the making of a Brazilian society. The same frontiers make also reference to the spaces of conquest

and appropriation of the environment, undermined by the construction of enduring anti-Indigenous narratives (Ramos 156). As settlement and frontier violence continued, the heteronomy of Indigenous identities focused on extinction discourses and romanticized narratives of the distinctive 'Indian' or the 'noble savage', which ultimately served to maintain the superiority of the white settler state and to legitimize their imperial imagination of civilization (Ramos 156-157).

Colonial and post-colonial legacies lay open how the Indigenous presence and relevance has been manufactured through violence, marginalization, and storytelling. These processes are central in the making of the historical condition, necessary to be considered to portray a comprehensive picture of inequalities. The research paper argues that over time, these have persisted and find new ways of expression through environmental and frontier phenomena that continue to represent patterns colonialism and accumulation. In other words, the nuances of oppression of IPs have been subject to changes over time, but the guiding elements in materializing superiority have remained the same, always evolving around using the image of the 'Indian' as it best serves the colonizer (Barreto 28-29). Ferrari-Nunes argues that the ideology of accumulation has been co-constitutive ever since, even before the formal recognition of a capitalist productive system (203). In this sense, the author brings forward the idea that colonialism is still a relevant tool to analyse capitalist extractivism in the 21st century. The forms of extractivism, modes of appropriation, come to define inequalities in Brazil and shape the livelihoods of IPs.

New and old: The environment and contemporary inequality

Having established a brief historical context of the obstacles to overcome structural oppression, I want to begin this analysis by presenting important steps towards recognition and inclusion that were adopted in the legal framework of the Brazilian state throughout the 20th century. One of the most important ele-

ments can be found in the current constitution, passed in 1988. The document grants the right for the exclusive use of “lands traditionally occupied by Indians” and commits to the recognition of the social organization, customs, languages, beliefs, and traditions of IPs. This process is administered and must be approved by the Federal Union (qtd. in Mondardo 6). The Indian statute is the most relevant legal document in terms of defining who counts as Indigenous. Article 3 of the act states that as Indigenous status can claim “any person with pre-Columbian origin who identifies himself as belonging to an ethnic group whose cultural characteristics distinguish it from the national society” (“Índio ou Silvícola - É todo indivíduo de origem e ascendência pré-colombiana que se identifica e é identificado como pertencente a um grupo étnico cujas características culturais o distinguem da sociedade nacional”; my transl.; Estatuto do Índio). This definition was adopted from the Instituto Indigenista Interamericano (III) (Pacheco de Oliveira, *Sem a Tutela, Uma Nova Moldura de Nação* 212). While Pacheco de Oliveira criticizes the statute as “vulgar” (201) in its terminology and attributes it with an authoritarian and centralized posture on the one hand, he also recognizes the strong Indigenous presence in the elaboration of the constitutional article on the other hand (201).

The two documents introduced, the federal constitution and the Indian statute, provide a relatively solid legal basis for Indigenous recognition and rights, while the division from the ‘national society’ remains. In the last decades, there have been significant advances in the recognition of Indigenous peoples and the homologation of Indigenous land (TI) (Hoffman French 242), which consists of 733 territories that amount for 13% of the national territory (Dourado et al.), and 20% of the Amazon biome alone (Le Tourneau). Brazil approved ILO 169 and UNDRIP in 2002 and 2007 respectively. These legal frameworks are essential in backing IPs in their struggle to gain autonomy over traditionally occupied lands (Mondardo 9). Regarding ILO 169, Pacheco de Oliveira (*Sem a Tutela, Uma Nova Moldura de Nação* 212) notes that the convention clarifies the recognition as ‘peoples’ of Indi-

genous communities and self-identification as the basis of Indigenous identities in the Brazilian context. Furthermore, scholars add that Brazil has applied robust legal regulations for Indigenous property rights in international comparison (See generally Mueller; Dieguez Leuzinger and Lyngard).

However, despite the constitutional protection and the approval of international norms, “colonial conceptions and practices that lead to genocide, ethnocide and ecocide are still reproduced in the contemporary Brazilian context” (Mondardo 6). The recognition of territory does not impede the infringement of rights. Illegal activities and violence are ongoing phenomena and currently rising in numbers and intensity (CIMI). The underlying causes for this trend partially include the ineffectiveness of state agencies entrusted with the protection and the articulation of IPs, such as FUNAI (Fundação Nacional do Índio). The dismantling of Indigenous institutions (Mondardo 19) is a continuous process in which organizations ceased to fulfil their purpose (Alcantara, *FUNAI Was Not Defending Indigenous Peoples*) of protecting IPs and representing their interests (Alcantara, *Brazilian Politics Has given No Importance to the Indigenous Movement’s Agenda*). These actions can be regarded as “genocidal” (Menton et al. 2) when recalling the consciously caused humanitarian crisis on the land of the Yanomami (Rebello), where genocidal governance led to the death of hundreds. Furthermore, the approval of Indigenous territories had been halted since 2016 (Mondardo 20), until recently when current president Lula da Silva approved six new territories in the Amazon biome (Bridi and Maisonnave). During the same occasion, the national council for Indigenous politics (CNPI) was reinstalled after a suspension since the last administration, which marked another hit for institutional representation. The importance of territory in the context of Indigenous rights overall lies in the environmental dimension of most inequalities they face, such as access to health, education, food, security, and social exclusion (Mondardo). The political, geographic, and bureaucratic obstacles in effectively protecting the human and land rights of IPs should also be seen in a broader context of

Indigenous struggle. They are elements of a matrix of colonial practises which shape Indigenous existence in the 21st century.

Beyond the *realpolitik* of Indigenous land recognition, Gallois brings up a more fundamental issue, highlighting the limits of such legal category for the understanding of territory in relation to IPs' articulation and practice of different territorialities from an anthropological perspective. She points out that there are different forms of indigenous territorial organization which cannot be understood or described in a single legal category which describes land in mathematically quantified terms (1-2). Nevertheless, the scope of this investigation focuses on the conflicts that arise within borderlands identified by the legal category, allowing for the explanation of frontier struggles and the environmental nature of indigenous inequalities.

The journey of inequalities through history into the 21st century, it has been pointed out, has been guided by a colonial regime of power relations (See generally Quijano), embedded in modernist narratives of progress and prosperity. As the hunt for natural resources and development projects continues, a defence of indigenous territories becomes not only a decolonial task for justice, recognition, and peace, it is also vital for countering the escalation of environmental pressures. The mutual dependence of the environmental and human condition must be recognized and respected in the strategies towards a sustainable future. Nevertheless, the "fragility of Indigenous territories legal protection and environmental conservation when state interests are at stake" (Le Tourneau 215) is an indirect way of expressing that indigenous existence is constantly subjugated by the state, which at the same time holds responsibility for granting and applying their rights. This denies IPs an independent right to have rights, employing Arendt's (1949) consideration in the Brazilian context. Infringements by the state and powerful industries express how power relations are framed by the hegemony of the state, regardless of international agreements and constitutional rights.

The reality behind this coloniality is multifold. One of the dominant phenomena is *grilagem*, or land grabbing (See generally

Borras Jr. and Sauer). Land grabbing is not a new phenomenon, it exists ever since Portuguese settlers established themselves in Brazil. But it has evolved according to the needs and prospects of capitalism. At its core, land grabbing refers to the acquisition of land, be it through violence or bureaucratic means, for the purpose of exploiting the productive capacity of the land for exports (petroleum and biofuels, woods, food, metals) into global commodity supply chains and infrastructure aimed at expanding the national energetic sector (Borras Jr. and Sauer 15-16; Machado Junior 2). In Brazil, these activities have been incentivized by the lack of a rigorous protection of Indigenous rights. Land grabs were the expression of an export-oriented economy that feeds demand elsewhere, in line with the imperial mode of living presented in section 3. In 2017, the political lobby of the agribusiness sector influenced the passing of land law “Nr. 13465”, which facilitates the open practice of land grabs (Brito et al. 1). It represents a loophole for economic interests in the national legislation and further complicates the application of Indigenous rights.

Similarly, *grilagem verde*, or green grabbing, is an adaptation of land grabbing and especially relevant in the context of decarbonizing efforts in the global agenda for ‘sustainable development’. A green grab is considered as the acquisition of land not for the purpose of ultimately monetizing the natural resources of that specific piece of land, but to keep it as a natural reserve or protected area (UC: Unidade de Conservação) to meet conservation requirements, set in the national legislation (Teixeira). Green grabbing allows extractivist sectors to find narratives to justify intensive land-use on production or exploitation sites, formally complying with conservation policies on appropriated land ‘in the good will of environmental conservation’. Consequences include further environmental conflicts in already protected areas, where traditional populations live in danger of being evicted or exterminated (Teixeira). Both phenomena contribute to the increasing annual violence towards indigenous peoples. In 2021, for the sixth time in a row, the record of “possessory invasions, illegal exploitation of resources and damage to property” increased (CIMI

8) on a national scale. Land grabbing and green grabbing can be regarded as articulations of accumulation logics. Especially green grabbing achieves to frame its appearance in the contemporary environmental narrative, centred around ‘greening’, ‘sustainable development’ and conservation of the environment for a better future (Machado Junior 4-5; see generally Sawaya et al. for an understanding of how ‘green’ is associated with the dialectic of the current development model), and makes use of environmental tools that these narratives offer (Borras Jr. and Sauer 17). Critically, the monetarization of nature remains a cornerstone in these approaches and the accumulation-based mode of appropriation does neither address systemic or long-term crises that are intensifying in the food-, energy-, and financial-industries (Machado Junior 3). These aspirations of greening and decarbonizing economies already have and will have significant impacts on environmental inequalities, of which IPs, among other groups, are particularly affected. Under the premise of core-periphery relations, as proposed by the in the imperial mode of living (Brand and Wissen, *Imperiale Lebensweise*), further environmental exploitation will be justified as ‘sustainable energy production’ (Puga et al.; Sawaya et al.), destined towards the decarbonization of export-oriented supply chains, as Brazil’s 10-year energy plan formulates (Puga et al. 84). In the last decades, the domestic strategy has put special emphasis on hydroelectric energy, which “can be considered a pioneer case of green extractivism” (“[L]a energía hidráulica puede incluso considerarse un caso pionero de ‘extractivismo verde’”; my transl.; Puga et al. 84.) Ambitions to become a global energy supplier (See Sawaya et al.) will further endanger the rights of IPs by reinforcing environmental inequalities.

A primary example in this debate is the contested construction of the Belo Monte dam, a major infrastructure project for the generation of hydroelectric energy, finished in 2016 after decades of protest and criticism around its realization. The project exemplifies the ambiguities of ‘sustainable development’. Both supporters, and opponents of the dam, would use environmental arguments to construct their narrative (Bingham 18) and frame it into an un-

derstanding of sustainable development. Prone to appropriation by imperial 'development' logics, the 'sustainable' part of the concept is often limited to the creation of a specific narrative. The problem of such vagueness especially affects IPs, because the discourse of a technological fix of environmental degradation is not critical of the repercussions of a commodification of nature and gives little room for alternative knowledge and worldviews as approaches toward climate mitigation. The Belo Monte dam as a "socially and environmentally destructive 'sustainable development' [intervention] ... can source discursive legitimacy from dominant global agreements" (Bingham 33). Continuing this analysis, Acselrad et al. argue that the climate question has opened a new frontier of accumulation based on the technologies of renewable energy, promoted by the same industries that have largely contributed to historical emissions and pollution (178). The political debate about the negative long-term effects of such renewed appropriation, in the sense of inequalities and wellbeing, often remains within the borders of academia and socio-environmental movements. This discursive imbalance is a practical example of the hegemonic relations that govern the interests of state and industry against IPs and marginalized populations.

This power matrix undoubtedly contains colonial elements and shows how a hegemonic discourse such as 'sustainable development' justifies *green crime*. Green crime can be regarded as an "escalating social conflict on the frontiers of resource extraction" (Garvey et al. 167). The conceptualization of green crime opens new and necessary investigations in the field of environmental criminology, helping to better understand frontier conflicts and violence. At the heart of these conflicts lay the fundamental differences between "the speculative tendencies of capital and the distinct nature-human metabolic relations of communities that depend on direct access to forests, soils and rivers" (178). Nevertheless, besides the material relevance to Indigenous sufficiency, the resource and extractive frontiers can also be seen through an existential lens, as indigenous eviction and the injustices become a defining element of their existence (See Kröger). In the

way that these developments take away part of IPs' existential and cosmological lifeline, there is a deeply rooted ideological narrative besides the techno-entrepreneurial justifications of green grabbing and extractivism.

A military-nationalist ideology (See generally Bingham; Mitchell; Acsehrad et al.) is maintaining Indigenous inequalities in discursive ways. As Mitchell shows in his analysis of the construction of the Alcântara spaceport, the countries' main launch site and operational basis of the Brazilian Space Agency (AEB), a modernist vision of a sovereign Brazil is constructed through a developmental and techno-capitalist vision, leaving little space for the inclusion of IPs and the promotion of their unnegotiable rights. It reinforces the argument that inequalities related to resource extraction, rights, and representation are of ideological nature, as it influences the behaviour of different actors over time. The conditioning of inequality through ideology can be understood as follows:

"Inequality never stands merely as fact, as the way things are or the way things are done: it requires moral reinforcement in collective beliefs. What beliefs and of what sort depends on place and history" (Fields and Fields 277).

In his Book, Mitchell portrays how multi-scaled "politics of inequality" led to the eviction of Indigenous and Quilombola communities, in order to allow for a "first world catch up" (4) to happen, using military-nationalist and neoliberal ideologies to reproduce inequalities for the historically oppressed. The examples provided show that the lack of legal protection and ongoing oppression are well present "the interaction of the extractive, agribusiness, infrastructure and conservation sectors with indigenous peoples" (United Nations 77). Applying emphasis on the frontiers as the areas of conflict has helped to voice the determinants of Indigenous inequalities. The frontiers essentially portray the power relations between two conflicting modes of living that clash on unequal terms. Hereby, inequalities are created and maintained through a hegemonic narrative that iden-

tifies the natural environment as a servant to human needs of material production, in a neoliberal capitalism unable to reflect on its substantial assumptions about ecosystems (Mondardo 17). This modernist vision is countered by the understanding of the environment as the commonplace of traditions, cosmologies, and meanings beyond economic appropriation. Furthermore, other imaginations of territoriality and spatial logics guide IPs in their ways of being (See Gallois).

Nevertheless, in the accruing conflicts and histories of violence, IPs are not limited to a passive role. Over centuries of injustice and oppression, IPs have deployed their own strategies of contact and interaction with settler societies in Brazil (see Roller, 2021). In some cases, long term conflicts have strengthened community ties and increased capacity for active resistance, e.g., by entering voluntary isolation or by expelling *garimpeiros*, i.e., miners, or other invaders from their territories (Menton et al. 8). In this sense, IPs engage in actively constructing the reappropriation of frontiers as a continuously contested space. *Retomadas* are land reclamations and an active practice of resistance. Beyond the act of occupying the land of their ancestors, Retomadas are an important articulation of “memory recovery” (Alarcon 4), a process that revives the stories of the land in a spiritual way.

In this section, some of the important phenomena that shape enduring inequalities faced by IPs were rehabilitated. As they continue to impact Indigenous lives, it is important to recall the structural basis of the inequalities and the contemporary rearticulation within hegemonic narratives such as ‘sustainable development’, which incentivizes new modes of appropriation that put IPs and their lands at risk. By deploying a PE perspective, the environmental dimensions through which inequalities are ‘governed’, gain visibility. A focus on the implications and repercussions of frontier dynamics allows the historical condition of IPs to be linked to the contemporary extractivisms and their discursive justification through the narratives which have been brought forward. The coloniality in these relations over the environment does not remain uncontested by Indigenous communities. The

practice of decolonial activities like *Retomadas* can be regarded as an indication of that. *Retomadas* can be understood in a broader context of efforts for the ‘reappropriation of nature’ and strategies that articulate *r-existence* (Porto-Gonçalves and Leff). These strategies embrace the act of “revaluing the ecological-cultural space” (73), and therefore a vision towards planetary wellbeing. This non-uniformity with predominant concepts of modernity gives also rise to visions like *bem viver*, understood as “living well”, that oppose colonialism, hegemony and androcentrism (McGregor et al. 37). Instead, *bem viver* calls for a harmonious way of living and can be conceived as a practical example of Latin American Indigenous cosmology (See Schlemmer Alcântara and Cioce Sampaio). Overall, the analysis conducted on the case study concludes with the finding that inequalities rest on environmental appropriations which often contribute to its degradation. In the global dimensions of development, production and consumption, the levels of degradation rise unproportionally and especially affect IPs and local communities, hence the focus on frontiers. The analysis represents an urgent articulation of the obstacles towards social and environmental justice for Indigenous peoples. These are informed by historical ties, political realities, and hegemonic action. Any lasting attempt for change must undoubtedly start from these dimensions.

A contested future?

With a look towards the coming years, then, the critical question that needs to be asked is: What are, the perspectives and preconditions for the liberation of indigenous worldviews, knowledge, and cosmologies on the premise of the affirmation of their rights and land? First, it needs to be recognized that the structural inequalities in place cannot be deconstructed in the short term. It is important to maintain the historical perspective, as proposed throughout my paper. The ongoing inequalities are rearticulations of a five-century long process of oppression and subjugation. From the 20th century, legal changes started to formally

incorporate IPs into the national society, but the fundamental ideological prejudices of romanticism, primitiveness, savagery, and backwardness (Ramos 157-164) have not been eroded and continue to constitute racism in contemporary Brazil (Ioris 6-9).

Having this in mind, current environmental ambitions, taking the example of the Green New Deal Brasil (Molon et al.), presented during the COP26 in Glasgow, do not even mention IPs in their programme and propose a continuation of the neo-liberal sustainable development narrative. Similarly, the Latin American initiative Big Push Ambiental (BPA) focuses on economic recuperation supported by an agenda for 'green extractivism' (See generally Gramkow, 2019). The case study offers an adequate reading of Indigenous inequalities and recognizes that their deconstruction is not a bureaucratic task as part of a renewed agenda for growth, labelled 'green' or 'sustainable'. Without the recognition of the colonality of the existing and the proposed governance of the environment and the people of this ecosystem, change will remain superficial.

Moving beyond the Brazilian agenda for 'green growth', the current administration of Lula da Silva shows itself committed to "retaking" indigenous politics (Ministério dos Povos Indígenas). This formulation is a reference to the openly anti-indigenous agenda of former president Bolsonaro (Rebello). The report stresses the creation of a new ministry of Indigenous peoples and the reorganization of FUNAI. The state agency is ready to work closely with the newly created ministry on the approval of Indigenous territories and revoking legal decisions that incentivized socioenvironmental conflict and land grabbing in disregard of constitutional rights and ILO169, as well as strengthening cooperative ties with national and international NGOs (Ministério dos Povos Indígenas). Whether these first indications have the potential to ignite more structural changes regarding the material and discursive inequalities of IPs, or whether they remain an expression of a political agenda in momentaneous transitions, remains to be seen. On the one hand, the dedication of a state ministry to IPs is a powerful and symbolic political gesture, as

well as a move towards an increased institutionalization of indigenous politics (Rebello). On the other hand, the open support of a ‘sustainable development’ narrative based on economic growth and neoextractivist models will sooner or later enter in conflict with indigenous agendas. Nevertheless, it also expresses the inter-state competition and geopolitical importance, which articulate the political pressures that arise within the current system. Alternative models of “living well” are being pushed to the edges of the internationally relevant.

It can be concluded that the current political administration needs to prove beyond symbolic actions and bureaucratic changes that it enters a profound and honest dialogue with IPs. This is a paramount challenge and requires the non-repetition of previous decisions that harmed the environment and IPs alike. To gain credibility in tackling Indigenous inequalities, the government needs to articulate a new political culture that takes compliance seriously and increases the participation of IPs in environmental politics. As preliminary results of the 2022 census indicate, the first conducted in 12 years, Indigenous population increased by 84% and amounts now for about 1.65 million (Carneiro). This number might be an important indication of an increasing re-articulation of Indigenous identities and the declaration of “rights and relationship with the state” (Pacheco de Oliveira, *A History of Brazilian Indians in the National Censuses* 198), as the self-identification as Indigenous implies a positionality in front of the state concerning demands and treatment.

Evaluation and recommendations

The results of the analysis conducted in section 5 accentuate the material and discursive dimensions of Indigenous inequalities, which serves the continuation of historical power relations in social, political, and economic realms. The PE approach unraveled that the inequalities root in different forms of appropriation of the natural environment, which is understood in hegemonic terms as the material source of extraction and imperial develo-

pment and the discursive tool of separation between humans and nature. It creates 'otherness' to affirm dominance (Ramos 166-168). As a symbol and as a reality, the natural environment becomes the frontier of clashes between two inherently different ways of living. Trying to think of the case study in terms of the SDG agenda, the realization is that 'sustainable development' mirrors a "hegemonic global discourse" (Bingham 1), which does not guarantee sustainable futures for people and planet. More precisely, the proclaimed reduction of inequalities in Goal 10 does not even consider structural inequalities as inherent to the globalized world, which have been identified as the root cause in the case study. Moreover, Goal 10.2, advocating for the "social, economic and political inclusion of all", proposes an economic indicator for its assessment, what subverts most of the evidence brought forward in the case study. Therefore, situating Brazil within this conflictive framework will not respond to the need for a socio-ecological turn that would allow IPs to effectively fight inequalities, as long as it sticks to understandings of sustainability which continue to harm Indigenous peoples and further increase their environmental vulnerability towards human made climate change. An agenda for sustainable futures and livelihoods must recognize that the needs of peoples and planet are united in their reliance on just environments, even more so in times of ecological crises, if they want to prevail in the long term.

For a sustainable agenda, it is substantial that it denounces coloniality and its violent forms of appropriation and destruction. A greater dialogue among sustainability indicators is necessary to portray complex realities. The case study proves that inequalities must take into consideration the environmental and historical relations. In this sense, the scope of this paper goes necessarily beyond any 'sustainable development' narrative. While positive or negative developments could be equally articulated in this weak framework, a Latin American perspective of PE achieves to shed light on the structuralism of inequalities in the case study. Its role can be described as follows:

“Political ecology and its critical analysis of the socio-natural relations that build our reality have a key role in exposing the processes, dynamics, and consequences of degradation and violence present in the practices of transformation and production of nature, as well as in countering this reality and pointing toward new paths” (Empinotti et al. 2).

The critical nature of the concept inevitably points to the global dimension as well. With a view to how frontier dynamics at the same time constitute Indigenous inequalities and represent a global system of accumulation that has reached the tipping point of causing irreversible damage, this paper fits into a dialogue of global importance, which exactly seeks to point “toward new paths”. Regarding the fundamental question about what can be done to reduce inequalities, the paper endorses the implementation of already existing recommendations by the Permanent Forum on Indigenous Issues (PFII) in its latest report “State of the World’s Indigenous Peoples”, which focuses specifically on rights to lands, territories and resources. The report inter alia calls for states’ compliance with international legal frameworks (ILO169 and UNDRIP), the creation of effective and protective national legislation, the inclusion of IPs in legislation and consultation processes, especially the free, prior and informed consultation principle (FPIC), and respect for their identities and support for autonomous conservation efforts (United Nations 78-81, 117). Nevertheless, these institutional and widely shared or accessible recommendations seem to lose capacity and a sense of urgency exactly because of their institutionalized character.

Beyond these means, I want to highlight the importance of all forms of environmental, political, and social activism and the active articulation of decolonization, justice, and sustainability as powerful means for change and the manifestation of indigenous life. These means are designed by and for Indigenous peoples and allies in the process of building a strong agenda for environmental justice. The abstract nature of recommendations is due to the generic scope of the paper, but also because the analysed inequa-

lities are part of wicked problems which are part of the foundations of the modern Brazilian society and the contemporary global system. The case study suggests that the application of already existing rules and legislation would significantly reduce inequalities. However, the very non-compliance is the articulation of a structural inequality which remains a major obstacle towards historical and environmental justice for IPs. The hegemony of the state becomes also visible in its capacity to selectively endorse (See Lightfoot, Selective Endorsment without intent to implement for an account on Anglosphere practices, which offer some analogies to the Brazilian case) Indigenous legislation following its own interests, visible in Brazil through the subjugation of Indigenous rights by the preferential treatment of issues voiced as 'national' importance. The role of the global political movement of Indigeneity is to create a platform for solidarity and organization. At its core, the movement calls for the elaboration and integration of other epistemologies in the place of the patterns of hegemonic and Eurocentric knowledge. This process departs from a perspective which builds on an ecosystem perspective to re-assess the human paths of creating meaning and value on planet earth.

In the context of deconstruction and transformation, the articulation of an Indigenous political ecology, which aims at dismantling the Eurocentric approaches towards power, political economy, and human-environment relations (Middleton 561-562, 573), can be a powerful tool. It rearticulates the centrality of place in approaching indigenous identities, knowledge, and spirituality. Similarly, the further consolidation of a distinctive field of Latin American Feminist Political Ecology (LAFPE) incorporates gender relations as "a central analytical category to understand the differentiated processes between men and women in relation to the environmental conflicts and issues" (Ulloa 435). It is a necessary and situated critique of Latin American PE current, which does not achieve to highlight the complex and integral role of gender in constituting ongoing inequalities. In this sense, the increasing importance feminist political ecologies (FPEs) in a Latin American context will give further voice to subaltern and

dissenting feminisms and build on existing forms of communitarian feminisms, especially in an Indigenous context (Ulloa 437).

Decolonization is a shared theme in most analyses and identifies the decarbonization of ‘developed’ economies as based on rearticulations of exploitation of IPs in the majority world and Brazil. Hereby, patterns of coloniality are openly reproduced. Sultana reminds that it is indispensable to recognize climate coloniality and act upon it by deconstructing the status quo with the help of robust and decolonial EJ movements (62), including the “Indigenization of knowledge and politics” (63). The acknowledgement of IPs’ knowledge and methods of conservation and sustainable land-use by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in its Global Assessment Report (IPBES) is an important sign to policy makers and governments, giving voice to communities’ role to play in climate mitigation and adaptation strategies. Nevertheless, it must be ensured that this recognition is coupled to more autonomy in decision-making instead of renewed processes of hegemonic appropriation. The paramount importance of autonomous decision-making rests on a rigid application of the FPIC principle, especially on indigenous land. Free, prior, and informed consultation is binding in Brazil through the ILO 169 and as part of the universal right to self-determination. Nevertheless, Schumann argues that this political right has often been eroded through varying legal interpretation (16), which essentially stripped IPs of this fundamental right. The construction of the previously mentioned Belo Monte dam is an example of such conscious non-compliance by the Brazilian state. In terms of conservation strategies, Anaya and Espírito-Santo note that these need to be designed in terms of social and environmental justice and wellbeing for people and communities, instead of following numeric indicators (10). For the successful projecting of a justice movement that addresses Indigenous issues, it will be beneficial to seek more active co-operation of the Indigenous movement with the EJ movement on a national scale. As suggested before, the historical condition of Indigenous inequalities distinguishes itself from many other

forms of inequality, but as Miki points out, the relevance of “the interconnectedness of indigenous and black histories” (12) in the ideological creation of the Brazilian nation, might be of useful insight for the perspective of the environmental justice movement. Pacheco advocates for a united movement “beyond the question of color”, in order to capture the intersecting and diverse rooted inequalities under a similar hegemonic paradigm identified throughout the paper. She coins a dominant doctrine behind the inequalities as *environmental racism*, referring to “the social and environmental injustices that fall disproportionately on ethnic groups that have been made vulnerable” (Pacheco 721). This holistic observation of similarities in environmental inequalities in Brazil hints towards the necessity of an alternative model which does not rest on the violent separation of people and nature in an appropriative attempt to control them.

The destination that serves as an inspiration to bring the human, more-than-human, and nature in balance again, be named as *planetary wellbeing*. The paper argues for the necessity of such undertaking, supported by arguments of justice, equity, the biospheric limits of the planet, and the human capacity to enable the necessary social change. Planetary wellbeing is a broad term, but it is a suited guiding principle in what needs to be done to reduce the inequalities of IPs as part of a mode of living which follows overall different societal goals.

Planetary wellbeing resembles a holistic understanding of wellbeing, which as an ecological critique must not be understood in terms of wellbeing in modernity, western individualism (Carlisle et al. 1557-1558), and the overall “anthropocentric normative orientation” (Kortetmäki et al. 1). Rather, planetary wellbeing promotes equal wellbeing of humans and non-humans and shifts the methodological attention from individuals towards earth and ecosystem processes (Kortetmäki et al. 3). By applying a systems oriented and non-anthropocentric approach, planetary wellbeing aims at “bridging divergent worldviews” (6), similar to what Agrawal (1995 433) proposed by dismantling the dichotomy of scientific and indigenous or traditional knowledge. The pursuit

of planetary wellbeing requires the redefinition of prosperity, the acknowledgement of the limitations and flaws of the scientific method and the awareness that it needs cultural and societal transformations (See generally Kortetmäki et al.; Redvers et al.). Applied to Indigenous struggles and the broader environmental injustices in Brazil, this process must necessarily be one of decolonial character. The decolonization of power relations and the reappropriation of nature are phenomena that would reduce the omnipresent inequalities and advance the agenda of planetary wellbeing. Indigenous *Retomadas* stand emblematic for this undertaking, which bring together “the political will of the people who participate in them and the key document that [...] their status as indigenous individuals [represents]” (Pacheco de Oliveira, *Fighting for Lands and Reframing the Culture* 13). Existing alternative modes of living, among them *bem viver*, are site-specific dynamics which actively practice sustainability in human-environment relations. As a final consideration, it is the land itself, and the interactions it englobes, what matters. Sustainability and wellbeing emerge from the ground, and one should learn from the insight that this realization offers.

Conclusion

Throughout the paper, the initial research questions formulated on page two have been systematically approached. A theoretical and thematic corridor was established by introducing the concepts of Political Ecology and Indigeneity, and important features of environmental justice in the Brazilian context. Under the premise of analysing the ongoing inequalities that IPs, historical conditions were considered when approaching the contemporary modes of appropriation that take place in the *frontier*. There are different logics and perspectives when it comes to understanding frontiers, but their commonality consists in illustrating conflicts and struggles. While the meaning and understanding of frontiers goes beyond a given spatial dimension, my analysis has identified them as the spaces where processes of inequalities and environmental

degradation are interlocked, locally affecting IPs and the environment, and globally contributing to intensifying environmental crises. Followingly, any attempt of evaluating Indigenous inequalities must acknowledge the interdependence of systems of human oppression with systems of environmental discrimination.

By considering this finding, the paper concludes that the general accumulation regime of capitalism, the monetarization of natural resources for the objective of national economic development, as well as decarbonization and global ‘greening’ narratives led by the ‘developed’ states and expanding throughout the world, perpetuate coloniality in Brazil. It has been articulated that the SDG agenda proposed by the UN is unable to capture these complex and systemic modes of oppression. Even more, the ongoing hegemonic appropriation of nature reconstitutes inequalities for the historically marginalized, especially Indigenous peoples. The analysis portrays how they were deliberately “made vulnerable” (Pacheco 721) through histories of colonization, violence, state-formation, and portraiture. In times of an approaching ecological collapse, mainstream narratives reproduce this coloniality, suggesting that increasing inequalities and further accumulation are not the main problem. It is a harmful gesture by the privileged minority and emblematic of their short-term and individualist thinking. For the overwhelming majority of the world population, it is a catastrophic assumption, which needs to be countered by collective efforts for a historical environmental justice.

In order to conduct the analysis, the research paper builds to a large extent on argumentative and conceptual ideas based on scientific data from the fields of ecology, history, political science, and anthropology. Brazil proves to be a relevant context for the case study, suggesting that more emphasis on the environmental dimension of inequalities is needed to develop societal models that promote historical equality and justice, which would profoundly renew the human-nature relationship. To think about sustainability and wellbeing from a system-based perspective is a first step towards the reduction of inequalities, for Indigenous peoples in Brazil and other marginalized communities around the world. Ne-

vertheless, time is overdue and the current direction not goal oriented. The pathway of IPs will be shaped by the state's compliance with existing legal frameworks, the impact of Indigenous politics and activism, and the influence that a growing environmental justice movement can exert (globally). While there are local and decentralized initiatives which successfully fight inequalities, it will need the policy-makers initiative to support the access and the distribution of different philosophies, ontologies, and epistemologies in the sense of a detachment from the prevailing knowledges, as Mignolo formulated it, which still give continuity to the ideological canon of interdependent colonial and capitalist accumulation.

Literature

- Acsehrad, Henri, et al.** "Desigualdade ambiental e acumulação por espoliação: o que está em jogo na questão ambiental?" *E-Cadernos CES*, vol. 17, Sept. 2012, pp. 164–83, <https://doi.org/10.4000/eces.1138>.
- Agrawal, Arun.** "Dismantling the Divide Between Indigenous and Scientific Knowledge." *Development and Change*, vol. 26, no. 3, July 1995, pp. 413–39, <https://doi.org/10.1111/j.1467-7660.1995.tb00560.x>.
- Alarcon, Daniela Fernandes.** "The Return of Relatives: Processes of Mobilisation and Village Construction among the Tupinambá of Serra Do Padeiro, Southern Bahia, Brazil." *Vibrant: Virtual Brazilian Anthropology*, vol. 15, no. 2, Nov. 2018, <https://doi.org/10.1590/1809-43412018v15n2a401>.
- Alcantara, Maria.** "Eliesio Marubo: 'Brazilian Politics Has given No Importance to the Indigenous Movement's Agenda.'" *Debates Indigenas*, Dec. 2022, debatesindigenas.org/ENG/ns/204-eliesio-marubo-brazilian-politics-has-given-no-importance.html.
- . "Joenia Wapichana: 'FUNAI Was Not Defending Indigenous Peoples.'" *Debates Indigenas*, Feb. 2023, debatesindigenas.org/ENG/ns/207-funai-was-not-defending-indigenous-peoples.html.
- Alimonda, Héctor.** "The Coloniality of Nature: An Approach to Latin American Political Ecology." *Alternautas*, vol. 6, no. 1, 2019, pp. 102–42, <http://www.alternautas.net/blog/2019/6/10/the-coloniality-of-nature-an->.
- . *Una Introducción a La Ecología Política Latinoamericana (Pasando Por La Historia Ambiental)*. 2015, redcolca.org/pdf/Alimonda-Ecologia-Politica-Latinoamericana.pdf.
- Anaya, Felisa C., and Mário Espírito-Santo.** "Protected Areas and Territorial Exclusion of Traditional Communities: Analyzing the Social Impacts of Environmental Compensation Strategies in Brazil." *Ecology and Society*, vol. 23, no. 1, 2018, [jstor.org/stable/26799038](https://www.jstor.org/stable/26799038).

- Barreto, Marcos Rodrigues.** "Índios de Papel – Construção Discursiva Do Preconceito Sobre o Indígena No Brasil." *Brasiliiana: Journal for Brazilian Studies*, vol. 5, no. 1, May 2022, pp. 9–32, <https://doi.org/10.25160/bjbs.v5i1.23040>.
- Basnett, Bimbika Sijapati**, et al. "SDG 10: Reduced Inequalities – An Environmental Justice Perspective on Implications for Forests and People." *Sustainable Development Goals: Their Impacts on Forests and People*, edited by Carol J Pierce Colfer et al., Cambridge University Press, Cambridge, 2019, pp. 315–48.
- Bingham, Alexa.** "Discourse of the Dammed: A Study of the Impacts of Sustainable Development Discourse on Indigenous Peoples in the Brazilian Amazon in the Context of the Proposed Belo Monte Hydroelectric Dam." *Alexa Bingham POLIS Journal*, vol. 4, no. 2, 2010, pp. 1–47.
- Blaikie, Piers, and Harold Brookfield**, editors. *Land Degradation and Society*. 1st ed., Routledge, 1987, [https://doi.org/https://doi.org/10.4324/9781315685366](https://doi.org/10.4324/9781315685366).
- Blaikie, Piers.** "A Review of Political Ecology." *Issues, Epistemology and Analytical Narratives*, vol. 43, no. 1, 1999, pp. 131–47, <https://doi.org/10.1515/zfw.1999.0009>.
- Borras Jr., Saturnino, and Sérgio Sauer.** "Land Grabbing e Green Grabbing: Uma Leitura Da Corrida Na Produção Acadêmica Sobre a Apropriação Global de Terras." *Território: Revista de Geografia Agrária. Edição Especial.*, 2016, pp. 6–42. <https://doi.org/10.14393/RCT112301>.
- Brand, Ulrich, and Markus Wissen.** "Imperiale Lebensweise." *Handbuch Politische Ökologie*, edited by Daniela Gottschlich et al., transcript Verlag, 2022, pp. 393–98, <https://doi.org/10.1515/9783839456279-037>.
---. *Imperiale Lebensweise. Zur Ausbeutung von Mensch Und Natur Im Globalen Kapitalismus*. München: oekom Verlag, 2017.
- Bridi, Carla, and Fabiano Maisonnave.** "Lula Reconoce 6 Áreas Indígenas, La Mayoría En La Amazonía." *AP News*, 28 Apr. 2023, <https://apnews.com/article/noticias-c2875d18fe7de7198820ccaa4e50835d>.
- Brito, Brenda**, et al. "Stimulus for Land Grabbing and Deforestation in the Brazilian Amazon." *Environmental Research Letters*, vol. 14, no. 6, 2019, <https://doi.org/10.1088/1748-9326/ab1e24>.
- Bryant, Raymond L.** "Power, Knowledge and Political Ecology in the Third World: A Review." *Progress in Physical Geography: Earth and Environment*, vol. 22, no. 1, Mar. 1998, pp. 79–94, <https://doi.org/10.1177/030913339802200104>.
---. "Putting Politics First: The Political Ecology of Sustainable Development." *Global Ecology and Biogeography Letters*, vol. 1, no. 6, 1991, pp. 164–66, <https://doi.org/10.2307/2997621>.
- Carlisle, Sandra**, et al. "'Wellbeing': A Collateral Casualty of Modernity?" *Social Science & Medicine*, vol. 69, no. 10, 2009, pp. 1556–60, <https://doi.org/10.1016/j.socscimed.2009.08.029>.
- Carneiro, Lucianne.** "Com Número Preliminar, Censo 2022 Conta 1,652 Milhão de Indígenas No País." *Globo*, 3 Apr. 2023, <https://valor.globo.com/brasil/noticia/2023/04/03/com-nmero-preliminar-censo-2022-counta-1652-milho-de-indgenas-no-pas.ghtml>.
- CIMI.** *Violence against Indigenous Peoples in Brazil - 2021 Data*. 2021, cimi.org.br/2022/08/relatorioviolencia2021/.

- Clifford, James.** *Returns: Becoming Indigenous in the Twenty-First Century.* Harvard University Press, 2013.
- CPT.** *Conflitos No Campo Brasil 2019.* Goiânia: CPT, Apr. 2020, cptnacional.org.br/component/jdownloads/summary/41-conflitos-no-campo-brasil-publicacao/14195-conflitos-no-campo-brasil-2019-web.
- Corntassel, Jeff.** "Who Is Indigenous? 'Peoplehood' and Ethnonationalist Approaches to Articulating Indigenous Identity." *The Concept of Indigenous Peoples in Asia: A Resource Book*, edited by Christian Erni, 2008, pp. 51–76.
- Cunha, Manuela Carneiro da, and Mauro W. B. de Almeida.** "Indigenous People, Traditional People, and Conservation in the Amazon." *Daedalus*, vol. 129, no. 2, 2000, pp. 315–38. JSTOR, [jstor.org/stable/20027639](https://www.jstor.org/stable/20027639).
- Dieguez Leuzinger, Márcia, and Kylie Lyngard.** "The Land Rights of Indigenous and Traditional Peoples in Brazil and Australia." *Revista de Direito Internacional*, vol. 13, no. 1, Aug. 2016, pp. 419–39, <https://doi.org/10.5102/rdi.v13i1.4065>.
- Dourado, Martha Fellows, et al.** "A Gestão Ambiental e Territorial de Terras Indígenas Da Amazônia Brasileira: Uma Questão Climática." *Brasílica: Journal for Brazilian Studies*, vol. 5, no. 1, May 2022, pp. 230–53, <https://doi.org/10.25160/bjbs.v5i1.23031>.
- Empinotti, Vanessa Lucena, et al.** "Between Crises and Insurgencies: The Political Ecology in Defense of Shared Living." *Ambiente e Sociedade*, vol. 24, 2021, <https://doi.org/10.1590/1809-4422asoc20210160vu2021L5ID>.
"Environmental Degradation." *Economic and Social Commission for Western Asia*, archive.unescwa.org/environmental-degradation. Accessed 12 Oct. 2022.
- Escobar, Arturo.** "Construction Nature: Elements for a Post-Structuralist Political Ecology." *Futures*, vol. 28, no. 4, 1996, pp. 325–43, [https://doi.org/10.1016/0016-3287\(96\)00011-0](https://doi.org/10.1016/0016-3287(96)00011-0).
- Fanon, Frantz.** *The Wretched of the Earth.* Edited by Richard Philcox, Grove Press, 1963.
- Ferrari-Nunes, Rodrigo.** "Indigeneity and Consciousness in Brazil: Analyzing Sousa (1587) and Mendes Jr (1912)." *Critique of Anthropology*, vol. 31, no. 3, Sept. 2011, pp. 185–209, <https://doi.org/10.1177/0308275X11409730>.
- Fields, Karen E., and Barbara J. Fields.** *The Soul of Inequality in American Life.* Verso, 2012.
- Gallois, Dominique Tilkin.** "Terras Ocupadas? Territórios? Territorialidades?" *Terras Indígenas e Unidades de Conservação Da Natureza. O Desafio Das Sobreposições Territoriais*, edited by Fany Ricardo and Valéria Macedo, Instituto Socioambiental, 2004, pp. 37–41.
- Garvey, Brian, et al.** "Green Crime, Territorial Resistance and the Metabolic Rift in Brazil's Amazon and Cerrado Biomes." *Criminological Encounters*, vol. 5, no. 1, 2022, pp. 165–82, <https://doi.org/10.26395/CE22050111>.
- Ghosh, Emily, et al.** "The Missing Link between Inequality and the Environment in SDG 10." *Transitioning to Reduced Inequalities*, edited by Sabin Bieri and Christoph Bader, 10th ed., 2023, pp. 19–44.
- Gomez, Abel R.** "Indigeneity." *Political Theology Network*, Jan. 2023 politicaltheology.com/indigeneity/.
- Gramkow, Camila.** "O Big Push Ambiental No Brasil Investimentos Coordenados Para Um Estilo de Desenvolvimento Sustentável." *Perspectivas - Fundación Friedrich Ebert*, no. 20, Mar. 2019, hdl.handle.net/11362/44506.

- Guterres, António.** *Secretary-General's Remarks at Opening Ceremony of the 22nd Session of the UN Permanent Forum on Indigenous Issues [as Delivered]*. 17 Apr. 2023, un.org/sg/en/content/sg/statement/2023-04-17/secretary-generals-remarks-opening-ceremony-of-the-22nd-session-of-the-un-permanent-forum-indigenous-issues-delivered#:~:text=%20salute%20indigenous%20movements%20across,land%20management%20and%20climate%20adaption.
- Harvey, David.** "The Nature of Environment: Dialectics of Social and Environmental Change." *The Socialist Register: Real Problems False Solutions*, edited by Ralph Miliband and Leo Panitch, vol. 29, The Merlin Press, 1993, pp. 1–51.
- Herculano, Selene.** "Riscos e Desigualdade Social: A Temática Da Justiça Ambiental e Sua Construção No Brasil." *Encontro Da ANPPAS*, vol. 1, 2002, pp. 1–15.
- Hickel, Jason.** "Global Inequality." *A Handbook of Economic Anthropology*, edited by James G Carrier, 3rd ed., Edward Elgar Publishing, 2022, pp. 316–30, <https://doi.org/10.4337/9781839108921.00035>.
- Hoffman French, Jan.** "The Power of Definition: Brazil's Contribution to Universal Concepts of Indigeneity." *Indiana Journal of Global Legal Studies*, vol. 18, no. 1, 2011, pp. 241–61, <https://doi.org/10.2979/indjglolegstu.18.1.241>.
- ILO.** "Ratifications of C169 - Indigenous and Tribal Peoples Convention, 1989 (No. 169)." *International Labour Organization*, ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO::P11300_INSTRUMENT_ID:312314. Accessed 31 May 2023.
- Ioris, Antonio A. R.** "Racism and Indifference in Brazil: Anti-Indigenous Text, Action, and Sensibility." *Human Arenas*, 2023, <https://doi.org/10.1007/s42087-022-00321-7>.
- IPBES.** *Global Assessment Report on Biodiversity and Ecosystem Services*. Edited by E.S. Brondizio et al., IPBES secretariat, 2019, <https://doi.org/10.5281/zenodo.3831673>.
- Kortetmäki, Teea, et al.** "Planetary Well-Being." *Humanities and Social Sciences Communicatons*, vol. 8, 2021, <https://doi.org/10.1057/s41599>.
- Kröger, Markus.** "Frontiers of Existence: Redefining Who Can Exist and How at Resource Frontiers." *Suomen Antropologi: Journal of the Finnish Anthropological Society*, vol. 46, no. 1, Nov. 2021, pp. 77–96, <https://doi.org/10.30676/jfas.v46i1.99900>.
- Le Tourneau, François-Michel.** "The Sustainability Challenges of Indigenous Territories in Brazil's Amazonia." *Current Opinion in Environmental Sustainability*, vol. 14, 2015, pp. 213–20, <https://doi.org/https://doi.org/10.1016/j.cosust.2015.07.017>.
- Leff, Enrique.** "Political Ecology: A Latin American Perspective." *Desenvolvimento e Meio Ambiente*, vol. 35, Dec. 2015, pp. 29–64, <https://doi.org/10.5380/dma.v35i0.44381>.
- Lightfoot, Sheryl.** *Global Indigenous Politics: A Subtle Revolution*. Routledge, 2016.
- Lightfoot, Sheryl.** "Selective Endorsement without Intent to Implement: Indigenous Rights and the Anglosphere." *The International Journal of Human Rights*, vol. 16, no. 1, Jan. 2012, pp. 100–22, <https://doi.org/10.1080/13642987.2012.622139>.
- Lugones, María.** "Colonialidad y Género." *Tabula Rasa*, vol. 9, July 2008, pp. 73–101, revistas.unicolmayor.edu.co/index.php/tabularasa/article/view/1501.
- Machado Junior, Edmundo F.** *Grilagem Verde No Cerrado: Impactos Sob Os Territórios Das Comunidades Tradicionais No Sul Do Piauí*. 1, 2018.
- "Mapa De Conflitos."** *Injustiça ambiental e saúde no Brasil: o Mapa de Conflitos* mapadeconflitos.ensp.fiocruz.br/?populacao_tax=povosindigenas&atv_gerad_tax=0&dano_tax=0&impacto_tax=0&uf_tax=0&q. Accessed 13 May 2023.

- McGregor, Deborah**, et al. "Indigenous Environmental Justice and Sustainability." *Current Opinion in Environmental Sustainability*, vol. 43, 2020, pp. 35–40, <https://doi.org/10.1016/j.cosust.2020.01.007>.
- Merlan, Francesca**. "Indigeneity: Global and Local." *Current Anthropology*, vol. 50, no. 3, June 2009, pp. 303–33, <https://doi.org/10.1086/597667>.
- Middleton, Beth Rose**. "Jahât Jat'totôdom: Toward an Indigenous Political Ecology." *The International Handbook of Political Ecology*, edited by Raymond L. Bryant, Edward Elgar Publishing, 2015, pp. 561–76, <https://doi.org/10.4337/9780857936172.00051>.
- Mignolo, Walter**. *Desobediencia Epistémica. Retórica de La Modernidad, Lógica de La Colonialidad y Gramática de La Descolonialidad*. Ediciones del Signo, 2010.
- Miki, Yuko**. "Frontiers of Citizenship: A Black and Indigenous History of Postcolonial Brazil." *Afro-Latin America*, Cambridge University Press, 2018, <https://doi.org/10.1017/9781108277778>.
- Ministério da Justiça**. "Estatuto Do Índio." *Presidência Da República*, Lei nº 6.001, 19 Dec. 1973, http://www.planalto.gov.br/ccivil_03/leis/l6001.htm.
- Ministério dos Povos Indígenas**. *Nos 100 Dias de Governo Lula, Funai Inicia Processo de Retomada Da Política Indigenista*. Apr. 2023, gov.br/funai/pt-br/assuntos/noticias/2023/nos-100-dias-de-governo-lula-funai-inicia-processo-de-retomada-da-politica-indigenista.
- Mitchell, Sean T**. *Constellations of Inequality: Space, Race, and Utopia in Brazil*. University of Chicago Press, 2017.
- Molon, Alessandro**, et al. *Green New Deal Brasil 30 Ações Até 2030 Para Um Desenvolvimento Justo e Sustentável*. 2021, gnd-brasil.com.br.
- Mueller, Bernardo**. "Property Rights and Violence in Indigenous Land in Brazil." *Land Use Policy*, vol. 116, 2022, <https://doi.org/10.1016/j.landusepol.2022.106063>.
Nakoda: Strategies for Modern Art. 9 July – 18 Dec. 2022, Museu de Arte Moderna do Rio de Janeiro, Rio de Janeiro.
- Niezen, Ronald**. "The Origins of Indigenism: Human Rights and the Politics of Identity." *Human Rights and the Politics of Identity*, University of California Press, 2003, pp. 53–93, <https://doi.org/doi:10.1525/9780520936690-005>.
- Pacheco de Oliveira, João**. "Entering and Leaving the 'Melting Pot': A History of Brazilian Indians in The National Censuses." *Journal of Latin American Anthropology*, vol. 4, no. 2, Mar. 1999, pp. 190–211, <https://doi.org/10.1525/jlca.1999.4.2.190>.
---. "Fighting for Lands and Reframing the Culture." *Vibrant*, vol. 15, no. 2, 2018, journals.openedition.org/vibrant/2357.
---. "Sem a Tutela, Uma Nova Moldura de Nação: O Pós-Constituição de 1988 e Os Povos Indígenas." *Brasiliana: Journal for Brazilian Studies*, vol. 5, no. 1, May 2022, pp. 200–29, <https://doi.org/10.25160/bjbs.v5i1.23353>.
- Pacheco, Tânia**. "Inequality, Environmental Injustice, and Racism in Brazil: Beyond the Question of Colour." *Development in Practice*, vol. 18, no. 6, 2008, pp. 713–25, JSTOR, jstor.org/stable/27751978.
- Porto, M.**, et al. *Injustiça Ambiental e Saúde No Brasil: O Mapa de Conflitos*. E-Book, Editora Fiocruz, 2013.

- Porto-Gonçalves, Carlos, and Enrique Leff.** "Political Ecology in Latin America: The Social Re-Appropriation of Nature, the Reinvention of Territories and the Construction of an Environmental Rationality." *Desenvolvimento e Meio Ambiente*, vol. 35, Dec. 2015, pp. 65–88, <https://doi.org/10.5380/dma.v35i0.43543>.
- Price, Kiley.** "Indigenous Leaders: To Tackle Climate Change, 'we Must First Address Racial Inequality'" *Conservation International*, Aug. 2020, conservation.org/blog/indigenous-leaders-to-tackle-climate-change-we-must-first-address-racial-inequality.
- Puga, Buno P., et al.** "Green New Deal Para Ellos y Same Old Deal Para Nosotros." *Ecología Política: Cuadernos de Debate Internacional*, no. 64, 2022, pp. 81–85.
- Quijano, Aníbal.** "Coloniality of Power and Eurocentrism in Latin America." *International Sociology*, vol. 15, no. 2, June 2000, pp. 215–32, <https://doi.org/10.1177/0268580900015002005>.
- Ramos, Alcida R.** "A Hall of Mirrors: The Rhetoric of Indigenism in Brazil." *Critique of Anthropology*, vol. 11, no. 2, June 1991, pp. 155–69, <https://doi.org/10.1177/0308275X9101100205>.
- Rebello, Daniela.** "Brazil's First-Ever Ministry of Indigenous Peoples Launched amid a State of Emergency." *NACLA*, Feb. 2023, nacla.org/brazils-first-ever-ministry-indigenous-peoples-launched-amidst-state-emergency.
- Redvers, Nicole, et al.** "The Determinants of Planetary Health: An Indigenous Consensus Perspective." *The Lancet Planetary Health*, vol. 6, no. 2, 2022, pp. 156–63, [https://doi.org/10.1016/S2542-5196\(21\)00354-5](https://doi.org/10.1016/S2542-5196(21)00354-5).
- Ribeiro, Darcy.** *O Povo Brasileiro: A Formação e o Sentido Do Brasil*. 2nd ed., São Paulo: Companhia da Letras, 1995.
- Roller, Heather F.** *Contact Strategies: Histories of Native Autonomy in Brazil*. Stanford University Press, 2021.
- Sawaya, Alexandre, et al.** "The Green Hidden Gem – Brazil's Opportunity to Become a Sustainability Powerhouse." *McKinsey & Company*, Nov. 2022, mckinsey.com/br/en/our-insights/all-insights/the-green-hidden-gem-brazils-opportunity-to-become-a-sustainability-powerhouse#.
- Schlemer Alcântara, Liliane C. And C. A. Cioce Sampaio.** "Bem Viver: Uma Perspectiva (Des)Colonial Das Comunidades Indígenas*." *Revista Rupturas*, vol. 7, no. 2, 2017, pp. 1–31, <http://doi.org/10.22458/rr.v7i2.1831>.
- Schumann, Charlotte.** "Competing Meanings: Negotiating Prior Consultation in Brazil." *The Journal of Latin American and Caribbean Anthropology*, vol. 23, no. 3, Nov. 2018, pp. 541–59, <https://doi.org/10.1111/jlca.12364>.
- Sultana, Farhana.** "Decolonizing Climate Coloniality." *Not Too Late: Changing the Climate Story from Despair to Possibility*, edited by Rebecca Solnit and Thelma Young Lutunatabua, Haymarket Books, 2023, pp. 58–65.
- Tauli-Corpuz, Victoria.** "The Concept of Indigenous Peoples at the International Level: Origins, Development and Challenges." *The Concept of Indigenous Peoples in Asia: A Resource Book*, edited by Christian Erni, 2008, pp. 77–99.
- Teixeira, Fabio.** "What Is 'green Land Grabbing' - and Why Is It Surging in Brazil?" *Thomson Reuters Foundation*, Nov. 2021, news.trust.org/item/20210929090849-bswj7.

- Tetreault, Darcy.** "Three Forms of Political Ecology." *Ethics & the Environment*, vol. 22, 2017, [https://doi.org/ 10.2979/ethicsenviro.22.2.01](https://doi.org/10.2979/ethicsenviro.22.2.01).
- Thaler, Gregory M., et al.** "From Frontier Governance to Governance Frontier: The Political Geography of Brazil's Amazon Transition." *World Development*, vol. 114, 2019, pp. 59–72, <https://doi.org/https://doi.org/10.1016/j.worlddev.2018.09.022>.
- Ulloa, Astrid.** "Feminist Political Ecologies in Latin American Context." *Companion to Feminist Studies*, 2020, pp. 427–46, <https://doi.org/https://doi.org/10.1002/9781119314967.ch24>.
- United Nations.** *State of the World's Indigenous Peoples: Rights to Lands, Territories and Resources*. Edited by Terri Lore, vol. 5, United Nations Publications, 2023.
"United Nations Department of Economic and Social Affairs." *Reduce Inequality within and among Countries*, sdgs.un.org/goals/goal10. Accessed 7 Oct. 2022.
- Watts, Michael.** "Political Ecology." *A Companion to Economic Geography*, 2017, pp. 257–74, <https://doi.org/https://doi.org/10.1002/9781405166430.ch16>.

NASLOV ZBIRKE: OIKOS, Modra

UREDNIK ZBIRKE: dr. Andrej A. Lukšič

TAJNIK ZBIRKE: Nejc Jordan

UREDNIŠTVO ZBIRKE:

Marko Hočevar, Nejc Jordan, Andrej A. Lukšič, Izidor Ostan Ožbolt,
Taj Zavodnik, Karla Tepež, Sultana Jovanovska

MEDNARODNI ZNANSTVENI SVET ZBIRKE:

Dan Chodorkoff, Nives Dolšak, John S. Dryzek, Robyn Eckersley, Marina Fischer-Kowalski, Christoph Görg, Lučka Kajfež-Bogataj, Andrej Kirn, Drago Kos, Bogomir Kovač, Andrej Kurnik, Nicholas Low, Catriona Mortimer-Sandilands, Darko Nadić, Luka Omladič, Dušan Plut, Ariel Salleh, Mark C. J. Stoddart, Romina Rodela, Irina Velicu, Žiga Vodovnik, Christos Zografos, Cheng Xiangzhan.

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Inštitut za ekologijo, za založnika: Andrej Lukšič

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