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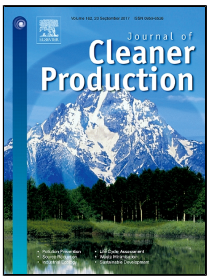

The Transition of Germany`s Energy Production, Green Economy, Low-Carbon Economy, Socio-Environmental Conflicts, and Equitable Society

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PII:	S0959-6526(17)31679-7
DOI:	10.1016/j.jclepro.2017.07.223
Reference:	JCLP 10226
To appear in:	*Journal of Cleaner Production*
Received Date:	12 July 2016
Revised Date:	03 April 2017
Accepted Date:	29 July 2017

Please cite this article as: Gabriel Weber, Ignazio Cabras, The Transition of Germany`s Energy Production, Green Economy, Low-Carbon Economy, Socio-Environmental Conflicts, and Equitable Society, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.07.223

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Wordcount: 5978

Abstract
Low carbon transitions have been predominantly analysed using quantitative methods, mostly building on present and forecasted data of social metabolism. This paper addresses both the economic and social dimensions of low carbon emissions by analysing the presence of socio-environmental conflicts in Germany. These conflicts appear to be a consequence of unsustainable policies targeting firms' planning and behaviour, mainly based on neoclassical economic thinking and various stakeholder groups that oppose carbon intensive businesses. By applying a Delphi Method with 18 experts, the authors analyse 117 socio-environmental conflicts (e.g. derived from extractive activity, energy production, and infrastructure projects) in Germany. Most of these conflicts include the struggle of various society groups to achieve a low carbon economy but also a more equitable society. The analyses presented in this paper shows that Germany provides both the best and the worse of achieving low carbon paths: a significant investment into renewable energy, but also a strong dependency on lignite which supplies the most polluting power stations of Europe. By addressing the problem from an historical perspective, the authors demonstrate how carbon intensive extractive activity has been one of the major causes for environmental activism and protest in both socialist and capitalist societies.

Highlights:

German energy transition raises questions of equitability as energy poverty has increased

Green Economy focus favours mega projects as high voltage power lines

Despite ambitious goals, Germany (so far) has remained a high-carbon economy

Extraction activities targeting lignite had been dominant in both socialist and post-socialist Germany

The Vattenfall's divestment from Lusatian Lignite is presented as a case of corporate de-growth

Keywords:
Germany, Energy Transition, Green Economy, Low-Carbon Economy, Socio-Environmental Conflicts, Equitable Society

1. Introduction

The "Green Economy" manifesto, launched during the Rio+20 summit in 2014, addresses growth in income and employment which is "driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services" (UNEP, 2011 p.16). Germany ranks first in the so called Green Economy Perception Index (Tamanini, 2014). German policymakers tend to associate a greener economy with the transition towards a low-carbon economy (Federal Ministry of Education and Research, 2014). Particularly with the "*Energiewende*" ("Energy Turnaround") project, the German government has taken a quite radical approach with the aim to change the country's energy supply by withdrawing from nuclear energy and mostly relying on renewable energies. However, Kunze and Becker (2014) argue that *energy transformations* regularly generate and bring together social movements opposing opencast mining, fracking and energy poverty. These movements tend to ally with local groups frequently promoting and campaigning in favour of renewable energy in socio-environmental conflicts which arise from structural inequalities related to income and power-supply. These conflicts affect the environment as well as people's wellbeing at regional and sub-regional levels, pushing local communities to organise massive protests in order to preserve their physical environment and quality of life (EJOLT 2016).

Although small-sized renewable energy projects may awake environmental consciousness, broader initiatives targeting energy transformations can divert vast segments of German society from focusing on the

main causes of any ecological crisis. For instance, a large number of conflicts related to fossil fuels and climate justice/energy, together to other conflicts related to the transition to 'greener economies', cast some doubts about whether the Energiewende project will ever contribute to curb negative environmental effects associated with power generation. Four out the five European most polluting power stations in terms of CO2 emissions are lignite power stations located in Germany. Lignite is abundant in Germany: since the industrial revolution, it remains the only raw material for energy production in the country which does not need to be imported. In 2013, Germany mined 183 million tons of lignite, followed by China (147 million tons), Russia (73 million tons), and the USA (70 million tons; Heinrich Böll Stiftung, Bund 2015). Lignite is extracted intensively in the Rhenish mining area (North Rhine-Westphalia), in the Lusatian mining area (southeast of Brandenburg), in northeast and northwest Saxony. The reserves of lignite in these four major German areas mining amount to approximately 40 billion tons: only Russia (91 Billion tons) and Australia (44 Billion tons) have larger reserves.

1.1. Goals and objectives

The study we present in this paper aims to contribute to the ongoing debate about low-carbon transitions, addressing how ecological conflicts characterise the passage from fossil-fuel economy to a low-carbon economy in Germany. In many socio-environmental conflicts, different stakeholders appear to have a more sustainable perspective of the (low-carbon) economy than proponents of practices focusing on the use of environmentally intensive resources. We aim to investigate why and how broad coalitions of stakeholders in Germany engage in societal battles aimed at decarbonizing the economy associated with the production of energy. In doing so, we examine a broad spectrum of socio-environmental conflicts, providing an in-depth account of the conflicts occurring in many carbon intensive lignite mining areas.

Our analysis draw on several sustainability related literature streams discussed in the Journal of Cleaner Production such as low-carbon economy (Jänicke 2008; Jin et al. 2014; Robertson, 2015; Zhang et al., 2015), greening of production (Yong et al. 2016; Cucchiella et. al. 2015; 2017), mining and conflicts (Bebbington 2014; Dougherty and Olsen, 2014; Govindan et al. 2014; Pimentel et al. 2016), and sustainable de-growth (Lorek and Spangenberg, 2014; Rommel et al. 2016; Schneider et al.; 2010; Sekulova et al., 2013). Jin et al. (2014), while investigating the impact of the most common carbon policies, such as carbon emission tax, inflexible cap, and cap-and-trade; found that significant carbon reductions within energy economies could only be achieved by applying a high carbon tax rate, a high carbon price, and/or a very strict carbon cap. However, according to Robertson (2015, p. 12), "even accepting the premise that society may agree conceptually as to the most suitable form its sustainable future should adopt, entrenched divisions within the same society as to the underlying causes of un-sustainability and the like divisions as to the appropriate remedial actions required to achieve sustainability will most probably result in any consensus on the issue of sustainability remaining elusive, if not impossible to achieve". More optimistically, Zhang et al. (2015) conclude that a transition to a low carbon economy is possible, using China as example: the largest CO2 emitting country is gradually following a low-carbon development pattern.

Also Yong et al. (2016) and Cucchiella et. al. (2015; 2017) explore and examine the greening of (energy) production. Yong et al. (2016, p.1) argue that "cleaner energy is the cornerstone for cleaner production", stating that environmental impacts should be minimized through net-regenerative development should be the overarching aim. Cucchiella et al. (2017) find that each renewable source has its own profitability, and that incentives are particularly necessary only in specific cases e.g. to sustain photovoltaic technology.

Mining, anyway, remains a precondition for un-sustainable forms of energy generation based on nuclear and coal exploitation; henceforth more sustainable mining appears to be a necessity (Bebbington 2014, Pimentel et al. 2016). Govindan et al. (2014, p. 214) state that "sustainable practices are a must", arguing that social responsible mining could only be achieved by engaging with and involving multiple stakeholders including governmental, media, and societal associations. Pimentel et al. (2016, p. 2145) argue that "a nation's mineral resources can only generate prosperity if specific technology assets are employed in a way as to effectively develop its resource sector, capture value from it, and transform that value into long-term benefits", although they identify important gaps in operations and waste management, mine closure and rehabilitation. Bebbington 2014, states that "socio-environmental conflict presents mining companies with the chance to engage in vital discussions on the relationships between development, democracy and the environment". While we agree with the last statement, we also argue that lignite mining firms must go beyond that and

sustainably de-growth in order to meet the objective of zero emissions by 2030-2050, as set by the Paris Agreement (UNFCCC 2015).

The conditions for sustainable de-growth has been widely discussed in the Journal of Cleaner Production (e.g. Rommel et al. 2016; Schneider et al.; 2010; Sekulova et al., 2013). Schneider et al. (2010, p. 511) define sustainable de-growth "as an equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions at the local and global level, in the short and long term", criticizing the green economy as it often implies the development of 'greener' industries without necessarily replacing traditionally polluting industries. In this paper, we illustrate the case of Germany showing that an increasing share of renewable energy and equally an expanding coal production are quite common to find in developed economies. Germany energy transition, with its wide range of community renewable energy projects to the de-growth movement, "serves as an international showcase for the transition of a large industrialized economy to a low-carbon energy system", and bears little evidence of a general change in attitudes towards technology, consumption, or equity. (Rommel et al. 2016, p. 1).

In light of these considerations, we challenge the notion of de-growth in the German energy sector, arguing that it is simply a case of green growth without any significant replacement of lignite mining and coal fired energy production. Moreover, we investigate the struggle of various society groups to achieve a low carbon economy, and a more equitable society. In particular, we explore the geographies of socio-environmental conflicts, identifying different types of conflicts, environmental activism and movements, roots and causes of activism. These are analysed with regard to role of the German government and state-owned companies in light of a transition towards a low carbon economy. In addition, the study explores disinvestment and equitable de-growth in mining and energy production from the perspective of (state owned) companies in rich industrialized countries, providing options for policymakers for equitable and effective transitions.

2. Literature Review

2.1 History of high carbon economy, energy policy, and historical inequalities in Germany

In Germany, mining activities extracting lignite increased significantly with the advent of the National Socialist government in 1933. Output passed from 120 million tons in the early 1930s to 250 million tons in 1942 (Heinrich-Böll Stiftung and BUND 2015). As part of its autarky policy, the government forced industrial installations to convert lignite into petrol needed for the (planned) war, which employed forced labor of tens of thousands men and women (Holdinghausen, 2015). After the fall of National Socialism, in both the Federal Republic of Germany (GFR; or West Germany) and the German Democratic Republic (GDR; or East Germany) the achievement of an equitable society became a *raison d'être*. West Germany promoted the economic model Soziale Marktwirtschaft (social market economy) (Abelshauser 2004), while policy in East Germany makers intended to achieve social equitability by the ideological values and goals of official Marxism-Leninism, promoting an equitable access to the social surplus (Artz et al, 2006). East Germany promoted self-sufficiency and own lignite resources covered two thirds of primary energy demand (Nawrocki, 1981); whereas in West Germany imported resources (mainly oil) covered 60% of energy use (Petschow et al., 1990).

In West Germany, environmental activism and related movements appeared in the early 1970s, due to growing concerns among the population associated with the escalation of the nuclear conflict and the oil crisis (Rink, 2002). Although West Germany had large mining sites of both hard coal and lignite in Rhine-Ruhr and Rhenish areas respectively, the environmental movement in the country in mid-1980s focused on other conflicts such as dying forests (Waldsterben) and the Chernobyl nuclear catastrophe (occurred in 1986). These facts saw a surge of protests against nuclear power stations, waste transport and storage (Lauber and Mez, 2004). By the end of the 1980s, the environmental movement in West Germany could celebrate some wins due to the implementation by the government of more stringent environmental policies.

The situation in East Germany was worse. In 1970, the country adopted a new environmental legislation to address issues such as pollution and forestry destruction, while Western countries only reached this standard much later and more reluctantly. The aim was to protect the environment as part of the class struggle and to prove the long-term superiority of socialism, since capitalism was unable to solve environmental problems. However, at the end of the 1970s, East Germany's socialist environmental policy

came under severe criticism of oppositional groups. Many regions of East Germany were in a permanent state of ecological emergency. Uranium mining in Erzgebirge (border to Czechoslovakia), lignite coal mining in Lusatia (Brandenburg/Saxony) Southern Leipzig Area, and heavy chemical industry in the Leipzig-Halle-Bitterfeld were all characterized by outdated and economically inefficient production facilities which created much environmental damage. In these areas, there were basically no flowing waters and lakes left ecologically intact. Protests started against air pollution and intensive mining, with more than 60 environmental organisations targeting misinformation campaigns operated by the East German government merged. The ecological crisis was one of the main factors of wave the mass protests which saw the East German environmental movement playing a major part in the collapse of the communist regime in 1989 (Rink, 2002, Metzger et al., 2007). Years later, the Western Green Party absorbed the Eastern German opposition movement *Bündnis 90* (Association 90) on the assumption that the two would jointly represent a broader power base with regard to environmental issues. Former activists under socialism were now part of a party machinery embedded in German "realpolitik", and no longer acting as representatives of eastern German grassroots civil society. Some of the initial goals of a more equitable society, embedded in a German third way comprising Western capitalism and Eastern socialism, went progressively diluted in day-to-day political life (Herrschel and Forsyth, 2001).

2.2 Spectrum of sustainability related lignite mining conflicts

Lignite mining conflicts have been identified in many countries including Bosnia and Herzegovina (2013), China (Miao and Marrs, 2000), Czech Republic (Frantál, 2016), Ireland (Leonard, 2008), India (Martinez-Alier et al., 2016), Nigeria (Olorode, 1998), Pakistan (Makki and Van Vuuren, 2015) Poland (Badera, and Kocoń, 2014), Romania (Popović et al. 2015), Serbia (Đukičin et al. 2014), Slovakia (Skvarekova, Kozakova 2012), Spain (Villar 2010; Zafrilla, 2014), Thailand (Fovsyth, 2004; Middleton, 2012), Turkey (Yaylacı and Düzgün, 2016), US (Montrie, 2003).

Badera, and Kocoń (2014) investigate lignite mining conflicts in Poland. They find that most inhabitants could not assess the mining company's environmental impact assessments and did not know if legal requirements for public participation in the decision process were sufficient. In his investigation on Czech lignite-mining areas Frantal (2016) finds that a strong place attachment that is characterized by the quality of living environment and the duration of residence proved to be important predictor of anti-coal attitude. Typical lignite opponents have a higher age, university degree and a strong place attachment. Villar (2010) investigates a conflict involving a large agrarian revolt in Francoist Spain, which started after the expropriation of local farmers' land for the exploitation of lignite. For the author, this conflict shows how ecological politics may operate as a critique of capitalist exploitation, highlighting the link between the tradition of anti-Franco struggle, and the affirmation of peripheral cultural identities in the political context of the 1970s. Middleton (2012) reports 30.000 displaced, 200 dead and 600 with serious health problems due to lignite mining and related power generation in Thailand. Fovsyth (2004) argues that social movements in Thailand have failed to avoid serious damage to human and environmental health. While concerns on lignite extraction in Thailand have increasingly become discursive structures into which new forms of activism have shaped, there is also evidence of several filed lawsuits local communities have won in their struggles against lignite mining, with projects cancelled and many residents receiving compensation (Middleton, 2012). Broto (2013), in his study of conflicts caused by the environmental impacts of lignite mining industry in Bosnia and Herzegovina, finds that a 'working class' status for local residents limit their capacity to cope with pollution, and has a significant detrimental impact on the social and political relationships between the industry and local residents.

Despite this broad international review of contested lignite-mining areas, little or no research has been conducted on socio-environmental conflicts lignite mining in Germany. Although there is a large body of literature investigating mining and post-mining landscapes from the lens of ecology (e.g. Grünewald 2001; Hüttl and Weber, 2001) or economics (e.g. Koch et al. 2005; Lienhoop and Messner 2009) integrated, interdisciplinary political ecology - or ecological economics based explorations are still rare. This is surprising because mining activity has been a source of concerns, conflict and confrontation for many years. Germany, with its strong green policy and low carbon path, existing movements and social struggles should find more sustainably its way into academic debates on de-growth, low-carbon economy, green economy, and commons.

2.3 Theoretical background

There is an increasing body of literature investigating the regional low-carbon economy in high polluting countries and industries (e.g. Robertson, 2015; Walz, 2011; Zhang et al., 2015). While the studies have a cutting edge present day perspective, it seems worthwhile to investigate historical examples of emissions intensive countries that has opted for emission reduction. The fact that China as a modern day unitary socialist one-party state is in the focus of research makes it interesting to investigate further socialist high carbon economies. Being the top lignite mining country in the world the GDR was comparable to present day neoextractivist countries (Acosta, 2013; Dougherty and Olsen, 2014; Gudynas 2009) such as Bolivia, Ecuador or Venezuela. Although East Germany implemented a new type of extractivism as part of advancing socialism, the social and environmental impacts remained unaltered; as a consequence, the conditions associated with extractive activities in the country generally deteriorated. The East German government was unable to find a strategy to enable the *buen vivir* ("living well") and to take advantage of non-renewable natural resources, turning them into a premium. The regional ecological emergency led to environmental injustice, with people living in contaminated areas having a much lower life expectancy and manifold higher risk of cancer and other serious diseases.

In West Germany particularly due to the strong environmental movement and environmental protection granted by government policies, the situation was much better than in the East. However, in West Germany and in the reunited present day Germany, policy makers have bought into the concept of ecological modernization (Jänicke, 2008; 2012), which proposes growth and environmental protection at the same time. Green Economy is not more than a new name for this old concept (Lorek and Spangenberg, 2014).

3. Methodology and data analysis

For the purpose of this study, we approached 18 experts in the fields of environment, ecology and economics. The need for a multidisciplinary methodology was acknowledged during discussions held by authors with peers at several symposiums organised in the field. Among the numerous available methods for working with experts (Fink et al. 1984; Jacobs 1995; Olson and Rueter 1987), we selected Delphi due to its methodical, transparent and well known approach (Bryman, 2006). Delphi is a method for organizing a group communication process so that the process is effective in allowing a group of persons to deal with complex problems (Linstone and Turoff 1975), and it is appropriate to analyse qualitative information based on diverse attitudes and complex concepts (MacMillan and Marshall 2006).

Selected experts were invited to an event to discuss and debate on issues and challenges related to environmental conflicts in Germany[1]. These conflicts arise from structural inequalities related to income and power whereby individuals engage in place-based struggles (EJOLT 2016). Participants were chosen due to their recognized record of commitment to (and concern in) decision-making/managerial roles, as well as in relation to their academic roles in sustainability. The purpose of the Delphi study was to explore geographies of socio-environmental conflicts based on the expertise of participants. All experts possessed a deep understanding of the historic and present-day issues of sustainable and unsustainable development in Germany and related conflicts.

The event was recorded/analysed to extract new knowledge in order to identify and map environmental conflicts in Germany in the past 30 years. Experts were provided with some information on the general purpose extracted from the EJOLT project. Specifically, the following classification of environmental conflicts: (i) Nuclear, (ii) Mineral Ores and Building Materials Extraction, (iii) Waste Management, (iv) Biomass and Land Conflicts (Forests, Agriculture and Livestock Management), (v) Fossil Fuels and Climate Justice/Energy, (vi) Water management, (vii) Infrastructure and Built Environment, (viii) Tourism Recreation, (ix) Biodiversity Conservation Conflicts, and (x) Industrial and Utilities Conflicts. In addition, knowledge on several global environmental conflicts (such as those identified in the Yasuni-ITT project.[2]) was shared with experts prior to the event.

The Delphi method recognizes the human judgement as a legitimate input to research (Cornish, 1977), so

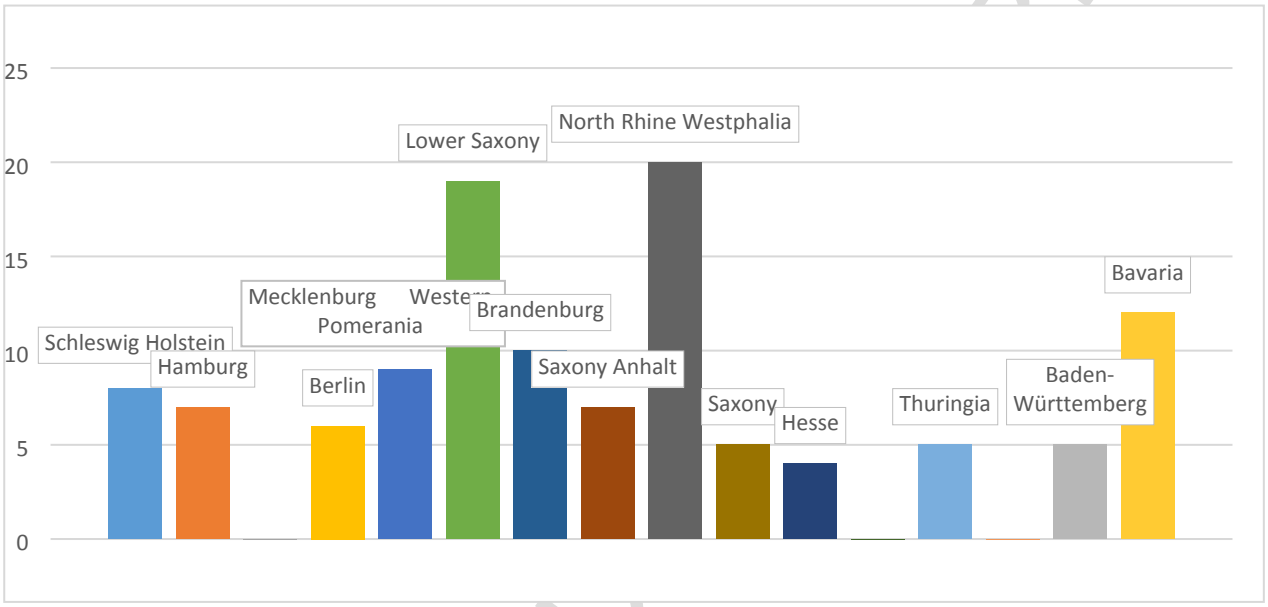
[1] The 18 experts were approached in July 2015. Their backgrounds varied within a wide range, including academia, business and entrepreneurship, NGO activisms and civil society.

[2] In this project Ecuador offered a perpetual suspension of oil extraction in parts of the Yasuni National Park in return for payments of the international community.

conflicts were discussed openly. Since the collective judgement of several informed people is likely to be better than the judgement of a single individual (Cornish, 1977). The discussion served to gain in-depth insights on environmental conflicts and roots and causes of environmental movements and activism.

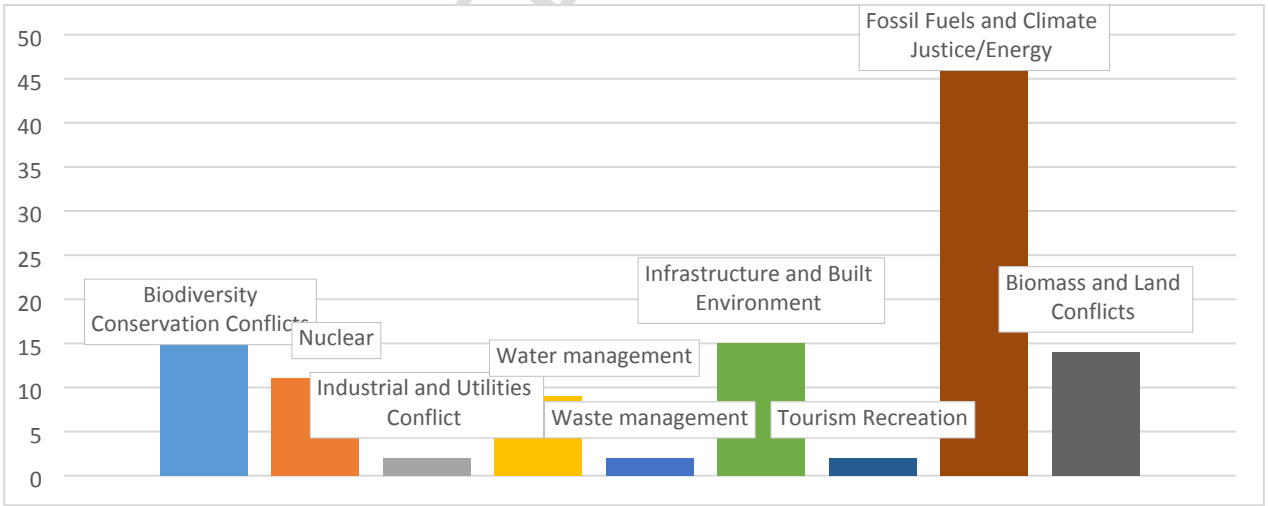
At the end of the event, the experts and activists explored the geographies of socio-environmental conflicts in Germany. The distribution of these identified environmental conflicts (n=117) is shown in Figure 1. Most of the current environmental conflicts are happening in North Rhine Westphalia, Lower Saxony, and Bavaria. However, these are relatively large and densely populated states; hence a higher frequency of conflicts within their boundaries is somehow expected. Figure 2 shows the different types of conflicts across sectors. Most conflicts (46) are related to fossil fuels and climate justice/energy, followed by infrastructure and built environment (15), biodiversity conservation conflicts (14), and biomass and land conflicts (14).

Figure 1: Environmental conflicts in the German States from 1990 to 2015 (n=117, no environmental conflict was identified in states: Bremen, Rhineland-Palatinate, Saarland)



(Source: own investigation)

Figure 2: Type of environmental conflict (n=117)



(Source: own investigation)

4. Discussion

According to the experts consulted in our analysis, most of socio-environmental conflicts in Germany are directly related to the Low-Carbon Economy. Of these conflicts, 26 cases (Fossil Fuels/ Energy 40-65 in Appendix) are fracking conflicts occurred mainly in the North and Northwest of Germany since mid-2000s.

Due to lower oil prices and more stringent government policies towards fracking, these conflicts have eased to some degree. Nine lignite mining conflicts (Fossil Fuels/ Energy 31-39) were identified, four in Western and five in Eastern Germany. Local resident groups, environmental justice organisations (EJOs) and other civil society groups are exposed to unsustainable means of energy production (Grüne Liga, 2016). Forms of active resistance appeared already at the time of the GDR, mostly in the Southern Leipzig mining area, where several towns versed in a state of environmental emergency (Beleites, 2016). The environmental movement played an important role in the peaceful revolution of 1989/90, in which the city of Leipzig, with the weekly Monday demonstrations, was the centre. In more rural Lusatia there was much less visible but still existing resistance against lignite mining especially in the Cottbus Nord (Fossil Fuels/ Energy 35) mining area. Until its very end, the socialist regime coal opponents were jailed and local communities such as in Lakoma were dispossessed. After the peaceful change of 1989/1990 mining assets were privatized and rent seeking behaviour let to a new wave of mining development, devastating landscapes, and dispossessing local communities.

In 1994 the local government of Brandenburg decided to extend the Jänschwalde lignite mine to the Sorbian (a slavic minority) village of Horno. This decision led to protests (Fossil Fuels/ Energy 34) and several (lost) court cases. The takeover of Lusatian mining sites and power generation by the Swedish government owned firm Vattenfall (in 2001), and related debates in the Swedish parliament, did not generate any positive outcome for Horno: local residents were resettled, and those resisting dispossessed in 2004. After Horno, Vattenfall proposed three new mining sides in Jaenschwalde-Nord (Fossil Fuels/ Energy 33), Welzow-Sued II (Fossil Fuels/ Energy 37) and Nochten II (Fossil Fuels/ Energy 36). While local governments in Brandenburg and Saxony supported these projects, the broader environment for lignite mining has changed.

After the Swedish elections in September 2014, a red-green coalition came to power with the aim to disinvest from Vattenfall and its high carbon-led operations. In April 2016 mining activities and related power stations were sold for at a loss to a consortium of two Czech companies (approval from Swedish government still needed, 2016). The divestment of Vattenfall from its lignite mining business can be considered as a case of corporate de-growth, even though the environmental repercussions for industrial firms remain unclear both socially and economically, since selling the mining assets resulted in no CO2 mitigation. In Czech Republic, the consortium is likely to face less stakeholder pressure aimed at a greening of production and more sustainable business models. Greenpeace made a bid for the mining assets of Vattenfall in October 2015 but was excluded by the selling bank (Citigroup). It did not offer money in the hope to transfer the operations into a sustainable business model, a charitable foundation supported by Vattenfall and both the German and Swedish governments, to phase out from lignite by 2030. However, similar to the Yasuni ITT case in Ecuador, where the state demanded money from the international community, this process failed due to lack of support from the international community. Both the German and Swedish governments shown relatively little support for this equitable solution. As a result, the level of social conflict in the area increased, including occupation of Welzow lignite mine (DW, 2016). Resistance against mining has shifted from a more local focus with farmers and local populations struggling to maintain their livelihood to a global, environmental justice oriented movement (Breakfree, 2016).

Before disinvesting from Lusatian mining and power generation Vattenfall already started to consider greener production and more sustainable business models. Since the mid-2000s, it invested in carbon capture and storage technology, then accepted and supported many organisations including the IPCC (Metz et al., 2005). However, several initiatives promoted by local resident groups and EJOs resisted a number of pilot projects proposed by Vattenfall and other companies (Fossil Fuels/ Energy 66-71), fearing that carbon leakages and high levels of energy intensity associated with the technology could generate more CO2 emissions. Similar fears were shared by the German government too.

In the end, CCS/ Vattenfall ceased its research and development activities in this field due to high costs and increased energy use. Increasing levels of resistance and discontent can be registered against new coal fired power stations (Fossil Fuels/ Energy 72-75), with local residents groups and EJOs opposing high carbon technology in their neighbourhoods. This situation highlights a contradiction within the German energy policy, which includes opting energy turnaround and on the same time sticking on lignite/ hard coal. Out of the EU 28 countries, only the Czech Republic, Estonia, and Luxembourg exceed Germany's per capita CO2 emissions (Eurostat 2016). In the two German largest cities of Berlin and Hamburg, local residents groups and EJOs are campaigning for a re-nationalisation of energy supply (Industrial and Utilities 76, 77).

By privatizing energy supply or selling it to foreign state owned companies (e.g. Vattenfall as in the case of Berlin and Hamburg), city and town councils lose their control over energy transition goals, the greening of energy production, and carbon intensity of regional economy. Finally, rent seeking behaviour of international utility companies seem to have exacerbated the problem of energy poverty in Germany, although more than 20 percent of the electricity price for households is attributable to the Renewable Energy Act (BDEW, 2016) given a guaranteed feed in tariff (introduced in 2000 to improve efficiency of renewable energy and transition to a low carbon economy). In 2015, 30.1% of the total gross electricity production came from renewable energy sources in 2015 (Destatis, 2016). Despite its positive effects related low-carbon economy, greening of energy production, energy transition, and green economy, it has caused environmental injustice and inequality (Weber, 2014).

Firstly, there is an unequal distribution of costs between industry and households. While industry uses 45.6% of electricity, it pays only 31.4% while private households use only 26.2% and pay 35.2% (Agentur für Erneuerbare Energien, 2014). Several energy intensive industries such as food, chemicals, paper, metal, and glass are generally excluded or receive large reductions. Secondly, electricity costs have more than doubled since the introduction of the Renewable Energy Act. Even though there is no official definition of energy poverty in Germany, it is widely accepted that a household is considered as "energiearm" (energy poor) if energy costs for living are higher than 10% of the net income (Diekmann, 2014). In 2011, about 6.9 million households (17% ot total) met this criteria, with households with an average income of 900€/month spending about 93€ in energy costs (Diekmann, 2014). Thirdly, the access to benefits of the feed-in tariff is distributed unevenly between rural and urban (poor) population. Tenants in poorer suburban areas have very limited possibility to benefit from feed-in tariffs as they have no facilities to install renewable energy such as photovoltaic. Lastly, many of these tenants are threatened by ecological renewal of neighbourhoods and energetic rehabilitation of buildings. This leads to additional rent increases and growing resistance against gentrification (Infrastructure 79, 80).

Renewable energy is predominantly produced in the rural wind-rich areas of Northern Germany, while energy usage is higher in the industrialized South. That is why network providers and policy makers have proposed new high voltage energy power lines, provoking protests and resistance in the middle (Thuringia) and south (Bavaria) of the country (Biodiversity Conservation, 5, 6; Infrastructure 84). Environmental NGO's, citizens' initiatives and other stakeholders criticize these large infrastructure projects, concerned about the effects of electrical and electromagnetic fields to human health and protection of nature and landscapes. Furthermore environmental justice organisations argue that energy grid should be expanded and developed according to the expansion of renewable energies, and not the other way around. Similarly, pumped storage power plants had been proposed in Thuringia, Baden-Württemberg, and Bavaria and faced resistance from Citizens' Initiatives and the local Green Party representatives (Biodiversity Conservation, 7-10). This type of hydroelectric storage is considered to be necessary for the energy transition in times when supply of renewable energy from sunlight and wind is reduced. High voltage energy power lines, and pumped storage power plants show a typical pattern of German policymaking towards the so called "Green Economy". It seems that there is a unilateral focus on "Green Growth" by development of clean technology, its implementation and exports. Local residents and environmental justice organizations are questioning this approach and highlight that many of these technical solutions are actually related to increased energy use, CO2 emissions and material flow. A more balanced promotion of renewable energy focusing on photovoltaic rather than wind would diminish the imbalance between North and South of the country, but also the apparent necessity of new High-Voltage Power Lines. And indeed, there is an increasing resistance again wind energy in Bavaria but also at the North Sea Cost and other regions (Biodiversity Conservation, 2-4). Citizens' initiatives ally with often conservative governments to resist wind energy due to concerns related to biodiversity and landscape conservation but also for a more balanced renewable energy generation.

5. Conclusions

The analysis presented in this paper illustrates how Germany has, over the past 30 years, both resisted and rearticulated its position towards a high-carbon economy, serving its energy needs through the destruction of its own environment. Using a comparative Delphi study over many years, we explored and examined the roles of the German government and state-owned companies in the light of the transition towards a low carbon economy. Furthermore, we addressed the contradictions of a Green Economy strategy. By focussing on growth and prosperity by the development of renewable energy technology that is to be sold in Germany as well as in

other countries. Besides its intended effects of increase of renewable energy production, it also generated several negative effects. So far, it has not led to a significant decrease of CO2 emissions related to energy production and usage (Destatis, 2016; Umweltbundesamt, 2015; Umweltbundesamt, 2016). Instead, it seems to have helped the development large projects such as High-Voltage Power Lines or pumped storage power plants which resulted significantly unpopular. The resistance of various stakeholder groups at local level (including CI's and EJO's) has prevented most of these projects, although they also revealed the nature of "red herring" (Spash, 2012) and "Wolf in Sheep's clothing" (Lander, 2011) attached to the Green Economy. Just a few months before the Fukushima accidents in 2011 the German government (re-)invented the 30 years old idea of Energiewende, which includes withdrawing from both lignite and nuclear energy. However, despite these ambitious plans the government has not smoothed the return of lignite power generation. In many German towns and cities, citizen's initiatives, and environmental justice organisations have resisted lignite mining and related power generation, but also power-related projects deemed necessary to develop an energy economy based on renewable energy.

Despite Energiewende, lignite related CO2 emissions in Germany were 4% higher in 2014 compared to 2010 (Sandbag, 2015). Government support has led renewable energies undercutting relatively climate-friendly natural gas on prices, pushing utilities to turn towards carbon intensive coal instead (Economist, 2014). Subsides for renewable energy are paid by the households according to the German Renewable Energies Act (EEG). Electricity prices for households have increased by 100% in the last 15 years (Statista 2016), increasing energy poverty especially in densely populated urban areas, where inhabitants have little possibility to install subsidized wind power or solar energy installations. Conversely, the mining extraction frontier continues to expand in rural Germany, wiping villages and farmland off the map. Despite these contradictions and inconsistencies, German policymakers seem to be committed towards a low-carbon economy which consider the needs of various industry stakeholders. These situation create the conditions for environmental conflicts, general disagreement and misalignment among different actors within the German society over the use of resources. In many environmental conflicts, individuals or groups disagree with the level of carbon emissions associated with local projects, escalating until entire communities engage in place-based struggles.

Our paper has some limitations. First, the applied Delphi study used a categorisation of different environmental conflicts (e.g. fossil fuels, nuclear) which might have discouraged the identification of conceivable conflicts on other areas related to sustainability. Nevertheless, the Delphi method enabled us to combine the knowledge and abilities of a group of experts to address socio-environmental conflicts, for which both qualitative and quantitative empirical evidence is rare. A second limitation resides on the fact that, even though experts came from all over Germany, there is a certain bias among regions in terms of identifying socio-environmental conflicts. This seems be due to the emphasis of conflicts related to the so-called 'decarbonisation' of Germany. As a result, other socio-environmental conflicts and region with less fossil fuel mining and related power generation may be underrepresented. Further research should address these gaps in literature. In particular, a large scale survey could provide a more comprehensive view of geographies of socio-environmental conflicts, and give more evidence on the roots and causes of environmental movements and activism.

Finally, a scalar variation of identified conflicts seems needed in order to increase our knowledge in the field. Our results provide no weighting or scale about the different conflicts. The difference in scale may be addressed in a further study that explores the connotation of the environmental conflicts for environmental movements and activism. This may be done by developing a discourse analysis addressing the media coverage of the different environmental conflicts.

Acknowledgements:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

References:

Abelshauser, W. (1983) Wirtschaftsgeschichte der Bundesrepublik Deutschland (1945-1980), Frankfurt.

Acosta, A. (2013). Extractivism and neoextractivism: two sides of the same curse. Beyond Development, 61.

Agentur für Erneuerbare Energien, 2014, Anteil verschiedener Verbrauchergruppen am Nettostromverbrauch in Deutschland sowie an den EEG-Gesamtkosten. http://www.energiezukunft.eu/umwelt/wirtschaft/eeg-umlage-senken-bei-fairer-kostenverteilung-gn102692/ (accessed 22.06.16)

Artz, L., Macek, S., & Cloud, D. L. (2006). Marxism and communication studies: The point is to change it (Vol. 8). Peter Lang.

Badera, J., & Kocoń, P. (2014). Local community opinions regarding the socio-environmental aspects of lignite surface mining: experiences from central Poland. Energy Policy, 66, 507-516.

BDEW (2016) Erneuerbare Energien und das EEG: Zahlen, Fakten, Grafiken. https://www.bdew.de/internet.nsf/res/7BD63123F7C9A76BC1257F61005AA45F/$file/160218_Energie-Info_Erneuerbare%20Energien%20und%20das%20EEG_2016_final.pdf (accessed 08.07.16)

Becker, S. (2004). Energy Poverty in Germany – Highlights of a Beginning Debate. Blog. EU Fuel Poverty Network. Working to raise awareness of fuel poverty across the EU. http://fuelpoverty.eu/2014/07/09/energy-poverty-in-germany-highlights-of-a-beginning-debate/ (accessed 18.04.16)

Bebbington, A. J. (2014). Socio-environmental conflict: an opportunity for mining companies. J. Clean. Prod., 84, 34.

Beleites, M. (2016) Dicke Luft: Zwischen Ruß und Revolte – Die unabhängige Umweltbewegung in der DDR. ISBN 978-3-374-04271-5. Evangelische Verlagsanstalt Leipzig.

Bell W. (1997). Foundations of futures studies: human science for a new era. New Brunswick: Transaction Publishers;

Breakfree (2016) On Six Continents, Thousands of People Took Bold Action To Break Free From Fossil Fuels. https://breakfree2016.org/ (accessed 08.07.16)

Broto, V. C. (2013). Employment, environmental pollution and working class life in Tuzla, Bosnia and Herzegovina. Journal of Political Ecology, 20(1), 1-13.

Bryman, A. (Ed.). (2006). Mixed methods. SAGE Publications Limited.

Cornish, E. (Ed.). (1977). The study of the future: an introduction to the art and science of understanding and shaping tomorrow's world. Transaction Publishers.

Cucchiella, F., D'Adamo, I., & Koh, S. L. (2015). Environmental and economic analysis of building integrated photovoltaic systems in Italian regions. J. Clean. Prod. 98, 241-252.

Cucchiella, F., Gastaldi, M., & Trosini, M. (2017). Investments and cleaner energy production: A portfolio analysis in the Italian electricity market. Journal of Cleaner Production, 142, 121-132.

Diekmann, F. (2014) Kostenexplosion bei Strom, Öl, Gas: Energiearmut in Deutschland nimmt drastisch zu. Spiegel 24.02.2014. http://www.spiegel.de/wirtschaft/service/gruenen-anfrage-energiearmut-in-deutschland-nimmt-drastisch-zu-a-954688.html (accessed 01.06.16)

Destatis (2016). 42% of electricity came from brown and hard coal in 2015. https://www.destatis.de/EN/FactsFigures/EconomicSectors/Energy/Energy.html (accessed 29.01.16)

Dovì, V. G., Friedler, F., Huisingh, D., & Klemeš, J. J. (2009). Cleaner energy for sustainable future. J. Clean. Prod., 17(10), 889-895.

Dougherty, M. L., & Olsen, T. D. (2014). "They have good devices": trust, mining, and the microsociology of environmental decision-making. Journal of Cleaner Production, 84, 183-192.

Đukičin, S., Đorđević, J., & Milanković, J. (2014). Spatial and social changes caused by the continuous exploitation of lignite in the Kolubara lignite basin, Serbia. Acta geographica Slovenica, 54(1).

DW (2016) Protesters take over German coal mine, block power plant. http://www.dw.com/en/protesters-take-over-german-coal-mine-block-power-plant/a-19258572 (Accessed 08.07.16)

Economist (2014). What has gone wrong with Germany's energy policy. http://www.economist.com/blogs/economist-explains/2014/12/economist-explains-10 (Accessed 15.02.16)

EJOLT (2016). Definitions of Ecological Conflicts for the purpose of the database, http://www.ejolt.org/maps/ (Accessed 15.02.16)

Eurostat (2016). CO2 emissions per inhabitant in the EU and in developing countries. http://ec.europa.eu/eurostat/en/web/products-datasets/-/TSDGP410 (Accessed 22.06.16)

Fink, A., Kosecoff, J., Chassin, M., & Brook, R. H. (1984). Consensus methods: characteristics and guidelines for use. American journal of public health, 74(9), 979-983.

Fovsyth, T. (2004). Social Movements in Thailand. Liberation ecologies: environment, development, social movements, 422.

Frantál, B. (2016). Living on coal: Mined-out identity, community displacement and forming of anti-coal resistance in the Most region, Czech Republic. Resources Policy, 49, 385-393.

Hüttl, R. F., & Weber, E. (2001). Forest ecosystem development in post-mining landscapes: a case study of the Lusatian lignite district. Naturwissenschaften, 88(8), 322-329.

Grünewald, Uwe. "Water resources management in river catchments influenced by lignite mining." Ecological engineering 17.2 (2001): 143-152.

Govindan, K., Kannan, D., & Shankar, K. M. (2014). Evaluating the drivers of corporate social responsibility in the mining industry with multi-criteria approach: A multi-stakeholder perspective. J. Clean. Prod., 84, 214-232.

Grüne Liga (2016). The Green League and lignite. Retrieved 08.07.2016 from http://www.kein-tagebau.de/index.php/en/englisch-content/102-the-green-league-and-lignite.

Gudynas, E. (2009). Diez tesis urgentes sobre el nuevo extractivismo. Extractivismo, política y sociedad, 187-225.

Herrschel, T., & Forsyth, T. (2001). Constructing a new understanding of the environment under postsocialism. Environ Plann A, 33(4), 573-587.

Heinrich-Böll-Stiftung, BUND Deutschland (Hrsg.). Kohleatlas. Daten und Fakten über einen globalen Brennstoff. Berlin. https://www.boell.de/sites/default/fi les/kohleatlas2015.pdf (Accessed 20.06.16)

Holdinghausen, H. (2015). Braunkohle: Rohstoff der Superlative. Heinrich Böll Stiftung. https://www.boell.de/de/2015/06/02/braunkohle-rohstoff-der-superlative (Accessed 25.05.16)

Jacobs, R. A. (1995). Methods for combining experts' probability assessments. Neural computation, 7(5), 867-888.

Jänicke, M. (2008). Ecological modernisation: new perspectives. J. Clean. Prod., 16(5), 557-565.

Jänicke, M. (2012). Dynamic governance of clean-energy markets: how technical innovation could accelerate climate policies. J. Clean. Prod., 22(1), 50-59.

Jin, M., Granda-Marulanda, N. A., & Down, I. (2014). The impact of carbon policies on supply chain design and logistics of a major retailer. J. Clean. Prod., 85, 453-461.

Jin, M., Tang, R., & Huisingh, D. (2015). Call for papers for a special volume on Advanced Manufacturing for Sustainability and Low Fossil Carbon Emissions. J. Clean. Prod., 87, 7-10.

Koch, H., Kaltofen, M., Grünewald, U., Messner, F., Karkuschke, M., Zwirner, O., & Schramm, M. (2005). Scenarios of water resources management in the Lower Lusatian mining district, Germany. Ecolog. Engin., 24(1), 49-57

Kunze, C.; Becker, S. (2014) "Energy democracy in Europe: A survey and outlook." Rosa Luxemburg Stiftung.

Lauber, V.; Mez L. (2004): Three decades of renewable electricity policies in Germany. In: Mez, Lutz (Hrsg.): Green power markets. History and perspectives. Brentwood, Essex. 599-623.

Lander, E. (2011). The green economy: The Wolf in Sheep's clothing. Amsterdam: Transnational Institute, 6.

Leonard, L. (2008). Mining: Tynagh and Donegal. The Environmental Movement in Ireland, 131-140. Makki, M., Ali, S. H., & Van Vuuren, K. (2015).

Lienhoop, N., & Messner, F. (2009). The economic value of allocating water to post-mining lakes in East Germany. Water resources management, 23(5), 965-980.

Linstone, H. A., & Turoff, M. (Eds.). (1975). The Delphi method: Techniques and applications (Vol. 29). Reading, MA: Addison-Wesley.

Lorek, S., & Spangenberg, J. H. (2014). Sustainable consumption within a sustainable economy–beyond green growth and green economies. J. Clean. Prod., 63, 33-44.

Makki, M., Ali, S. H., & Van Vuuren, K. (2015). 'Religious identity and coal development in Pakistan': Ecology, land rights and the politics of exclusion. The Extractive Industries and Society, 2(2), 276-286.

Martinez-Alier, J., Temper, L., & Demaria, F. (2016). Social metabolism and environmental conflicts in India. In Nature, Economy and Society (pp. 19-49). Springer India.

Metz, B., Davidson, O., De Coninck, H., Loos, M., & Meyer, L. (2005). Carbon dioxide capture and storage.

Metzger, B.; Bemmann, M.; Schäfer, R. (2007). Tagungsbericht und ewig sterben die Wälder. Das deutsche "Waldsterben" in multidisziplinärer Perspektive, Freiburg.

MacMillan, D. C., & Marshall, K. (2006). The Delphi process–an expert-based approach to ecological modelling in data-poor environments. Animal conservation, 9(1), 11-19.

Montrie, C. (2003). To save the land and people: A history of opposition to surface coal mining in Appalachia. Univ of North Carolina Press.

Nawrocki, J. (1981). Energiewirtschaft in der DDR. http://www.zeit.de/1981/12/wenn-braunkohle-zu-eis-wird (Accessed 27.05.2016)

Olorode, O. (1998). Imperialism, neocolonialism and the extractive industries in Nigeria. Ken Saro Wiwa and the crises of the Nigerian State. Lagos: Committee for Defense of Human Rights (CDHR).

Olson, J. R., & Rueter, H. H. (1987). Extracting expertise from experts: Methods for knowledge acquisition.

Petschow, U., Meyerhoff, J., Thomasberger, C. (1990). Umweltreport DDR. Frankfurt am Main: Fischer

Pimentel, B. S., Gonzalez, E. S., & Barbosa, G. N. (2016). Decision-support models for sustainable mining networks: fundamentals and challenges. J. Clean. Prod., 112, 2145-2157.

Popović, V., Miljković, J. Ž., Subić, J., Jean-Vasile, A., Adrian, N., & Nicolăescu, E. (2015). Sustainable Land Management in Mining Areas in Serbia and Romania. Sustainability, 7(9), 11857-11877.

Rink, D. (2002). Environmental policy and the environmental movement in East Germany. CNS, 13(3), 73-91.

Robertson, S., 2015. A longitudinal quantitative-qualitative systems approach to the study of transitions toward a low carbon society. J. Clean. Prod. 128, 221-233.

Rommel, J., Radtke, J., von Jorck, G., Mey, F., & Yildiz, Ö. (2016). Community renewable energy at a crossroads: A think piece on degrowth, technology, and the democratization of the German energy system. J. Clean. Prod.

Sandbag (2015). For the first time, 4 out of 5 largest EU emitters are German lignite power stations. https://sandbag.org.uk/blog/2015/apr/1/first-time-4-out-5-largest-eu-emitters-are-german-/. (Accessed 10.06.16)

Schneider, F., Kallis, G., & Martinez-Alier, J. (2010). Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue. J. Clean. Prod., 18(6), 511-518.

Sekulova, F., Kallis, G., Rodríguez-Labajos, B., & Schneider, F. (2013). Degrowth: from theory to practice. J. Clean. Prod., 38, 1-6.

Skvarekova, E., & Kozakova, L. (2012). Brown coal and lignite issues from the perspective of sustainable development in Slovakia. Gospodarka Surowcami Mineralnymi-Mineral Resources Management, 28(2), 31-42.

Spash, C. L. (2012). Green economy, red herring. Environ Value, 21(2), 95-99.

Statista (2016). Index zur Entwicklung des Strompreises* für Haushalte in Deutschland in den Jahren 1998 bis 2015 (1998 = Index 100). http://de.statista.com/statistik/daten/studie/234370/umfrage/entwicklung-der-haushaltsstrompreise-in-deutschland/ (Accessed 29.01.16)

Tamanini, J., Bassi, A., Hoffman, C., & Valeciano, J. (2014). The Global Green Economy Index GGEI 2014. Measuring National Performance in the Green Economy 4th Edition–October.

Umweltbundesamt (2016). Treibhausgas-Emissionen in Deutschland, http://www.umweltbundesamt.de/daten/klimawandel/treibhausgas-emissionen-in-deutschland (Accessed 29.01.16)

Umweltbundesamt (2015). Ressourcennutzung in Deutschland. http://www.umweltbundesamt.de/themen/abfall-ressourcen/ressourcenschonung-in-produktion-konsum/ressourcennutzung-in-deutschland (Accessed 29.01.16)

UNEP, 2011, Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. www.unep.org/greeneconomy (Accessed 11.02.16)

UNFCCC 2015, Adoption of the Paris agreement—Proposal by the President—Draft decision. http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf (Accessed 30.03.17)

Vatalis, K. I., & Kaliampakos, D. C. (2006). An overall index of environmental quality in coal mining areas and energy facilities. Environmental management, 38(6), 1031-1045.

Villar, M. D. C. R. (2010). The concept of resistance in contemporary Galician culture: towards a poetic ecology. Cosmos and History: The Journal of Natural and Social Philosophy, 6(2), 82-92.

Walz, R., 2011. Employment and structural impacts of material efficiency strategies: results from five case studies. J. Clean. Prod. 19 (8), 805-815.

Weber, G. (2014). La ecología política de la «Energiewende» (transición energética) en Alemania. Ecología Politica, 44, 61-68.

Yong, J. Y., Klemeš, J. J., Varbanov, P. S., & Huisingh, D. (2016). Cleaner energy for cleaner production: modelling, simulation, optimisation and waste management. Journal of Cleaner Production, 111, 1-16.

Zafrilla, J. E. (2014). The mining industry under the thumb of politicians: the environmental consequences of the Spanish Coal Decree. Journal of Cleaner Production, 84, 715-722.

Zhang, J., Zeng, W., Wang, J., Yang, F., & Jiang, H. (2015). Regional low-carbon economy efficiency in China: analysis based on the Super-SBM model with CO 2 emissions. J. Clean. Prod.

Appendix:

Nr.	Location	Region	Type of conflict	Groups	EJOLT ConflictType	X*
1	Kyritz-Ruppin	Brandenb.	Contra bombing range		Biodiv. Conservation	2
2	Bavaria	Bavaria	Contra wind energy		Biodiv. Conservation	1
3	Merzen	L.Saxony	Contra wind energy	CI's	Biodiv. Conservation	1
4	Bayreuth/	Bavaria	Mega Electricity Grid	Local CI	Biodiv. Conservation	1
5	Schmalwasser	Thuringia	Pumped-storage power	Local CI	Biodiv. Conservation	2
6	Schweinbach	Thuringia	Pumped-storage power	Local CI	Biodiv. Conservation	2
7	Atdorf	Baden W..	Pumped-storage power	Local CI	Biodiv. Conservation	1
8	Bad Tölz	Bavaria	Pumped-storage power	Local CI	Biodiv. Conservation	2
9	Wattenmeer	L.Saxony	National park, drilling of oil	BUND, WWF, fishers, farmers	Biodiv. Conservation	1
10	Lagoon area	MWP	Waive National Park	BUND, fishers, forestry	Biodiv. Conservation	1
11	N.Black-Forest	Baden-W	Designation National Park	NABU, BUND, GP, CI	Biodiv. Conservation	1
12	BavarianForest	Bavaria	Recolonisation of Lynxes	WWF, ÖJV	Biodiv. Conservation	1
13	Nandus	MWP	Mega Neobita	Nabu, farmers association	Biodiv. Conservation	1
14	Westerland	Schlesw.H	Offshore Windpark	CI Headwind Sylt	Biodiv. Conservation	1
15	Lauchstädt	Thuringia	Mega Electricity Grid	Municipalities, Thuringia, CI's	Biodiv. Conservation	1
16	Elbtalaue	L.Saxony	Declaration National Park	BUND, Farmers Association	Biodiv. Conservation	1
17	Magdeburg	Saxony A.	Genetically modified crops	CI Contra GMO	Biomass and Land	2
18	Giessen	Hesse	Genetically modified crops	CI Gendreck Weg(ContraGMO)	Biomass and Land	2
19	Groß Lüsewitz	M.W.P	Genetically modified crops	CI Gendreck Weg(ContraGMO)	Biomass and Land	2
20	Strausberg	Brandenb.	Genetically modified crops	CI Gendreck Weg(ContraGMO)	Biomass and Land	2
21	Brandenb.	Brandenb.	Landgrabbing		Biomass and Land	1
22	Freiburg	Baden W.	Use of pesticides	PAN (Pesticide Action Network)	Biomass and Land	1
23	Großenknete	L.Saxony	Impacts of factory farming	CI MUT (People, Flora, Fauna)	Biomass and Land	1
24	Mecklenburg	M.W.P.	Impacts of factory farming	CI No Agrarian Factories	Biomass and Land	1
25	Holzminden	L.Saxony	Impacts of factory farming	CI No Agrarian Factories	Biomass and Land	1
26	Salzwedel	Saxony A.	Impacts of factory farming	CI No Agrarian Factories	Biomass and Land	1
27	Rostock	M.W.P.	Impacts of factory farming	CI No Agrarian Factories	Biomass and Land	1
28	Emsland	L.Saxony	Impacts of factory farming	CI No Agrarian Factories	Biomass and Land	1
29	Wietze	L.Saxony	Impacts of factory farming	CIs, Animal welfare, GP, BUND	Biomass and Land	1
30	Schlesw. H	Schlesw.H	Privatization of forests	CI Forest Alliance, BUND,Nabu	Biomass and Land	1
31	Garzweiler I	N.R.W.	Contra lignite mining	BUND	Fossil Fuels /Energy	2
32	Garzweiler II	N.R.W.	Contra lignite mining	BUND/	Fossil Fuels /Energy	2
33	Jänschwalde-N	Brandenb.	Contra lignite mining	GP, BUND	Fossil Fuels /Energy	4
34	Jänschwalde	Brandenb.	Contra lignite mining	GP, BUND	Fossil Fuels /Energy	4
35	Cottbus Nord	Brandenb.	Contra lignite mining	GP, BUND	Fossil Fuels /Energy	4
36	Nochten II	Saxony	Contra lignite mining	Left/Green Party, BUND, Nabu	Fossil Fuels /Energy	4
37	Welzow Süd	Brandenb.	Contra lignite mining	Green League, CI	Fossil Fuels /Energy	4
38	Buir	N.R.W.	Contra lignite mining	CI	Fossil Fuels /Energy	1
39	Hambach	N.R.W.	Contra lignite mining	Bund, CI out of coal	Fossil Fuels /Energy	1
40	Drensteinfurt	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
41	Hamm	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
42	Werne	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
43	Herbern	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
44	Witten	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels/Energy	5
45	Isselburg	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
46	Kleve	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
47	Hochsauerland	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
48	Mülheim	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
49	Aachen, Jülich	N.R.W.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
50	Intschede	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
51	Rotenburg	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
52	Braunschweig	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
53	Wolfenbüttel	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
54	Lüneburg	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
55	Usedom	M.W.P.	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
56	Hamburg	Hamburg	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
57	Auenland	Schlesw.H	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
58	Lauenburg	Schlesw.H	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
59	Saal	M.W.P.	Contra fracking	CI	Fossil Fuels /Energy	1
60	Kassel	Hesse	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
61	Korbach	Hesse	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
62	Unstrut	Thuringia	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
63	Fahner Höhe	Thuringia	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
64	Weiden	Bavaria	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
65	Völkersen	L.Saxony	Contra fracking	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
66	Brandenb.	Brandenb.	CCS	CI No CCS	Fossil Fuels /Energy	2
67	Nehmten	Schlesw.H	CCS	Nabu, BUND, GP, CI	Fossil Fuels /Energy	5
68	North Sea	L.Saxony	CCS in the Sea	CI	Fossil Fuels /Energy	1
69	Mueritz Park	M.W.P.	CCS	CI No Gas below Gras	Fossil Fuels /Energy	1
74	Altmark	Saxony A.	CCS	CI No CO2 Repository Altmark	Fossil Fuels /Energy	1
75	Nordfriesland	Schlesw.H	CCS	CI No CO2 Repository	Fossil Fuels /Energy	1

70	Hamburg	Hamburg	Coal fired power plant	CI, Robin Wood	Fossil Fuels /Energy	2
72	Datteln IV	N.R.W.	Coal fired power plant		Fossil Fuels /Energy	1
73	Wilhelmshaven	L.Saxony	Coal fired power plant	CI	Fossil Fuels /Energy	1
76	Lubmin	M.W.P.	Coal fired power plant	CIs	Fossil Fuels /Energy	1
66	Hamburg	Hamburg	District heating piping	Robinwood, CI Countercurrent	Fossil Fuels /Energy	1
77	Hamburg	Hamburg	Renationalization energy	Nabu,BUND, GP, Robin Wood	Industrial and Utilities	1
78	Berlin	Berlin	Renationalization energy		Industrial and Utilities	2
79	Berlin	Berlin	Contra Tempelhof		Infrastructure	3
80	Berlin	Berlin	Contra Mediaspree project		Infrastructure	2
81	Halle/ Saale	Saxony A.	A 143 Saale valley	Nabu	Infrastructure	1
82	Leipzig	Saxony	Nato hub/ night flights	CI	Infrastructure	1
83	Dresden	Saxony	Construction of bridge	Green league	Infrastructure	3
84	Franconia	Bavaria	Mega electricity grid		Infrastructure	1
85	Stuttgart	Baden W.	Tunnel + train station	CIs	Infrastructure	1
86	Muenchen	Bavaria	Application for Olympia	CIs, NGOs	Infrastructure	1
87	Frankfurt	Hesse	Enlargement airport	CIs, BUND	Infrastructure	2
88	Munich Airport	Bavaria	Enlargement airport	CIs, BUND	Infrastructure	2
89	Berlin Airport	Berlin	New airport, flight routes,	CIs	Infrastructure	1
90	Berlin	Berlin	Stop motorway	CI STOP A 100	Infrastructure	1
91	Dresden-Usti	Saxony	Stop motorway	Deti Zeme (Kinder der Erde)	Infrastructure	1
92	Fehmarn	Schlesw.H	Stop bridge Baltic Sea	CI, VCD, Green/ Left Party	Infrastructure	1
93	Bad Segeberg	Schlesw.H	Enlargement motorway	Nabu, BUND	Infrastructure	1
94	Gorleben	L.Saxony	Contra suclear storage	GP, BUND, CI	Nuclear	4
95	Hamburg	Hamburg	Atom-Transport-Port		Nuclear	1
96	Gronau	N.R.W.	Uranium enrichment plant	CI Radiated	Nuclear	2
97	Jülich	N.R.W.	Nuclear waste as fuel	CI Radiated	Nuclear	1
98	Wackersdorf	Bavaria	Nuclear reprocessing	CI	Nuclear	2
99	Ahaus	N.R.W.	Interim nuclear storage	CIs	Nuclear	1
100	Stade	L.Saxony	Decommissioned plant	CIs	Nuclear	1
101	Neckarwestheim	Baden W.	Decommissioned plant	CIs	Nuclear	1
102	Asse	L.Saxony	Nuclear waste storage	CIs	Nuclear	1
103	Brokdorf	Schlesw.H	Nuclear power plant	CI, Anti-Nuclear-Movement	Nuclear	1
104	Kalkar	N.R.W.	Nuclear Power Station	CI, Anti-Nuclear Movement,	Nuclear	1
105	Sudelfeld	Bavaria	Snow cannons,water use	Alpine Association (DAV), CI	Tourism Recreation	1
106	Bad Schandau	Saxony	Climber sandstone rocks	Climber Association (SBB)	Tourism Recreation	1
107	Halle/ Saale	Saxony A.	Toxic waste in old mines	2 CIs	Waste Management	1
108	Ruhr Area	N.R.W.	Toxic waste in old mines	C	Waste Management	1
109	Potsdam	Brandenb.	Renationalization water	CI	Water management	1
110	Berlin	Berlin	Renationalization of water	CI Berlin Water Table	Water management	2
111	Saxony-Anhalt,	Saxony A.	Elbe river regulation		Water management	1
112	Hamburg	Hamburg	deepening of Elbe river		Water management	1
113	Saale	Saxony A.	River regulation	BUND	Water management	1
114	Hamburg	Hamburg	Water use for power plant	Citizen Initiative, NGOs	Water management	1
115	Straubing,	Bavaria	River regulation	BUND,Heritage NGO,Churches	Water management	1
116	Altmühltal	Bavaria	River regulation	BUND	Water management	1
117	Blankenese	Hamburg	Filling Elbe river for Airbus	CI Muehlenberg, Bund, Nabu	Water management	1

* times mentioned by different experts

CI(s)= Citizens' Initiative(s), GP = Greenpeace, BUND = German Federation for the Environment and Nature Conservation (Friends of the Earth Germany), Nabu = Nature and Biodiversity Conservation Union