

Article

Tele-Coupling Energy Efficiency Policies in Europe: Showcasing the German Governance Arrangements

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Abstract: Climate change entails many situations of tele-coupling. We analyze an example in the field of European climate and energy policy. The EU aims at an almost full decarbonisation of its economy by 2050. Achieving this objective asks for transforming the energy sectors of EU Member States. These are responsible for 80% of carbon emissions. Further to this policy coupling, the EU transformation objectives have to be implemented by the Member States, regions and local actors. This proves especially complex in the field of energy efficiency. Here, a variety of policy instruments and actors are in place. In our contribution, we investigate in the question how multi-level governance arrangements in the energy efficiency field are designed. We focus on Germany as example for a federal state setting. Our review method comprises literature content analysis, primary sources, expert interviews and an in-depth screening of the German Sustainable Energy Action Plans. We find that formal vertical coordination has been successfully backed up by horizontal and especially informal governance mechanisms, leading to a model of polycentric governance. This model might serve as blueprint for other multi-level governance arrangements. Yet, we find that the “last mile” of this coordination still needs strengthening: Local actors need more active engaging and empowering to reap the full potential of the governance arrangements.

Keywords: EU energy and climate policies; multi-level governance; energy efficiency governance in Germany; informal and polycentric coordination; Covenant of Mayors

1. Introduction

Climate change entails situations of increased connections and interdependencies between distant actors and regions [1,2]. These phenomena of teleconnection [3] or tele-coupling have recently gained attention in land system sciences [3–8]. The concept of tele-coupling describes physical connections, say the influence of soy bean demand in Europe on the producers in Brazil [9]. It also comprises societal and economic connections such as movements of goods, people or capital [2]. Following this analysis, a strand of literature ventures to find appropriate governance solutions. A number of works on tele-coupling governance in the framework of globalization suggested the creation of international institutions based on a top-down governance approach in a multi-level governance (MLG) framework [5,9]. More recent works however suggest that rather polycentric governance (so-called MLG II [6]) is a more suitable approach to tackle tele-coupling situations and empower local actors to actively contribute to a given problem [10].

In our contribution, we will focus on a special set of polycentric multi-level governance in European climate and energy policy. By doing this we enlarge the original concept of tele-coupling as interconnectivity of physically distant spaces [11–15]. For our purposes, we refer to the notion of interconnectivities in the same physical macro-region (European Union): In this region, political, economic and social distances exist between (1) different policy fields (climate change policies and energy policies); and (2) different governance levels (European Union; Member States; regional

and local stakeholders). Tele-coupling in this situation would be defined as the outreach of not directly related actors across policy fields. This is to differentiate to more commonly used terms of ‘coordinating between actors’, or ‘aligning actors’ in a multi-level governance setting describing top-down or bottom-up situations, in which policies are implemented in a “control and command” line. With tele-coupling, an actor such as the EU by-passes intermediate government levels (national and regional) to directly address the local level, without necessarily forcing it to implement a certain set of policies.

The coupling needs become clear when looking at the EU’s climate and energy objectives and their modes of delivery. The European Union aims at an almost full decarbonisation of its economy by 2050 [16]. This objective entails the necessity to transform the fossil-fuel-locked energy system. About 80% of carbon emissions stem from the energy sector. Reducing these emissions necessitates sustainable energy policies such as the uptake of renewable energies or energy efficiency [17–22]. Recent estimates of the European Commission [23] show that by achieving economically feasible energy savings of 30% by 2030, the EU could reduce CO_{2eq.} emissions by overall 41% against 1990 levels.

Changing from the climate change to an energy policy viewpoint, however, sustainability is only one of the key policy objectives. It aligns with competitive energy prices and security of supply. Especially in times of crisis [24,25] the latter goals often outweigh the sustainability goal and tamper their strong connection, leading to several redefinitions of the policy goals [26]. In the case of energy efficiency policies, this implies that overly costly measures such as mandatory energy refurbishment with existing buildings are often not addressed. Another factor impeding a swift implementation of EU climate and energy policies is the fact that Member States—and here more precisely local actors—have to deliver the EU objectives. In the absence of an effective emissions trading scheme as coordination mechanism (for a detailed discussion see [27]), governance arrangements need to coordinate local, regional, national and European action. This has led to a variety of implementation issues concerning climate and clean energy policies [28–32].

This coordination is especially complex with energy efficiency policies. Energy efficiency delivers least cost CO₂ reduction, safeguards energy security and lowers energy costs [33–36]. For these reasons, the IEA called on its Member States to make energy savings “the first fuel” to use [37]. This argumentation incited the EU and Germany to adopt the “energy efficiency first” principle [16]: Energy saving options should be used before installing new power plants. With the technological progress in the energy efficiency field, this principle is a continuous task over time for governments.

Energy efficiency policies do not lend themselves easily for top-down governance. The energy efficiency pattern of local actors (e.g., building insulation, up-take of efficient home appliances, energy-sufficiency, and mobility patterns) largely depend on individual choices. These choices are determined less by interest in contributing to European targets but by availability of finance, information on energy saving options, or qualified support by experts. The options at individual level are often limited through the existence of energy efficiency barriers (for a review of energy efficiency barriers see [38,39]). This raises the issue of finding a suitable multi-level governance structure to empower local actors and individual citizens to make consumption choices at local level that in turn support the overall macro-economic and -political climate objectives of the European Union.

Energy efficiency governance has been reviewed by the World Bank in 2007 [40], Jollands and Ellis (2009) [41], the IEA (2010) [42] and Delina (2012) [43]. These reviews focus on the set-up of formal institutions and processes, but less on informal arrangements [44]. In our contribution, we will demonstrate that informal arrangements—in line with Swyngedouw [45]—are highly important for a quick and effective coordination among government levels. In addition, “tele-coupled” outreach from the European level directly to the local level via the “Covenant of Mayors” can present an interesting aspect of semi-formal but yet highly effective coupling of different levels of government.

The research question of this article is: How are the multi-level governance arrangements in European energy efficiency policies designed, taking a special focus on Germany? By doing this, we address sub-questions such as: What is the role of polycentric governance in energy efficiency policies?

What is the importance of informal governance for achieving a solid coupling of all government levels and actors? And finally: Is the direct connection of the local level to EU policies strong enough to empower and emancipate individual citizens to participate in this governance structure?

To provide answers to these questions, this paper is structured as follows: In Section 2, we outline the key background of EU energy efficiency policies and link it to the specific German situation. Our methodology is presented in Section 3. Section 4 shows our findings for the coordination arrangements at European and national level. We discuss the validity of our results and the system boundaries of our research framework in Section 5 and draw conclusions on effective multi-level governance designs in Section 6.

2. Energy Efficiency Policies in the EU: Some Background

The EU has followed energy efficiency policies since the 1970s. Originally, environmental regulations were used to justify EU action in this field, as the EU did not have legislative competence foreseen in the European Community framework. This changed with the Treaty of Lisbon (Treaty of the Functioning of the European Union, TFEU), where article 194(1) empowers the European level to act in the field of energy efficiency.

In the Green Paper on Energy Efficiency [46] of 2005, Commission analysis showed an economic energy saving potential of 20% primary energy compared to the PRIMES business as usual scenarios for 2020. The Council of the EU turned this economic potential into a political target. It established the framework of the EU 2020 sustainable energy and climate goals in the energy and climate package of 2008. These goals consist of 20% reduction of greenhouse gases compared to 1990, 20% renewable energy sources in the energy and exploiting the 20% energy saving objective, all to be fulfilled by 2020 [47].

To reach the objective, the EU introduced or amended a set of secondary legal instruments (see Table 1 for an overview). These instruments consist of directives (transposition by the Member States needed; giving them leeway on the implementation) and regulations (no transposition is needed; legislation directly applies to the Common Market).

Table 1. Legal instruments of EU energy efficiency policies.

Instrument	Field	Major Content	Revision Status	Major Content of Revision with “Winter Package”
Energy Efficiency Directive (2012/27/EU)	Cross-cutting	<ul style="list-style-type: none"> Member States need to set indicative national targets Obligation for energy distributors or retail energy sales companies to achieve 1.5% energy savings per year through the implementation of energy efficiency measures (can be taken up by Member States in the framework of “alternative measures”) Exemplary role of the public sector in refurbishing public buildings by at least 3% of floor area Set-up of building efficiency strategies Mandatory energy audits for non-SMEs; incentives for SMEs to undertake energy audits Easy and free access to energy consumption data for consumers 	Ongoing	<ul style="list-style-type: none"> Update of EU efficiency target: 30% binding energy efficiency target for 2030 at EU level Extend energy efficiency obligation provision beyond 2020 while keeping the annual rate of savings at 1.5% Update provision of information on heating and cooling Strengthen consumer rights in metering and billing of thermal energy
Energy Performance of Buildings Directive (2010/31/EU)	Buildings	<ul style="list-style-type: none"> New buildings should be ‘nearly zero’ energy standard and use renewable energies ‘to a very large extent’ in 2020 Public authorities should take over an exemplary role for buying or renting ‘nearly zero energy building’ by 2018 Member States should support the refurbishment of buildings into very low energy buildings Minimum requirements for components 	Formal approval pending	<ul style="list-style-type: none"> Introduces path towards a low and zero emission building stock in the EU by 2050 underpinned by national roadmaps to decarbonize buildings Stronger use of information and communication technology (ICT) and smart technologies (introducing automation and control systems) Roll-out of infrastructure for e-mobility in all buildings Set-up of a “smartness indicator” to measure the buildings’ capacity to use new technologies Integrates long term building renovation strategies of the EED
Energy Labelling Directive (2010/30/EU)	Products	<ul style="list-style-type: none"> Labelling of energy consuming equipment to display i.a. energy consumption in a standardized manner 	Regulations amended	<ul style="list-style-type: none"> Labels have been recalibrated to an A–G class scale

Table 1. Cont.

Instrument	Field	Major Content	Revision Status	Major Content of Revision with “Winter Package”
Eco-design Directive (2009/125/EC)	Products	<ul style="list-style-type: none"> Minimum efficiency standards across life-cycle of product groups; implemented via regulations 	Updated	<ul style="list-style-type: none"> Updated work plan 2016–2019 comprising a target set of product groups to be regulated
Internal Electricity Market Directive (2007/72/EC)	Market/Consumer	<ul style="list-style-type: none"> Aim of providing 80% of all European customers with intelligent meters by 2020 	-/-	-/-
Energy Taxation Directive (2003/96/EC)	Taxation	<ul style="list-style-type: none"> Minimum tax rates for i.a. electricity and gasoline 	-/-	-/-
Standards for motor vehicles (Regulation (EC) No 715/2007 on type approval of motor vehicles)	Transport	<ul style="list-style-type: none"> Mandatory CO₂ standards for cars. Definition of Euro 5/ Euro 6 norms with view to reduce transport emissions constantly 	-/-	-/-

Source: Author’s own compilation based on [16,48].

Out of these, the Energy Efficiency Directive of 2012 (EED; Directive 2012/27/EU [49]) stands out in terms of governance: It strengthened and installed policy coordination mechanisms between EU and Member State level. The EED merged the earlier Directives on Energy Services (Directive 2006/32/EC [50]) and Combined Heat and Power (Directive 2004/8/EC [51]). The Service Directive asked Member States to deliver 9% end use savings by 2016 and demonstrate the achievement of these savings in tri-annual National Energy Efficiency Action Plans. The process of submitting, commenting and up-dating these plans has been retained in the EED. It proved to be a central governance element, which enables a structured dialogue between the European Commission and Member States. It will be analyzed in detail in Section 4.1.

Further to legislation, the Commission has tabled several communications and two EU action plans (2006 and 2011) on energy efficiency [52,53]. Especially the action plans with annexed list of multiple measures (in the case of the 2006 Action Plan, the list of annexed measures covers over 90 individual actions targeting European or national level) underlined the need to use a variety of policy instruments in different sectors. This implies working and coordinating closely with a multitude of stakeholders and actors, mainly at local level [54]. Local action is framed and supported by both national and regional governments, as well as local citizens and stakeholders [55–62]. To trigger additional local action, the European Commission initiated formats such as the Covenant of Mayors for Climate and Energy [63] as well as the Smart Cities and Communities Initiative [64]. These in turn have proved a valuable means of tele-coupling European and local level for sustainable energy and climate policy action, which we will review in detail in Section 4.1.

Following the Roadmap 2050 modelling exercise in 2012 [65] and the discussion on the update of the sustainable energy and climate objectives to 2030, the European Commission has tabled the “Clean Energy for All Europeans” strategy in 2015 [66]. The strategy and its related legislative “Winter package” fill the wider political concept of an EU Energy Union. Following a proposal of Council president Tusk, the Juncker Commission has upgraded sustainable energy policies into one of its ten “flagship initiatives” for the Commission working period 2015–2019 [67]. The overall aim of the Energy Union are security of energy supply, competitive energy prices and sustainability. The EU intends to reduce its greenhouse gas emissions by 80–95% by 2050 through these objectives to fulfil its pledge to the Paris Agreement. The strategy recognizes the greenhouse gas—energy use nexus and installs energy efficiency as cornerstone for achieving the CO_{2eq} reduction targets of the EU (“energy efficiency first”) [68,69]. With that, the two policy-fields are politically (tele-)coupled.

This coupling strategically necessitates an update of the sustainable energy targets for 2030. These are now tentatively set at reducing greenhouse gas emissions by 40%, achieving minimum 27% renewable energies in the energy mix and a proposed increase of energy efficiency by minimum 27%, potentially 30% [70]. It can be assumed that the objectives will still change, following political negotiations between Commission, Member States and the European Parliament. To support the more ambitious stance on energy efficiency, the “Winter Package” put forward revisions or recasts of all major energy efficiency legislation [71] (see Table 1 for proposed updates). The negotiations are still on-going but can be expected to be closed during the Bulgarian or Austrian Council presidency in 2018.

The need to step up efforts on energy efficiency to reduce greenhouse gases increases the need to coordinate among actors from different government levels. In consequence, several formal and informal coordination structures have developed that can serve as blueprints for multi-level governance, assuring a tele-coupling of European and local level.

The devised mechanisms can be exemplified with Germany as model for a federal structure. Optimally EU and Member State coordination leads to national coordination of the federal government with regional and local actors. Germany plans to reduce primary energy consumption by 20% in 2020 and by 50% in 2050 as compared to 2008 levels [72]. The latest strategy documents however show that the country needs to achieve further energy savings to deliver on these objectives [73,74]. Taking up further measures implies a close interaction between federal government, the 16 federal states and

the local level. We will now present our methodology for reviewing governance arrangements in the energy efficiency field.

3. Methodology

Building on the institutional analyses put forward by IEA (2010), Jollands and Ellis (2009) and Delina (2012) [41–43], we will start to present the formal institutional arrangements taken at EU and national level (Germany) for energy efficiency governance.

In order to review the European and German governance on policy coordination, we applied a two-tier approach. Tier one consisted of a comprehensive review of existing literature and reports on energy efficiency governance and policy coordination in Germany. To identify peer-reviewed papers we referred to Science Direct, EconLit and the Genios databases, the latter also to identify press and internet reviews. Of our search results, we retained 25 peer reviewed papers and 14 non peer-reviewed analyses and reports.

To identify suitable primary sources (reviews, studies and reports) we screened document repositories of the European Commission (DG Energy and DG Clima), the Cordis database (Community Research and Development Information Service) and the EU Joint Research Center's Publication Repository. The Legislative Observatory (OEUIL) of the European Parliament allowed us to track latest information on the governance regulation, which is presently under negotiation. The online database of the Covenant of Mayor allowed us to access the total of available Sustainable Energy and Climate Action Plans. To obtain material on the German governance mechanisms we retrieved information from the document repositories of the Federal Government, the Federal Ministry of Economic Affairs and Energy, the Federal Agency for Energy Efficiency and the national energy agency (dena). We identified similar sources at regional level, with a focus on the most populous states of North Rhine-Westphalia, Bavaria and Baden-Wuerttemberg. The material retained for analysis consists largely of primary sources such as legislative texts, impact assessments, research studies and policy reports. In total, this additional literature pool of primary sources consists of 38 documents.

In a second step, we validated the retrieved results by additional fact-finding. For this we could draw on information obtained through a total of five semi-structured interviews and two rounds of expert discussions with EU and German government representatives, civil society and energy experts. Interviews and expert workshop sessions were arranged along a predefined questionnaire and discussion questions, including both open and closed qualitative questions. Their key aim was to close factual knowledge gaps on the implementation of energy efficiency governance (interviews) and future possibilities to enhance this for EU energy policies at large (workshop sessions). EU feedback was retrieved in a dedicated workshop on energy governance (Trialogue workshop of the Governance Platforms of Humboldt and Viadrina universities on the governance of the EU Energy Union; Berlin 13 July 2017) which also included structured discussions with representatives of the German federal level and policy stakeholders at large [75]. The German-language evaluation of the discussion is available with the Supplementary Material. Following up on an earlier review of monitoring and verification of energy efficiency policies [44] we obtained information through semi-structured interviews with regional agency and government officials from North Rhine-Westphalia, Bavaria and Baden-Wuerttemberg, Germany's three most populous states. Table 2 summarizes the interview and workshop arrangements in an anonymized format, following the wish of some of the participants.

Table 2. Overview on interview and expert discussion design.

Stakeholder Function/Entity	No. of Participants	Survey Method	Date of Survey	Method of Contact	Aim of Interview	Evaluation of Material
European Commission, policy officer	1	Semi-structured interviews following interview guideline	11 January 2018	Telephone interview	Feedback on NEEAP availability and quality	Interview protocol
German federal government (ministry)	1	Semi-structured interviews following interview guideline	13 July 2017	Direct interview	Feedback on German NEEAP and administrative burden	Interview protocol
German federal government (agency)	1	Semi-structured interviews following interview guideline	21 November 2017	Telephone interview	Feedback on German NEEAP and administrative burden	Interview protocol
Regional government ministry (North Rhine Westphalia)	2	Semi-structured interviews following interview guideline	9 May 2017	Direct interview	Coordination with national and local level	Interview protocol
Regional government ministry (Bavaria)	1	Semi-structured interviews following interview guideline	13 June 2017	Direct interview	Coordination with national and local level	Interview protocol
Regional government ministry (Baden-Wuerttemberg)	2	Semi-structured interviews following interview guideline	14 December 2017	Direct interview	Coordination with national and local level	Interview protocol
Energy governance experts form EU and Germany (administration, politics, research, industry, NGO)	56	Workshop format (morning and afternoon session meetings in plenary and panel format)	13 July 2017	Open question following Delphi method (kick-off question; all stakeholders can react to comments made by one of them)	Options for further energy policy coordination in multi-level governance framework	Workshop evaluation and documentation (see Supplementary Materials)

Source: Author's own compilation.

Finally we analyzed the total set of 60 Sustainable Energy and Climate Action Plans of Germany. Here, we focused on identifying information on coupling of climate and energy policies to the regional, national or European level and the direct tele-coupling of EU and local level via the Covenant of Mayors. This was done by checking whether the plans contained dedicated arrangements to link i) energy and climate policies and ii) links or relations to regional, national or EU programmes in these fields. In addition, we investigated whether the plans were set up through means of involving the local population, industry associations or NGOs to create ownership and empower local entities and individuals and whether local energy efficiency objectives were set to support the overall EU energy efficiency goals (see Table S1).

To systemize our results we distinguish in line with Kemp et al. (2005) [76] between vertical coordination of different government levels and horizontal organization of entities at the same level. Our validation process showed that apart from the “classical” coordination mechanisms, which follow the legislative process in a multi-level governance setting, informal mechanisms play an increasingly important role. This is why we will also distinguish between “formal” and “informal” coordination arrangements.

4. Results: Tele-coupling of Energy Efficiency Policies

4.1. Governance Arrangements between EU and Member States

4.1.1. Formal Vertical Governance

The Treaty of the Functioning of the European Union (TFEU) codifies formal governance arrangements between European level and Member States. For energy efficiency policies, article 194(1) establishes a clear mandate for the European level. Article 4 TFEU classifies energy policy at large as “shared competence”, installing the subsidiarity principle in this field [16,77]. In practical terms, this implies that all major acts and regulations fall under joint law-making of European Commission, Council and the European Parliament (ordinary legislative procedure, OLP or “co-decision”). Whereas product legislation (eco-design and labelling) usually takes the legislative form of “regulation” to be directly applicable in the common market, the majority of legal acts is adopted as “directive”. The latter necessitates a transposition into national law to become effective. It leaves the Member States with some digression on how to implement the legislation in detail. Often technical details have to be settled following an OLP agreement or need to be up-dated over time. For this, it is common to install “comitology committees”. Under the chair of the European Commission, Member States representatives and Commission discuss implementing and delegated acts that modify or clarify legislation (See [78] for a detailed overview on the comitology procedures).

Member States need to notify the European Commission of the implementation of the EU acquis. The Commission can launch an “infringement procedure” against a Member State in case of non-transposition or non-compliance of the transposition with EU legislation. This could potentially lead to a court case with the European Court of Justice and financial penalties. To start the procedure, the Commission sends out a “letter of formal notice”, requesting transposition details from a Member State. The Member State in turn must reply within a given period (usually eight weeks). In case the country’s reply is not satisfactory and the Commission concludes the legal obligations are not (fully) met, the Commission will send out a formal request to comply (“reasoned opinion”), explaining the issues of non-compliance and again asking the Member State to act within a deadline (another eight weeks). If again the reply is unsatisfactory, the Commission can decide to refer the issue to the Court of Justice [79].

In cases where an infringement is not expected or simply information missing, the European Commission has the possibility to start an informal dialogue with the Member States, the so-called “EU-PILOT”. This online database is used to exchange information prior to an infringement procedure. Using this exchange channel, a Member State has ten weeks to reply to an inquiry and the Commission 10 weeks to reply to the Member State’s response. In 2016, 790 pilot cases were opened and some

further 875 pending. Still, in 75% of cases in 2015, the cases could be closed due to satisfactory replies from national governments [80]. Using the EU-PILOT as clarification tool for transposition is common for all energy efficiency acts. Especially with the implementation of the energy efficiency saving obligations of article 7 EED, the Commission has started pilots with almost all Member States [81] which in some cases are still open.

The governance arrangements presented may be suitable for formal exchange on legal implementation of energy efficiency acts. Yet, they fall short of pushing for an “ambitious” implementation of the legislation in several respects: (1) a continuous dialogue on policy upgrades is not possible. Especially in the field of energy efficiency, relying on a multitude of policies and measures at national level, this is of prime importance; (2) the process does not allow for a best practice exchange, neither vertically (between Commission and Member States), nor between Member States (horizontal coordination); and (3) as EU law binds only Member States/national governments, a direct link to actions in the regions and at local level is not possible within this format. In order to address these shortcomings, the European Commission has added further coordination tools.

4.1.2. Informal Policy Coordination Mechanisms

The shortcomings addressed in Section 4.1.1 are not specific to the energy efficiency field. They relate to several EU policy fields where a limited transfer of competences to the EU level or a lack of coordination competence exist. This has led the European Commission to apply several modes of “soft governance”, with the open method of coordination (OMC) being the most prominent example. As Knodt [71,82] points out, the Lisbon strategy installed OMC on the bases of voluntarism, participation and policy convergence. Usually standard setting, iteration and learning processes are used by means of peer-review, best practice exchange and benchmarking. Generally OMC installs a coordination mechanism by setting central goals and allowing for decentralized implementation [83].

In the energy efficiency field, OMC started with the 2006 Energy Service Directive of 2006. As described in section two this precursor of the Energy Efficiency Directive asked Member States to deliver 9% end energy savings against a base period 2001–2005 by 2016 by policy action. The national policies and measures and their respective savings were to be documented in tri-annual reports, the so-called National Energy Efficiency Action Plans (NEEAPs). Member States have to submit their NEEAPs to Commission Services by 20 June 2007, 2011, 2014, 2017 and 2020. Following the OMC principle of iteration, the Commission will respond to the Member States with suggestions on how to improve their policies [84]. This process allows the Commission to comment on the transposition of policies and measures taken in the Member States, allowing for an enhanced vertical coordination.

During the first two rounds of NEEAPs in 2007 and 2011, reporting and the strive for standardized monitoring and reporting were key issues [44,85]. In 2011 it became obvious that business as usual policies would entail missing the 20% efficiency target. This led to policy action on enlarging and enhancing the policy action in the framework of the Energy Efficiency Directive but also to the need to find formats that allow informal discussions with Member States on the “ambition level” of policy implementation. It soon became obvious that the NEEAPs could serve as a basis for a structured dialogue on energy efficiency policies between Commission and Member States. In consequence the Commission asked Member States to use NEEAPs as a “policy tool” [86]. This implies shifting the focus of the NEEAPs from the monitoring and reporting of energy savings to the display and evaluation of national policies and measures with the aim to support ambitious energy efficiency policy. The 2012 Energy Efficiency Directive (EED) confirmed this philosophy and has issued a template for the preparation of the NEEAPs and added lighter Annual Progress Reports to allow for a more frequent exchange on policy updates. This allows for a quasi-continuous structured dialogue on the various provisions between the Commission and Member States. Among Member States, the OMC method of benchmarking should be easier with this structure, allowing them to identify best practices. From 2020 on, the NEEAP reporting will be integrated in the larger framework of integrated National Energy and

Climate Plans (iNECPs; see [71] establishing the OMC method as method for the governance of the Energy Union. This approach is coordinated with the presently revised EED [87].

Given the technically complex and necessarily fragmented approach to implement energy efficiency policies, Commission and Member States agreed that a regular additional exchange on policy implementation was needed on an informal basis. They installed so-called “Concerted Actions” supporting the implementation of the EED and the EPBD (Energy Performance of Buildings Directive). Both formats enable bi-yearly informal meetings between Member States and Commission Services. Key features of the meetings are implementation issues and best practice exchange [88]. The meetings follow “core themes” covering the key requirements of the underlying legislation (NEEAPs, Financing, Public Sector, CHP and Heating and Cooling, Energy Services, Energy Obligation Schemes, Metering and Billing, Consumer Information in the case of the EED). Discussions and internal procedures follow Chatham House rules to allow frank and trustworthy exchanges on best practices but also shortcomings. Still, key outcomes of these meetings are available to the broad public in the form of consolidated reports.

Applying OMC to energy efficiency policy allows a much closer and quicker interaction with the Member States’ national institutions. It does not solve the shortcoming of addressing regions and the local public and private entities where the bulk of energy savings and hence greenhouse gas reductions can be achieved.

At regional level, this problem is less pronounced as the Committee of Regions can serve as an intermediary between European and regional level. In order to establish tele-coupling of the European and local level and accordingly directly reach out to local stakeholders, the Commission has set up several platforms and initiatives. Of these initiatives, the Covenant of Mayors for Climate and Energy [89] is the most comprehensive one. Founded in 2008, the Covenant serves as a voluntary platform for cities and communities of any size. The by now 7759 signatories to the Covenant commit themselves to underpin the EU energy and climate targets by similar objectives at local level. The cities and communities joining the Covenant need to set up local Sustainable Energy Action Plans (SEAPs; now called Sustainable Energy and Climate Action Plans or SECAPs with a 2030 perspective) demonstrating the local commitment to 20% greenhouse gas savings at local level. The SEAPs/SECAPs follow standardized guidelines in terms of contents and adaptation through the municipal council. The Joint Research Center of the European Commission provides technical support in forms of guidelines and templates and supports the monitoring of the process [90]. Here again, the classic method of OMC applies to achieve a tele-coupling of European and local level.

Summing up the discussion of the governance arrangements in the energy efficiency field, it can be shown that the European level uses both formal and informal methods of coordination to (i) safeguard the implementation of EU legislation and (ii) incite an “ambitious” implementation in the sense of harvesting the full energy efficiency potential and hence greenhouse gas reduction options. Table 3 provides an overview of the governance methods.

Table 3. Governance arrangements at EU level.

Arrangement	Type of Arrangement (Legal/Non-Legal)	Status (Formal/Informal)	Coordination Type (Vertical/Horizontal)	Entities Covered	Frequency of Interaction
Ordinary legislative procedure	Legal	Formal	Vertical	<ul style="list-style-type: none"> • EU level (Commission, Council, European Parliament) • Member States in Council position and in transposition • Regions via Committee of Regions (consultation process) 	<ul style="list-style-type: none"> • Only during negotiation process
Infringement procedure	Legal	Formal	Vertical	<ul style="list-style-type: none"> • European Commission and selected Member States 	<ul style="list-style-type: none"> • Ad hoc
EU PILOT	Non-legal	Formal	Vertical	<ul style="list-style-type: none"> • European Commission and selected Member States 	<ul style="list-style-type: none"> • Ad hoc
National Energy Efficiency Action Plans (NEEAPs)	Legal	Formal	Vertical	<ul style="list-style-type: none"> • European Commission and Member States 	<ul style="list-style-type: none"> • Regular every three years
Annual updates to the NEEAPs	Legal	Formal	Vertical	<ul style="list-style-type: none"> • European Commission and Member States 	<ul style="list-style-type: none"> • Annual
Concerted Action to the EED and the EPBD	Non-legal	Informal	Vertical and horizontal	<ul style="list-style-type: none"> • European Commission and Member States 	<ul style="list-style-type: none"> • Bi-yearly
Covenant of Mayors for Climate and Energy	Non-legal	Informal	Vertical and horizontal	<ul style="list-style-type: none"> • European Commission and local entities 	<ul style="list-style-type: none"> • Annual plenaries and ad hoc meetings depending on topics

Source: Author's own compilation.

We will now turn to the institutional arrangements for multi-level governance at Member State level in the field of energy efficiency. Here, the example of Germany can serve as a blueprint for countries with a federal architecture.

4.2. Multi-Actor Coordination at Member State Level: The Case of Germany

4.2.1. Assignment of Competences in the German Multi-Level Governance Structure

Energy efficiency plays a key role in reaching the climate and energy targets for 2020 underpinning the German energy transformation strategy (“Energiewende”). Furthermore, the federal government has pledged an indicative objective in terms of absolute primary energy consumption to fulfil article 3 of the EED and support the overall EU 20% energy saving objective.

The federal structures of Germany imply that all levels of government (federal government, regional federal states and local level) have competencies in the various fields of energy policy [91]. It follows that regional governments can and do add to federal government energy policy. In the case of climate and energy efficiency policies, the federal government and the federal states act as co-legislators. According to the subsidiarity principle, federal and local level can enact legislation once this is not done at central government level or once the regional and/or local regulations surpass the ambition of the federal regulations.

By now, all 16 federal states have enacted climate and energy strategies. These cover climate policy and energy efficiency objectives (see Table 4).

Table 4. Regional climate and energy concepts of the federal states in Germany.

Federal State	Law/Energy Concept	Date	Climate Objective	Energy Efficiency Objectives/Policies
Baden-Wuerttemberg	Energy concept "Integrated Energy and Climate Change Concept 50-80-90"	2014	-25% greenhouse gas emissions by 2020; -50% by 2050; both against 1990	-20% final energy consumption by 2020; -50% by 2050; double use of high efficient CHP to 20% of production
Bavaria	Regional energy programme for Bavaria; Climate protection programme Bavaria 2050	2014/2015	Reduce energy-related per capita emissions from 6.26 (2013) to 5.5 tons by 2025. In the long run reduction to below 2 tons per capita per annum	-10% primary energy consumption against 2010 by increasing primary energy productivity by 25% (again against 2010)
Berlin	Energy concept "Berliner Energiewendegesetz"; Energiekonzept 2020	2014	-40% greenhouse gas emissions by 2020; -60% by 2030; -85% by 2050 against 1990	Reduce end energy consumption by 2020 to 62,598 m KWh
Brandenburg	Energy concept "Energierstrategie Brandenburg 2030"	2014	-72% greenhouse gas emissions by 2030 against 1990	-23% end energy consumption by 2030 against 2007
Bremen	Energy concept "Energie- und Klimaprogramm 2020"	2009	-40% greenhouse gas emissions by 2020 against 1990; emissions of steel industry not covered	-/-
Hamburg	Energy concept "Hamburger Klimaplan"	2015	-50% greenhouse gas emissions by 2030; at least -80% by 2050; against 1990. About 2 Mt CO ₂ eq. savings by 2020	-/-
Hesse	Energy concept "Hessisches Energiekonzept" and cabinet decision "Klimaneutrales Hessen 2050"	2015/2016	-30% greenhouse gas emissions by 2020; -54% greenhouse gas emissions by 2025; total "carbon neutrality" by 2050	-/-
Lower Saxony	Energy concept "Niedersächsisches Energiekonzept"	2013	-40% greenhouse gas emissions by 2020; -80–95% by 2050; against 1990	-20% energy consumption by 2020
Mecklenburg-Vorpommern	Energy concept "Landesenergiekonzept"	2015	-40% greenhouse gas emissions by 2020; against 1990	-/-
North Rhine-Westphalia	Klimaschutzgesetz and Klimaschutzplan	2015	-25% greenhouse gas emissions by 2020; -80% by 2050; both against 1990	Increase share of CHP in power production from 10% (2009) to 25% (2020)
Rhineland-Palatinate	Klimaschutzgesetz	2014	-40% greenhouse gas emissions by 2020; -90–100% by 2050; against 1990	Increase share of CHP in power production to 25% (2020)

Table 4. Cont.

Federal State	Law/Energy Concept	Date	Climate Objective	Energy Efficiency Objectives/Policies
Saarland	Energy concept "Masterplan Energie"	2011	-80% by 2050; both against 1990 with presently not defined interim steps	Double share of CHP in power production to 25% (2020)
Saxony	Energy concept "Sächsisches Energieprogramm"	2013	-25% greenhouse gas emissions in non-ETS sectors by 2020 against 2009	Increase share of CHP in power production to 30% (2020)
Saxony-Anhalt	Coalition Agreement	2011	-47.6% greenhouse gas emissions by 2020 against 1990	-/-
Schleswig-Holstein	Gesetz zur Energiewende und zum Klimaschutz (Entwurf)	2016	-40% greenhouse gas emissions by 2020; -55% greenhouse gas emissions by 2030; -70% by 2040; -80–95% by 2050; all against 1990	Energy efficiency targets of the federal level have been taken up at regional level (reduction of primary energy by 20% (2020)/50% (2050); reduction of electricity consumption by 10% (2020)/25% (2050) etc.
Thuringia	Energy concept	2015	Reduce CO ₂ -emissions by 5% until 2015 through increased energy efficiency in buildings	Reduce electricity consumption in the private sector by 1% annually

Source: Author's own compilation.

To support the implementation of the policy strategies or simply national regulations, federal states and local actors have set up a multitude of institutional arrangements. These span from a clear assignment of the energy and climate topic to a responsible state ministry to the set-up of regional and local energy agencies.

Institutional arrangements have been set up at all government levels to safeguard policy implementation. These arrangements span from a responsible ministry for energy efficiency at federal state level, to the set-up of regional and local energy agencies. In some cases, these institutions co-exist. To cite two examples, the work of the state energy agency of the state of Baden-Wuerttemberg is complemented by 27 local energy agencies; five local agencies add to the regional agency in case of North Rhine-Westphalia.

Clearly, the logic of policy coordination differs from the logic applied with a centralized government structure [43]. The German coordination mechanisms closely follows the principle of subsidiarity. It is the task of the Federal Government to define a (minimum) set of policies in the energy efficiency field. Based on this, the federal states can add further energy and climate change policies. The local level is responsible for implementing these measures. Often it is given leeway to adapt them locally, by potentially adding components that fit local needs.

As in the case of the European Union, policy coordination in Germany can be analytically divided in (i) vertical and horizontal coordination, implying coordination top-down or bottom-up between the various levels of government; and (ii) formal and informal coordination, distinguishing between legally binding coordination such as the implementation of laws and non-binding interaction such as the exchange of best practices, benchmarks and support schemes. The IEA and several EU projects regularly review coordination mechanisms of their Member States [91–94]. These reviews however limit themselves to stocktaking of the formal vertical coordination.

4.2.2. Formal Vertical Policy Coordination

With energy efficiency, competencies shared between federal and regional governments, the formal vertical coordination overall follows the law-making process [44]. The second chamber of Parliament (Bundesrat; members are representatives of the federal states) needs to approve energy efficiency legislation. The government's draft laws will be circulated to the chamber's committee on 'economy and energy' or 'environment and climate change'. Here, the 16 federal state ministries in charge of energy and climate issues will comment and amend the federal government's proposal. The amended proposal will be voted in plenary and passed on to the first chamber (Bundestag) for approval. The federal state ministries will in turn coordinate with local representatives once local level implementation is needed.

Owing to the federal structures of Germany, this process of law-making is not particular to energy efficiency and climate policies. It is common to most fields of policy, turning it to an established procedure in law-making. Commentators argue that despite being relatively slow in comparison to centralized states this institutional procedures are highly effective in terms of coordination and concertation [95].

Like at European level, the German authorities have developed semi-formal vertical mechanisms to smoothen and speed up the formal law-making process for energy efficiency policies. Again, the method of OMC is applied. At regular intervals the Federal Ministry of Economic Affairs and Energy chairs a working group on energy efficiency (Bund-Länder-Arbeitskreis Energieeffizienz). This group consists of the responsible government officials at federal and federal state level. Informal talks and best practice exchanges are supposed to fine-tune the implementation of energy efficiency policies.

Formal horizontal coordination of climate and energy efficiency policies takes place both on national and on federal state level. Key for the coordination mechanism is the integration of all relevant formal actors, mainly ministries and government agencies. A lead ministry drafting a legislation is obliged to set up an inter-ministerial working group (Interministerielle Arbeitsgruppe, IMA) to ensure policy coherence [96]. At federal state level, additional working groups, the so-called "inter-ministerials" ensure that energy efficiency is dealt with even if the dossier is assigned to an economics ministry in one state and an environment ministry in the other.

At local level, the associations representing cities and communities usually take up direct horizontal coordination. Dedicated instruments to support this coordination (e.g., best practice databases, internet fora; common procurement processes) do not exist for the time being.

4.2.3. Informal Policy Coordination Mechanisms

Formal energy efficiency coordination mechanisms are overall designed to guarantee smooth law-making in line with a multi-level governance structure. It does not however cover a direct exchange with stakeholders outside the governance system. In addition to the semi-formal concertation between government entities, the German federal authorities have set up informal working groups reaching out directly to stakeholders such as industry representatives, consumer organizations or NGOs. These “energy efficiency platforms” are ad hoc meetings to discuss policies and measures to increase energy efficiency in different sectors. This allows knowledge exchange on topics such as the implementation of energy efficiency in buildings or in the transport sector.

The federal ministry of economics and energy used this informal coordination for the first time to develop the ‘National Action Plan on Energy Efficiency’ (NAPE). This plan supplements the 2014 National Energy Efficiency Action Plan (NEEAP) submitted to the European Commission [33,97] with further action. Government actors at all levels and overall stakeholders were invited to submit bottom-up proposals for additional energy efficiency measures to reach the national energy efficiency and climate objectives. Drawing on OMC techniques, a standardized format was used including the need to estimate the energy saving impacts of the measures proposed. Using the OMC method of iteration, the ministry circulated the proposals among stakeholders and hosted platform meetings for overall discussion [97,98].

Similar informal stakeholder processes exist at federal state level similar informal coordination mechanisms exist. Often energy efficiency is one of several cornerstones in a larger climate policy context. One prominent example of bottom-up development of strategies and measures is the Climate Concept and Climate Action Plan of North Rhine-Westphalia. Concept and Action Plan were drafted, discussed and finally adopted by using iterative stakeholder consultation processes, which also reached out to citizens [96].

With the growing role of energy efficiency, the local governments show a growing interest in informal policy coordination among themselves. This leads to project bundling for public procurement (joint contracting solutions on street lighting or energy efficient office equipment) which is loosely coordinated through the local and regional energy agencies and in some cases local energy efficiency networks. European formats such as the Covenant of Mayors or Smart Cities and Communities continue to raise interest with local actors but remain patchy in comparison to other EU countries.

In comparison to the over 3000 Italian adherents to the Covenant, only 60 German cities participate. The small number can be attributed to the existence of competing formats such as the European Energy Efficiency Award. Given that some 11,100 cities and communities exist in Germany, the simple number alone hints that the potential for horizontal coordination is not exploited to its full potential. This also limits the tele-coupling effect of linking European and local level in Germany. The plans set up locally are to be coordinated with local actors and stakeholders in order to empower them and create an active link and ownership of the individual to the overall macro-economic and political EU objectives.

This unexploited tele-coupling impact shows as well when closely analyzing the German SEAPs/SECAPs. As discussed in Section 1, climate policy and energy policies are coupled with renewable energies and energy efficiency contributing largely to greenhouse gas emissions. For this, the overall 20% greenhouse gas emissions reductions would need to be underpinned by stringent energy efficiency policies and measures. Our review (see Table S1) however shows that only eight of the 60 SEAPs/SECAPs contain dedicated objectives for energy efficiency improvements. Here again, a leeway for improved coordination or standard-setting along the line of OMC can be seen.

Summing up the German coordination arrangements for energy efficiency policy (Table 5), it can be shown that informal arrangements are strongly supplementing the formal coordination structures.

Table 5. German governance arrangements on energy efficiency policies.

Arrangement	Type of Arrangement (Legal/Non-Legal)	Status (Formal/ Informal)	Coordination Type (Vertical/ Horizontal)	Entities Covered	Frequency of Interaction
Legislative procedure (shared competences)	Legal	Formal	Vertical	<ul style="list-style-type: none"> Federal government and regions/ federal states via second chamber of parliament (Bundesrat) 	<ul style="list-style-type: none"> Only during negotiation process
Concertation on legislative proposal (inter-ministerial working groups)	Legal	Formal	Horizontal	<ul style="list-style-type: none"> Federal level (among ministries) only Federal state level ministries) only 	<ul style="list-style-type: none"> Ad hoc
Working Group on energy efficiency	Non-legal	Informal	Vertical	<ul style="list-style-type: none"> Federal government and regions/ federal states 	<ul style="list-style-type: none"> Regular (annually), but ad hoc meetings are possible
Consultation of local entities by Federal States	Legal	Formal	Vertical	<ul style="list-style-type: none"> Federal states and local entities 	<ul style="list-style-type: none"> Ad hoc
Energy Efficiency Platforms	regions/ federal states	Informal	Vertical	<ul style="list-style-type: none"> Federal government; federal state representatives, local entities via representatives and representatives of the broad public (via stakeholders such as industry representatives, NGOs and consumer organizations) 	<ul style="list-style-type: none"> Mainly ad hoc, but usually project timelines apply
Bottom-up development of regional climate and energy strategies	Non-legal	Informal	Vertical	<ul style="list-style-type: none"> federal state representatives, local entities via representatives and representatives of the broad public (via stakeholders such as industry representatives, NGOs and consumer organizations) 	<ul style="list-style-type: none"> Called upon on ad hoc basis, but usually following given deadlines
Local project bundling for energy efficiency	Non-legal	Informal	Horizontal	<ul style="list-style-type: none"> Selected local entities, often bundled through climate and energy agencies 	<ul style="list-style-type: none"> Ad hoc
Covenant of Mayors for Climate and Energy	Non-legal	Informal	Vertical and horizontal	<ul style="list-style-type: none"> European Commission and local entities 	<ul style="list-style-type: none"> Annual plenaries and ad hoc meetings depending on topics

Source: Author's own compilation.

The informal arrangements are strongly patterned along OMC methods such as iteration, benchmarking and best practice exchange and can help to overcome classical energy efficiency barriers like information gaps [36]. Especially the inclusion of a broader range of stakeholders allows tracking deficits or gaps with the present set of climate and energy efficiency policies.

5. Discussion

The field of climate change lends itself to analyze many situations of tele-coupling, involving geographically or procedurally different actors [1,2]. Especially in the European Union a strong link to energy policies exist. As discussed above, reaching the overall European greenhouse gas reduction objectives is largely depending on the individual preferences and choices of individual citizens in the EU to improve energy efficiency. Unlike the fields of industry emissions or the uptake of renewable energies, energy efficiency policies necessitate a set of multiple actors and instruments and cannot be tackled by one single instrument alone [53]. A set of multi-level government arrangements have been installed to make up for these difficulties. They link the European to the local level and even the individual citizen with the clear aim of empowering them to achieve the energy savings needed.

Our review tends to support the works in related tele-coupling reviews [3,9], which argue that multi-level governance arrangements can solve coordination problems that arise in situations of tele-coupling. The effectiveness and coupling effect of many instruments are hard to evaluate, given their informal nature. In addition, both effectiveness and coupling effect with the ad hoc instruments depend strongly on the individual case. For example, the effectiveness may be very high at one occasion (say implementation and feedback of energy labelling) but less effective at other moments (say building certificates). Table 6 sums up proxies for an assessment of the effectiveness of the regular governance and tele-coupling arrangements taken, leading to an overall first qualitative assessment.

Table 6. Evaluation of the regular governance and tele-coupling arrangements.

Type	Regular Coupling Arrangement between Government Levels	Direct Focus on Energy Efficiency Objectives or Measures	Results Public	Active Communication of Results	Peer Pressure/Naming and Shaming as Means to Increase Ambition Level	Sanctions in Case of Non-Compliance	Overall Qualitative Evaluation of Effectiveness Based on Previous Items
Exchange fora	Concerted Action	Yes	Partly (summary reports)	Partly (only public findings) via stakeholder events (Sustainable Energy Week).	No	No	Very effective, according to interviews and review studies. Given the confidentiality, this is hard to track.
	Energy efficiency platforms	Yes	Yes, via meeting minutes	No	No	No	Overall effective in assembling stakeholders.
	Ministry Working group on energy efficiency	Yes	No	No	No	No	Effectiveness cannot be judged given the confidentiality arrangements.
Reports	National Energy Efficiency Action Plan (NEEAP)	Yes	Yes	No. Document is seen rather as reporting tool. Policy development is taken in other formats, e.g., the National Action Plan on Energy Efficiency (NAPE).	Yes, Commission review and feedback. EU projects tracking progress in Member States.	Yes, following standard EU procedures.	Iterations show qualitative improvement. However, still rather reporting than policy-shaping instrument.
	Annual reports to NEEAP	Yes	Yes	No	Yes, Commission review and feedback.	Yes, following standard EU procedures.	Limited public attention, mainly reporting document.
	Sustainable Energy Action Plan/Sustainable Energy and Climate Action Plan.	No, varies locally. Only 6 of the 60 plans contain efficiency objectives.	Yes	Yes, locally and on website of the Covenant of Mayors.	Yes, feedback from CoM secretariat.	Suspension of membership in case of missing documents for establishing SEAP/SECAP. Updates/monitoring reports: signatory is put on hold, implying that the city profile on the public website will turn grey and will not appear when searching.	Effectiveness depending strongly on national setting (e.g., number of adherents in Italy versus Germany). Given the overall CO ₂ -reduction focus, the impact on shaping energy efficiency policies remains limited with overall majority of plans.

Source: Author's own compilation.

Our findings confirm the key role of formal vertical coordination structures as discussed in literature and policy reviews [41,42,93]. Still we suggest that horizontal coordination and—to a much larger extent informal coordination mechanisms—can help to align policies across several levels of government and at spatial distance. This underlines the need to investigate further in polycentric governance as analyzed by Oberlack et al. [10]. Formats such as the Concerted Actions or the Covenant of Mayors help to bring together stakeholders and arrange policy implementation in a systematic manner. Eakin et al. point out in their works on land-use coupling similar findings with the emergence of new actors that take the role of facilitators [7]. The success of informal arrangements such as OMC shows through their up-take in other fields (the set-up of a Concerted Action on the Renewable Energy Directive) and as overall coordination structure for post 2020 EU energy policies [71].

The institutional arrangements presented can serve as blueprints for other fields of resource governance. However, our findings tend to confirm the work of Swyngedouw [45], pointing out that a clear distinction is to be made between effective governance, emancipation and empowerment of the individual actors. The arrangements found in the energy efficiency field are installed mainly in a top-down manner. One notable exemption is the regional climate and energy concept of North Rhine-Westphalia that has been developed in a comprehensive stakeholder dialogue process [96]. Our screening of the German SEAPs/SECAPs shows that only six of the total of 60 plans have been set up through local stakeholder consultations or include stakeholder feedbacks and only eight of the 60 tackle energy efficiency targets directly. This highlights that also in climate and energy efficiency governance institutional arrangements and processes might need to be improved “on the last mile” for a full emancipation and empowerment of individual actors to contribute to EU climate and energy policies.

Especially at local level, limited capacities and resources as well as fragmented jurisdiction represent key barriers against further participation. Many municipalities still lack awareness on existing EU funding or capacity building possibilities. Emancipating local actors works on several levels: It comprises both formal and informal inclusion in policy design and policy feedback processes in political terms. In terms of empowerment, local actors need to have access to best practices, exchange networks and financial support. EU-financed projects such as “Mayors in Action” [55] can help to foster this empowerment – again by means of tele-coupling – but remain too selective to close the gap at this level.

Turning to the wider perspective of lessons learnt of this case for the field of “critical and transformative sustainability sciences”, the following three issues deserve further looking into: (1) Rather than classic top-down governance, polycentric governance structures seem more promising arrangements to include and empower the local level; (2) the notion of governance should not restrict itself to formal arrangements, but also consider informal settings that facilitate the formal arrangements; and (3) adequate support and capacity building is necessary especially at the “last mile” of the governance chain. This can be provided by direct tele-coupling with more distant policy levels and actors, which is the case between local and EU level in the case of energy efficiency policies.

In order to deepen and generalize these findings, we suggest further research based on this review. EU energy efficiency policies and the German institutional set-up is a valid, but still limited case for polycentric governance across several institutional levels. This review would need to be enlarged to other EU countries with a “federal” setting (say Austria, Belgium, Italy or Spain) or contrasted to a more centralized approach like the French governance system.

In addition to enlarging the realm of review, a deepening of the analysis would lend itself for further research. Our regional analysis focused on only three of the 16 German federal states. The same is true for the local level concerning two aspects. (1) In-depth interviews with the signatory cities and communities could not be undertaken but might deliver further insight on why so few chose to opt for a larger stakeholder involvement, empowering individuals to participate in the formulation of local climate and energy policies. (2) The cities participating in the Covenant of Mayors are likely those that support sustainable energy systems and lowering CO₂ emissions and can consequently be regarded as

frontrunners. Taking a larger sample of cities and investigating in the reasons for not participating in the governance scheme might deliver valuable further insights. It should also be noted, that our review focused formal and public governance, while it only skim-reads other forms of governance like societal self-governance such as energy cooperatives or self-sustained energy regions [99–104]. Whereas both are less developed in the field of energy efficiency, a follow-up analysis would be beneficial.

6. Conclusions

This paper analyzed multi-level governance for energy efficiency policies in the EU and Germany based on a comprehensive literature review, structured interviews with the relevant actors at all levels and a screening of the local Sustainable Energy and Climate Action Plans of 60 German cities and municipalities. We find that tele-coupling of European climate and energy objectives with local delivery at individual citizen level can be solved by introducing stringent multi-level governance. Optimally this governance should be polycentric, including horizontal governance relations between actors of the same level. Clearly formal governance is a sine qua non. Still, to be fully functioning, informal mechanisms should back it up.

The Covenant of Mayors is an example for a governance arrangement, which tries to directly connect European and local level. It can be seen as establishing a “political tele-coupling arrangement”. Logistic support is given to the local level to set up SEAPs/SECAPs. Both the cascading polycentric energy efficiency governance and this “tele-coupling shortcut” can serve as potential blueprints for other tele-coupling arrangements. Still, our findings suggest that outreach to the individual citizens still needs to be improved to create a stronger policy coherence at this “last mile” of policy delivery.

This linking to individual citizens is key to empowering them to actively participate and govern in EU climate and energy policies. Further research is needed to identify (1) means to enlarge the coupling of EU-local level to more local entities and (2) best practices to include and activate final consumers in the governance arrangements.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/10/6/1754/s1>, Figure S1: Evaluation of energy governance workshop, Table S1: Evaluation of SEAPs and SECAPs.

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References

1. Duit, A.; Galaz, V.; Eckerberg, K.; Ebbesson, J. Governance, complexity, and resilience. *Glob. Environ. Chang.* **2010**, *20*, 363–368. [[CrossRef](#)]
2. Moser, S.C.; Hart, J.A.F. The long arm of climate change: Societal teleconnections and the future of climate change impacts studies. *Clim. Chang.* **2015**, *129*, 13–26. [[CrossRef](#)]
3. Friis, C.; Nielsen, J.Ø.; Otero, I.; Haberl, H.; Niewöhner, J.; Hostert, P. From teleconnection to telecoupling: Taking stock of an emerging framework in land system science. *J. Land Use Sci.* **2015**, *11*, 131–153. [[CrossRef](#)]
4. Seto, K.C.; Reenberg, A.; Boone, C.G.; Fragkias, M.; Haase, D.; Langanke, T.; Marcotullio, P.; Munroe, D.K.; Olah, B.; Simon, D. Urban land teleconnections and sustainability. *Proc. Natl. Acad. Sci. USA* **2012**, *109*, 7687–7692. [[CrossRef](#)] [[PubMed](#)]
5. Kissinger, M.; Rees, W.E.; Timmer, V. Interregional sustainability: Governance and policy in an ecologically interdependent world. *Environ. Sci. Policy* **2011**, *14*, 965–976. [[CrossRef](#)]
6. Hooghe, L.; Marks, G. Unraveling the central state, but how? Types of multilevel governance. *Am. Polit. Sci. Rev.* **2003**, *97*, 233–243.

7. Eakin, H.; DeFries, R.; Kerr, S.; Lambin, E.F.; Liu, J.; Marcotullio, P.J.; Messerli, P.; Reenberg, A.; Rueda, X.; Swaffield, S.R.; et al. Significance of Telecoupling for Exploration of Land-Use Change. In *Rethinking Global Land Use in an Urban Era*; Seto, K.C.-Y., Reenberg, A., Eds.; The MIT Press: Cambridge MA, USA, 2014; pp. 141–161.
8. Seto, K.C.-Y.; Reenberg, A. (Eds.) *Rethinking Global Land Use in an Urban Era*; The MIT Press: Cambridge MA, USA, 2014.
9. Lenschow, A.; Newig, J.; Challies, E. Globalization's limits to the environmental state? Integrating telecoupling into global environmental governance. *Environ. Politics* **2015**, *25*, 136–159. [[CrossRef](#)]
10. Oberlack, C.; Boillat, S.; Brönnimann, S.; Gerber, J.-D.; Heinemann, A.; Ifejika Speranza, C.; Messerli, P.; Rist, S.; Wiesmann, U. Polycentric governance in telecoupled resource systems. *Ecol. Soc.* **2018**, *23*. [[CrossRef](#)]
11. Young, O.R.; Berkhout, F.; Gallopin, G.C.; Janssen, M.A.; Ostrom, E.; van der Leeuw, S. The globalization of socio-ecological systems: An agenda for scientific research. *Glob. Environ. Chang.* **2006**, *16*, 304–316. [[CrossRef](#)]
12. Yu, Y.; Feng, K.; Hubacek, K. Tele-connecting local consumption to global land use. *Glob. Environ. Chang.* **2013**, *23*, 1178–1186. [[CrossRef](#)]
13. Liu, J.; Hull, V.; Batistella, M.; DeFries, R.; Dietz, T.; Fu, F.; Hertel, T.W.; Izaurralde, R.C.; Lambin, E.F.; Li, S.; et al. Framing Sustainability in a Telecoupled World. *Ecol. Soc.* **2013**, *18*. [[CrossRef](#)]
14. Liu, J.; Mooney, H.; Hull, V.; Davis, S.J.; Gaskell, J.; Hertel, T.; Lubchenco, J.; Seto, K.C.; Gleick, P.; Kremen, C.; et al. Sustainability. Systems integration for global sustainability. *Science* **2015**, *347*, 1258832. [[CrossRef](#)] [[PubMed](#)]
15. Meyfroidt, P.; Lambin, E.F.; Erb, K.-H.; Hertel, T.W. Globalization of land use: Distant drivers of land change and geographic displacement of land use. *Curr. Opin. Environ. Sustain.* **2013**, *5*, 438–444. [[CrossRef](#)]
16. European Commission. Division of Competences within the European Union. 2016. Available online: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:ai0020> (accessed on 7 February 2018).
17. Ringel, M. Fostering the use of renewable energies in the European Union: The race between feed-in tariffs and green certificates. *Renew. Energy* **2006**, *31*, 1–17. [[CrossRef](#)]
18. Vogelphl, T.; Ohlhorst, D.; Bechberger, M.; Hirschl, B. German renewable energy policy: Independent pioneering versus creeping Europeanization? In *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*; Solorio Sandoval, I., Jörgens, H., Eds.; Edward Elgar Publishing Limited: Cheltenham, UK; Northampton, MA, USA, 2017; pp. 45–64.
19. Solorio Sandoval, I.; Jörgens, H. The EU and the promotion of renewable energy: An analytical framework. In *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*; Solorio Sandoval, I., Jörgens, H., Eds.; Edward Elgar Publishing Limited: Cheltenham, UK; Northampton, MA, USA, 2017; pp. 3–22.
20. Solorio Sandoval, I.; Jörgens, H. (Eds.) *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*; Edward Elgar Publishing Limited: Cheltenham, UK; Northampton, MA, USA, 2017.
21. Solorio Sandoval, I.; Bocquillon, P. EU renewable energy policy: A brief overview of its history and evolution. In *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*; Solorio Sandoval, I., Jörgens, H., Eds.; Edward Elgar Publishing Limited: Cheltenham, UK; Northampton, MA, USA, 2017; pp. 23–44.
22. Hoppe, T.; van Bueren, E. From frontrunner to laggard: The Netherlands and Europeanization in the cases of RES-E and biofuel stimulation. In *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States*; Solorio Sandoval, I., Jörgens, H., Eds.; Edward Elgar Publishing Limited: Cheltenham, UK; Northampton, MA, USA, 2017; pp. 65–84.
23. European Commission. *Impact Assessment Proposal for a Directive of the European Parliament and of the Council amending Directive 2012/27/EU on Energy Efficiency*; SWD(2016) 405 Final; European Commission: Brussels, Belgium, 2016.
24. Chalvatzis, K.J.; Ioannidis, A. Energy supply security in the EU: Benchmarking diversity and dependence of primary energy. *Appl. Energy* **2017**, *207*, 465–476. [[CrossRef](#)]
25. Austvik, O.G. The Energy Union and security-of-gas supply. *Energy Policy* **2016**, *96*, 372–382. [[CrossRef](#)]
26. Vogler, J. Changing conceptions of climate and energy security in Europe. *Environ. Politics* **2013**, *22*, 627–645. [[CrossRef](#)]

27. Daskalakis, G. Temporal restrictions on emissions trading and the implications for the carbon futures market: Lessons from the EU emissions trading scheme. *Energy Policy* **2018**, *115*, 88–91. [[CrossRef](#)]
28. Becker, S.; Blanchet, T.; Kunze, C. Social movements and urban energy policy: Assessing contexts, agency and outcomes of remunicipalisation processes in Hamburg and Berlin. *Util. Policy* **2016**, *41*, 228–236. [[CrossRef](#)]
29. Quitzow, L.; Canzler, W.; Grundmann, P.; Leibenath, M.; Moss, T.; Rave, T. The German Energiewende—What’s happening? Introducing the special issue. *Util. Policy* **2016**, *41*, 163–171. [[CrossRef](#)]
30. Joas, F.; Pahle, M.; Flachsland, C.; Joas, A. Which goals are driving the Energiewende? Making sense of the German Energy Transformation. *Energy Policy* **2016**, *95*, 42–51. [[CrossRef](#)]
31. Gailing, L.; Röhring, A. Is it all about collaborative governance? Alternative ways of understanding the success of energy regions. *Util. Policy* **2016**, *41*, 237–245. [[CrossRef](#)]
32. Fischer, W.; Hake, J.-F.; Kuckshinrichs, W.; Schröder, T.; Venghaus, S. German energy policy and the way to sustainability: Five controversial issues in the debate on the “Energiewende”. *Energy* **2016**, *115*, 1580–1591. [[CrossRef](#)]
33. BMWi—Bundesministerium für Wirtschaft und Energie. *Nationaler Energieeffizienz-Aktionsplan (NEEAP) 2017 der Bundesrepublik Deutschland*; BMWi: Berlin, Germany, 2017.
34. European Commission. *Annex to the State of the Energy Union. Guidance to Member States on National Energy and Climate Plans as Part of the Energy Union Governance*; COM(2015) 572 Final and {SWD(2015)08}, {SWD(2015) 209}, {SWD(2015) 217 à 243}; European Commission: Brussels, Belgium, 2015.
35. European Commission. *State of the Energy Union*; COM(2015) 572 Final; European Commission: Brussels, Belgium, 2015.
36. IEA. *Energy Efficiency 2017; Market Report Series*; IEA: Paris, France, 2017.
37. UNEP—United Nations Environment Programme. *Energy Efficiency Financial Institution Group. Final Report Covering Buildings, Industry and SMEs*; UNEP: Nairobi, Kenya, 2015.
38. WEC—World Energy Council. *Energy Efficiency Technologies. Annex I. Energy Efficiency Potentials and Barriers for Realization in the Industry Sector*; WEC: Aachen, Germany, 2013.
39. Trianni, A.; Cagno, E.; Farné, S. Barriers, drivers and decision-making process for industrial energy efficiency: A broad study among manufacturing small and medium-sized enterprises. *Appl. Energy* **2016**, *162*, 1537–1551. [[CrossRef](#)]
40. Limaye, D.; Heffner, G.; Sankar, A. *An Analytical Compendium of Institutional Frameworks for Energy Efficiency Implementation*; World Bank Energy Sector Management Assistance Program ESMAP; ESMAP: Washington, DC, USA, 2007.
41. Jollands, N.; Ellis, M. *Energy Efficiency Governance—An Emerging Priority*; ECEEE 2009 Summer Study; ECEEE: Stockholm, Sweden, 2009. Available online: http://regulationbodyofknowledge.org/wp-content/uploads/2013/04/Jollands_Energy_Efficiency_governance.pdf (accessed on 7 February 2018).
42. IEA. *Energy Efficiency Governance Handbook*; IEA: Paris, France, 2010.
43. Delina, L.L. Coherence in energy efficiency governance. *Energy Sustain. Dev.* **2012**, *16*, 493–499. [[CrossRef](#)]
44. Ringel, M. Energy efficiency policy governance in a multi-level administration structure—Evidence from Germany. *Energy Effic.* **2017**, *10*, 753–776. [[CrossRef](#)]
45. Swyngedouw, E. Governance Innovation and the Citizen: The Janus Face of Governance-beyond-the-State. *Urban Stud.* **2016**, *42*, 1991–2006. [[CrossRef](#)]
46. European Commission. *Green Paper on Energy Efficiency or Doing More with Less*; COM/2005/0265 Final; European Commission: Brussels, Belgium, 2005.
47. Council of the European Union. *Presidency Conclusions of European Council March 8/9 2007. 7224/1/07 REV 1*; Council of the European Union: Brussels, Belgium, 2007.
48. Bosseboeuf, D. Energy Efficiency Policies in the EU. Lessons from the Odyssey Mure Project. 2012. Available online: <http://www.odyssee-mure.eu/publications/br/MURE-Overall-Policy-Brochure.pdf> (accessed on 7 February 2018).
49. European Commission. *Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on Energy Efficiency, Amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA Relevance: EED*; European Commission: Brussels, Belgium, 2012.
50. European Commission. *Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on Energy End-Use Efficiency and Energy Services and Repealing Council Directive 93/76/EEC (Text with EEA Relevance): ESD*; European Commission: Brussels, Belgium, 2006.

51. European Commission. *Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the Promotion of Cogeneration Based on a Useful Heat Demand in the Internal Energy Market and Amending Directive 92/42/EEC: CHP Directive*; European Commission: Brussels, Belgium, 2004.
52. European Commission. *Energy Efficiency Plan 2011*; COM(2011) 109 Final; European Commission: Brussels, Belgium, 2011.
53. European Commission. *Action Plan for Energy Efficiency: Realising the Potential. Communication from the Commission of 19 October 2006*; COM(2006) 545—Not Published in the Official Journal; European Commission: Brussels, Belgium, 2006. Available online: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3A127064> (accessed on 14 May 2018).
54. Committee of Regions. *Multi-Level Governance and Partnership Practices in Development and Implementation of Sustainable Energy Action Plans (SEAP)*; Committee of Regions: Brussels, Belgium, 2016. Available online: <http://cor.europa.eu/en/events/Documents/SEAP.pdf> (accessed on 7 February 2018).
55. Mayors in Action. *Empowering Supporting Structures of the Covenant of Mayors to Assist Local Authorities in Implementing and Monitoring Their Sustainable Energy Action Plan*. 2017. Available online: <https://ec.europa.eu/energy/intelligent/projects/en/projects/mayors-action> (accessed on 15 April 2018).
56. Hoppe, T.; Butenko, A.; Heldeweg, M. Innovation in the European Energy Sector and Regulatory Responses to It: Guest Editorial Note. *Sustainability* **2018**, *10*, 416. [CrossRef]
57. Heldeweg, M. Normative Alignment, Institutional Resilience and Shifts in Legal Governance of the Energy Transition. *Sustainability* **2017**, *9*, 1273. [CrossRef]
58. Grotenbreg, S.; van Buuren, A. Facilitation as a Governance Strategy: Unravelling Governments' Facilitation Frames. *Sustainability* **2017**, *9*, 160. [CrossRef]
59. Hoppe, T.; van der Vegt, A.; Stegmaier, P. Presenting a framework to analyze local climate policy and action in small and medium-sized cities. *Sustainability* **2016**, *8*, 847. [CrossRef]
60. Betsill, M.M.; Bulkeley, H. Cities and the multilevel governance of global climate change. *Glob. Gov.* **2006**, *12*, 141–159.
61. Bulkeley, H.; Betsill, M. Rethinking sustainable cities: Multilevel governance and the 'urban' politics of climate change. *Environ. Politics* **2005**, *14*, 42–63. [CrossRef]
62. Rohracher, H.; Späth, P. The interplay of urban energy policy and socio-technical transitions: The eco-cities of Graz and Freiburg in retrospect. *Urban Stud.* **2014**, *51*, 1415–1431. [CrossRef]
63. Committee of Regions. *Opinion: The Future of the Covenant of Mayors. 115th Plenary Session, 3-4 December 2015. ENVE-VI/006*; Committee of Regions: Brussels, Belgium, 2015.
64. Manville, C.; Millard, J.; Liebe, A.; Massnik, R. *Mapping Smart Cities in the EU*; Report for the ITRE Committee of the European Parliament; P/A/ITRE/ST/2013-02; European Parliament: Brussels, Belgium, 2014.
65. European Commission. *Energy Roadmap 2050*; European Commission: Brussels, Belgium, 2012.
66. European Commission. *Communication Clean Energy for All Europeans*; COM(2016) 860 Final; European Commission: Brussels, Belgium, 2016.
67. European Commission. *A Resource-Efficient Europe—Flagship Initiative under the Europe 2020 Strategy*; COM/2011/0021 Final; European Commission: Brussels, Belgium, 2011.
68. ECF—European Climate Foundation. *Efficiency First: A New Paradigm for the European Energy System*. Available online: https://europeanclimate.org/wp-content/uploads/2016/06/ECF_Report_v9-screen-spreads.pdf (accessed on 7 February 2018).
69. European Commission. *Speech by Commissioner Arias Cañete at the Lisbon Council "Towards an Effective Energy Union"*; Speech 15/4439; European Commission: Brussels, Belgium, 2015.
70. Council of the European Union. *Conclusions on 2030 Climate and Energy Policy Frame Work*; European Council (23 and 24 October 2014); Doc 145356; Council of the European Union: Brussels, Belgium, 2014.
71. Ringel, M.; Knodt, M. The governance of the European Energy Union: Efficiency, effectiveness and acceptance of the Winter Package 2016. *Energy Policy* **2018**, *112*, 209–220. [CrossRef]
72. Federal Government. *Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply*; Federal Government: Berlin, Germany, 2010.
73. Fraunhofer, I.F.A.M.; Fraunhofer, I.S.I.; Prognos, A.G. *Ausarbeitung von Instrumenten zur Realisierung von Endenergieeinsparungen in Deutschland auf Grundlage einer Kosten-/Nutzen-Analyse. Wissenschaftliche Unterstützung bei der Erarbeitung des Nationalen Aktionsplans Energieeffizienz (NAPE)*; Projekt BfEE 01/2014; NAPE: Berlin, Germany, 2014.

74. Ringel, M.; Schlomann, B.; Krail, M.; Rohde, C. Towards a green economy in Germany? The role of energy efficiency policies. *Appl. Energy* **2016**, *179*, 1293–1303. [CrossRef]
75. Schwan, G.; Treichel, K. *Die Governance der Europäischen Energieunion—Zwischen Nationalen Energiestrategien und Pariser Klimazielen*; Bericht ETR/02-2017; Europäischen Energieunion: Berlin, Germany, 2017.
76. Kemp, R.; Parto, S.; Gibson, R.B. Governance for sustainable development: Moving from theory to practice. *Int. J. Sustain. Dev.* **2005**, *8*, 12–30. [CrossRef]
77. European Commission. *Fitness Check. Reporting, Planning and Monitoring Obligations in the EU Energy Acquis*; SWD (2016) 397 Final; European Commission: Brussels, Belgium, 2016.
78. Metz, J. Expert groups in the European Union: A sui generis phenomenon? *Policy Soc.* **2017**, *32*, 267–278. [CrossRef]
79. European Commission. Infringement Procedure. 2016. Available online: https://ec.europa.eu/info/law/law-making-process/applying-eu-law/infringement-procedure_en (accessed on 7 February 2018).
80. European Commission. *Single Market Scoreboard Performance per Governance Tool: EU Pilot*; European Commission: Brussels, Belgium, 2017.
81. Rosenow, J.; Forster, D.; Kampman, B.; Leguijt, C.; Pato, Z.; Kaar, A.L.; Eyre, N. *Study Evaluating the National Policy Measures and Methodologies to Implement Article 7 of the Energy Efficiency Directive*; Final Report; European Commission: Brussels, Belgium, 2015.
82. Knodt, M.; Stoiber, M. Comparative Politics in the Context of Multilevel Analysis. *Z. Vgl. Polit.* **2010**, *4*, 79–102. [CrossRef]
83. Linsenmann, I.; Meyer, C. Dritter Weg, Übergang oder Teststrecke? Theoretische Konzeption und Praxis der offenen Politikkoordination. *Integration* **2002**, *25*, 285–296.
84. Coalition for Energy Savings. *Coalition Guide to the Energy Efficiency Directive*. 2013. Available online: <http://eedguidebook.energycoalition.eu/images/PDF/EED.pdf> (accessed on 3 March 2017).
85. Wuppertal Institute. *Measuring and Reporting Energy Savings for the Energy Services Directive—How It Can Be Done. Results and Recommendations from the EMEEES Project*. 2009. Available online: http://www.evaluate-energy-savings.eu/emeees/en/publications/reports/EMEEES_Final_Report.pdf (accessed on 7 February 2018).
86. Suomi, U. *CA EED Reports—Core Theme Series Reports Covering Work from January 2013 to March 2015*. 2015. Available online: [http://www.esd-ca.eu/outcomes/core-theme-series-reports/ca-eed-reports-covering-work-from-january-2013-to-march-2015/\(theme\)/7040](http://www.esd-ca.eu/outcomes/core-theme-series-reports/ca-eed-reports-covering-work-from-january-2013-to-march-2015/(theme)/7040) (accessed on 3 March 2017).
87. Sajn, N. Revised Energy Efficiency Directive. European Parliamentary Research Service. 2017, pp. 1–8. Available online: [http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI\(2017\)595923](http://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2017)595923) (accessed on 2 March 2017).
88. CA EPBD. *Concerted Action on the Energy Performance of Buildings Directive*. 2012. Available online: <http://www.epbd-ca.org/index.cfm?cat=home#objectives> (accessed on 3 March, 2017).
89. JRC—Joint Research Center. *The Covenant of Mayors: In-depth Analysis of Sustainable Energy Actions Plans 2015*. Available online: http://www.eumayors.eu/IMG/pdf/2015-11-13_JRC_SEAPAnalysis.pdf (accessed on 7 February 2018).
90. JRC—Joint Research Center. *The Covenant of Mayors for Climate and Energy Reporting Guidelines*. 2016. Available online: <http://publications.jrc.ec.europa.eu/repository/handle/JRC103031> (accessed on 12 March 2018).
91. IEA. *Energy Policies of Member Countries: Germany*; OECD/IEA: Paris, France, 2014.
92. Energy Efficiency Watch. *Improving and Implementing National Energy Efficiency Strategies in the EU Framework*. 2013. Available online: http://energy-efficiency-watch.org/fileadmin/eew_documents/images/Event_pictures/EEW2_Logos/EEW-Final_Report.pdf (accessed on 24 March 2018).
93. Energy Efficiency Watch. *Energy Efficiency in Europe Assessment of Energy Efficiency Action Plans and Policies in EU Member States. Country Report Germany*. 2013. Available online: http://www.energy-efficiency-watch.org/fileadmin/eew_documents/Documents/EEW2/Germany.pdf (accessed on 02 February 2018).
94. Schlomann, B.; Eichhammer, W.; Reuter, M.; Frölich, C.; Tariq, S. *Energy Efficiency Trends and Policies in Germany*. 2015. Available online: <http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-germany.pdf> (accessed on 7 February 2018).
95. ifo Institute. *Koordination von Innovations-, Energie- und Umweltpolitik*; ifo Institute: München, Germany, 2013.

96. Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur und Verbraucherschutz des Landes Nordrhein-Westfalen. Klimaschutzplan NRW, 2015. Available online: https://www.umwelt.nrw.de/fileadmin/redaktion/Broschueren/klimaschutzbericht_nrw_151201.pdf (accessed on 7 February 2018).
97. BMWi—Bundesministerium für Wirtschaft und Energie. Energiewende Plattform Energieeffizienz. Bericht der Konstituierenden Sitzung am 10.07.2014. 2014. Available online: https://www.bmwi.de/Redaktion/DE/Downloads/P-R/plattform-energieeffizienz-zusammenfassung-sitzung-1.pdf?__blob=publicationFile&v=2 (accessed on 02 February 2018).
98. BMWi—Bundesministerium für Wirtschaft und Energie. Mehr aus Energie Machen—Nationaler Aktionsplan für Energieeffizienz, 2014. Available online: http://www.bmwi.de/Redaktion/DE/Downloads/M-O/nationaler-aktionsplan-energieeffizienz-nape.pdf?__blob=publicationFile&v=4 (accessed on 7 February 2018).
99. Oteman, M.; Kooij, H.-J.; Wiering, M. Pioneering Renewable Energy in an Economic Energy Policy System: The History and Development of Dutch Grassroots Initiatives. *Sustainability* **2017**, *9*, 550. [[CrossRef](#)]
100. Warbroek, B.; Hoppe, T. Modes of Governing and Policy of Local and Regional Governments Supporting Local Low-Carbon Energy Initiatives; Exploring the Cases of the Dutch Regions of Overijssel and Fryslân. *Sustainability* **2017**, *9*, 75. [[CrossRef](#)]
101. Saintier, S. Community Energy Companies in the UK: A Potential Model for Sustainable Development in “Local” Energy? *Sustainability* **2017**, *9*, 1325. [[CrossRef](#)]
102. Lammers, I.; Diestelmeier, L. Experimenting with Law and Governance for Decentralized Electricity Systems: Adjusting Regulation to Reality? *Sustainability* **2017**, *9*, 212. [[CrossRef](#)]
103. Brummer, V. Of expertise, social capital, and democracy: Assessing the organizational governance and decision-making in German Renewable Energy Cooperatives. *Energy Res. Soc. Sci.* **2018**, *37*, 111–121. [[CrossRef](#)]
104. Yildiz, Ö.; Rommel, J.; Debor, S.; Holstenkamp, L. Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda. *Energy Res. Soc. Sci.* **2015**, *6*, 59–73. [[CrossRef](#)]



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