

The political economy of climate and energy policy: A Theoretical Framework

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Abstract

Devising policies that facilitate a transition to low-carbon energy systems requires a close understanding of the country-specific political economy of energy and climate policy formulation. We develop a theoretical framework to analyze country-specific experiences and identify entry points that could bring about policy change. Adopting an actor-centered perspective, we argue that those policies are implemented that best meet the objectives of actors that have the greatest influence on policy decisions. Applying the framework includes three basic steps: i) identifying the societal and political actors most relevant for the formulation of energy and climate policies; ii) spelling out these actors' underlying objectives; and iii) assessing the economic, institutional, discursive and environmental context which determines how certain objectives matter for certain societal actors. Context factors determine how these societal actors influence political actors engaged in formal public policy formation, and how the interplay of different political actors' interests results in the adoption of energy and climate policies. We illustrate how the framework could be applied to country case studies with applications to South Africa, Indonesia and Vietnam.

Keywords: Political economy, climate and energy policy, coal

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1. Introduction

The goal of reducing greenhouse gas emissions to mitigate the impacts of climate change has been recognized on the international level, for instance within the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC 2015), which aims to limit global warming to ‘well below 2°C’. The large majority of countries have stated their intention to contribute to this target in the form of voluntary ‘Nationally Determined Contributions’ (NDCs) as well as national climate change strategies and plans.

In spite of considerable additional benefits of low-carbon energy systems, such as improved local air quality and decreased dependence on energy imports, many countries still heavily invest in new fossil-fuel based energy infrastructure, in particular coal-fired power plants. These investment decisions are not exclusively driven by economic factors, but are also heavily influenced by political considerations. These include, inter alia, public demand for low energy prices, lobbying from powerful interest groups, or the desire to create jobs and accelerate structural change. The extent to which such political issues hinder the transition towards a clean energy system crucially depends on the specific context, e.g. a country’s endowment with fossil fuels, its potential for alternative energy sources, its industrial structure, public attitudes towards climate change, etc.

Continued investments in coal-fired power plants would lock in emissions and impede the implementation of climate measures in the future as this infrastructure has a life-time of several decades. For instance, if all coal-fired power plants that are currently announced, planned or under construction were actually built, the 2°C-target would likely be out of reach (Edenhofer et al. 2018). In order to devise strategies that prevent such developments and instead highlight possible entry points for ambitious climate policies, it is useful to gain a better understanding of why individual countries currently build up carbon-intensive energy systems. Despite obvious benefits of climate change mitigation policies for the public good, particular interest groups might lose from more ambitious climate policy. They might even have the power to veto any reform that would change the status quo. In order to identify politically viable entry points into ambitious climate policy the underlying political economy needs to be understood.

This paper contributes to this goal by providing a novel theoretical framework to analyze issues of political economy, i.e. the factors driving energy and climate policy formulation. We adopt the perspective that energy and climate policies emerge from a complex interplay of a diverse set of actors, such as influential individuals, key ministries, industry groups, unions, voters, etc., that have different objectives as well as different means for influencing policy-making. The framework builds on the central assumption that policies reflect the objectives of those actors that have the greatest influence in the decision-making process – very similar to approaches modeling policy formulation as an interplay of demand from interest groups which meets supply by policy makers (Keohane, Reversz, and Stavins 1998; Oye and Maxwell 1994). Applying this generic framework, which could in principle be applied for a broad range of political economy issues, entails three central steps: First, it aims at identifying the societal as well as political actors most relevant for the formulation of energy and climate policies. Second, spelling out these actors’ underlying objectives and how these are affected by their

specific contexts. Third, assessing how these societal actors influence political actors taking formal decisions in institutionalized public policy processes, i.e. how the interplay of different political actors' interests in these institutional settings results in the adoption of certain energy and climate policies.

Section 2 briefly reviews the literature on the political economy of energy policy and places our contribution within this literature. Section 3 develops the theoretical framework by discussing how to conceptualize key actors, their underlying objectives as well as their influence on policy formulation and provides examples for each of these three categories. Section 4 demonstrates how our framework can be applied for the case of three countries that currently plan expanding their coal firing capacities, namely Indonesia, Vietnam, and South Africa. Section 5 discusses how this descriptive framework can be employed to identify politically feasible entry points for climate policies, with a focus on policies to avoid coal expansion. Section 6 concludes.

2. Literature Review

The study of political economy of policy formulation is firmly established in a range of policy fields, including, for example, trade (e.g., Grossman and Helpman 2001) and environmental policy (e.g. Keohane, Reversz, and Stavins 1998; Oates and Portney 2003; Aklin and Urpelainen 2013; Oates and Portney 2003). Public policy scholars have advanced and empirically tested a range of theories of the policy process (e.g., Majone 1975; Sabatier and Weible 2014). These emphasize different factors in policy formation, including the role of the construction of interests and policy learning of key actor groups (Sabatier and Weible 2007), policy entrepreneurs (Kingdon 1995) and institutional contexts (Elinor Ostrom 2005). Gilens and Page (2014) point out the differing power of voter and interest groups in affecting policy outcomes, with economic elites and organized business interest groups having higher influence than median income voters in the US context.

Research on the political economy of climate and energy policy often builds on insights from literature on the political economy of environmental policy developed in earlier decades. Oye and Maxwell (1994), for example, distinguished between 'Stiglerian' settings, in which the beneficiaries of an environmental policy are well-organized and costs widely dispersed (thus making policy adoption more likely), and 'Olsonian' settings, in which costs of regulation are concentrated but benefits are dispersed (making policy adoption more difficult due to free-riding problems in interest group formation). These considerations have also sparked a substantial amount of work examining how special interests lobby to achieve favorable regulation, e.g. by providing contributions for electoral campaigns (Kim, Urpelainen, and Yang 2016).

Previous studies of the political economy analyses of climate and energy policy focused on explaining fossil energy system lock-in (Unruh 2000; Moe 2010; Helm 2010), and on the challenge of transitioning towards a low-carbon energy system mainly based on renewables (Geels 2014). These studies identified a combination of powerful rent-seeking incumbent interest groups, technological infrastructures favoring fossil fuel use (such as grids build

around large-scale coal and gas power production), and regulatory regimes stabilizing this configuration. Various studies have examined potential mechanisms by which transition towards more sustainable energy systems might be politically feasible, including notions of niche development of renewable technologies (Geels et al. 2017), polycentric governance approaches emphasizing decentralized efforts at sustainability transition (Urpelainen 2013; Ostrom 2010), and the role of building “green” constituencies that would counteract the interest of incumbent veto players (Aklin and Urpelainen 2018). Concerning the latter, Meckling et al. (2015) argue that it is essential to grow renewable energy technology interest groups first, to enable more ambitious climate policy formation in later stages. Pahle et al. (2017) advance this line of research on climate policy sequencing by suggesting a typology of barriers to climate policy stringency and options to relax these over time. Hughes and Urpelainen (2015) develop a political economy model that emphasizes public opinion and special interests as drivers of economy-wide and sectoral policies.

In addition to research examining the strategic interplay of actors with diverse objectives in specific institutional and technological settings, a more recent line of research is systematically investigating a broader range of structural political economy factors by applying econometric techniques on large cross-country samples (Tjernström and Tietenberg 2008; Lachapelle and Paterson 2013; Sam Fankhauser, Gennaioli, and Collins 2015; Samuel Fankhauser, Gennaioli, and Collins 2016). Other studies explore support for different kinds of climate policy instruments (Rhodes, Axsen, and Jaccard 2017), including the factors determining the adoption and level of domestic carbon pricing in depth (Dolphin, Pollitt, and Newbery 2016; Rafaty 2018) or focus on carbon market design (Jenkins 2014; Ervine 2017) and revenue recycling (Carl and Fedor 2016; Klenert et al. 2018) .

Another recent line of research, which is closely related to our paper, aims at systemizing and cumulating of theoretical and empirical insights on the political economy of climate and energy policy. Biber et al. (2017) review the literature and discuss a long list of political economy factors influencing energy and climate policy formation. In a similar vein, Karapin (2016) identifies a range of structural and process factors in the literature, and applies these in a comprehensive comparative case study on California, New York and the US federal level. However, neither proposes a generalized framework suited for organizing political economy analysis of climate and energy policy, which is the aim of this paper. Finally, a meta-theoretical framework to analyze the interplay between techno-economic, socio-technical and political factors in energy system transitions is provided by Cherp et al. (2018).

Whereas these authors focus on outcomes, our analysis aims at empirically identifying, describing, and explaining the role of relevant actors, their objectives, and the decision context. Our framework builds on the literature reviewed in this section and aims at including all of the identified factors and processes in a general framework. We follow the approach outlined by Ostrom (2007) to allow for a flexible combination of different theories that consider individual sub-systems and more specific causal effects that are relevant for the understanding of political processes. In aiming for comprehensiveness we consciously trade off theoretical detail, but we consider this particularly justified in view of a future research agenda that aims at developing systematic comparative political economy of climate and energy policy including large-n studies, (comparative) case studies, and large-n meta-analysis

of case studies. Following the example of Ostrom (1990, 2005) and her broader research agenda aiming at stimulating case-study research, theory development and comparative large-n analyses, we believe that a general framework will be useful in establishing common terminology enabling later comparison and analysis of specific studies. Another advantage of our framework is that it is in principle compatible with a range of disciplinary approaches, including political science, social choice and neoclassical welfare economics. We return to this point below, and develop the analytical framework building on the literature next.

3. The Analytical Framework

Our framework to analyze the political economy of energy and climate policy builds on three central elements, namely (i) the relevant *actors*, (ii) their *objectives*, as well as (iii) the *context* determining how a certain objective matters for each actor and how these actors can influence policy formulation. This section first describes these elements in detail and then provides a mathematical formalization that illustrates how this framework can be applied to describe policy formulation. We then discuss how our approach can incorporate a large variety of perspectives on the political economy of energy and climate policy and finally provide an outlook how analyses conducted along this framework can help to inform policy making.

3.1. Actors, objectives, and context

First, our framework aims at identifying the most important *actors* that influence the formulation of climate and energy policies. We divide this category into *societal actors* and *political actors*. Societal actors include unions, industry associations, civil society organizations and voters as well as international organizations and bi- and multilateral development banks. Political actors include political parties, the parliament, key ministries, the president, etc. While the behavior of political and societal actors is embedded within a set of formal and informal institutions constituting a society's polity, we suggest a strong focus on actors as a core unit of analysis because these are the driving forces of policy change or continuity. Choosing actors a key unit of analysis is also helpful to facilitate empirical access to the field (e.g. via interviews, stakeholder analysis), and to consider strategies available to different actor groups in policy advice.

Second, the framework entails establishing a list of *objectives* which matter for these actors. This perspective acknowledges that energy and climate policies are usually implemented with multiple policy objectives in mind (Jakob and Steckel 2016; Edenhofer and Kowarsch 2015), and that objectives and their prioritization differ across groups (Joas et al. 2016). The scientific literature has identified numerous trade-offs and synergies of energy and climate policies with other policy objectives, including economic costs and their distribution, energy security consideration, ambient air quality etc. Hence, we assume that in general, each actor's stance towards energy and climate policy may depend on their relative weighting of several (but not necessarily all) of these policy objectives. For instance, environmental civil society organizations may be most concerned about integrity in terms of domestic or international environmental issues, unions about employment and wages, and the private sector about

profits. Yet, each of these groups may also care about other aspects more directly concerning other groups, such as distributional implications. We assume that for societal actors, these objectives matter directly (societal objectives) and that political actors are concerned about the interests of the societal actor groups they represent but may also have additional idiosyncratic objectives, such as being reelected or increasing standing or power (political objectives). As an example, the ministry of the economy might be most responsive to the demands of key industries, while the ministry of the environment might be more amenable to lobbying by environmental NGOs. Which policies eventually become implemented will be determined by the complex interplay of the interests of these political actors mediated by the political process. For the analysis, it is helpful to distinguish between objectives that can be directly achieved by energy and climate policy, such as low energy prices or security of supply, and those that result in a more indirect fashion, such as employment and structural economic change.

Third, our framework examines the general *context* in which policymaking takes place. In our formulation, context includes economic, environmental, institutional, and discursive aspects. Economic factors include, for example, the level of development, the economic structure (e.g. share of energy-intensive industries), or the energy resource endowments (e.g. fossil or renewable energy resource-base) of a country. Formal and informal domestic institutions structure both how societal groups interact with policy actors, and how formal policy decisions are being taken (e.g. electoral system, constraints on lobbying) and implemented. Beyond domestic institutions, the international embeddedness of a country may also matter for domestic climate and energy policy formation in varying forms and degrees (e.g. Paris Agreement, access to international financial markets). Discursive factors include public opinion (e.g. the share of the population believing in global anthropogenic climate change, political polarization, or the level of government support) or the governance and behavior of media actors. Environmental factors include affectedness of a country or more specific regions by local (e.g. air pollution) and global (e.g. climate change) environmental problems.

We specify that context matters in four ways. First, it structures how individual policy objectives affect individual societal actors. For example, the way in which profits matter for utilities likely depends on whether electricity generation is mainly carried out by private or state-owned companies (i.e. organization of the power sector). Second, context determines the form and degree in which societal actors have an influence on political actors. For example, the extent to which organized lobby groups can influence policy decisions can be expected to depend on the informal and formal forms of interest group representation, the prevailing level of corruption, political ideologies and trust in government. Third, context structures the form and degree of how these political actors can influence policy making. For example, parliament chambers and ministries likely have different powers in presidential and parliamentary systems, and the power of political parties can be expected to differ between proportional and majoritarian electoral systems. Finally, following Karapin (2016) we note that context factors are relevant both in providing the relatively stable *structure* within which climate and energy policy formation takes place, as well as by affecting policy *processes* via specific and sometimes contingent events. Examples for the latter include exogenous events such as episodes of local environmental problems (e.g. smog, extreme weather events), or

strategically coordinated media and policy initiatives by actor networks (e.g. to address local or global environmental problems).

In applying the framework, carefully characterizing the relationships and power structures determining political actors' objectives is important. These are shaped, first, by the objectives of societal actors that can influence political actors inhabiting formal positions of power in various ways (e.g. campaign financing, voting behavior). Second, distinct objectives of political actors such as ministries aiming at increasing their political power need to be accounted for as well. These can also interact with the objective functions of other political actors (such as the president).

Our analytical framework is based on the idea that decision makers can choose from a given set of policy packages. We presume that those policies will be implemented that best meet the objectives of those actors that have the most pronounced influence on policy formulation, either directly in their role as political actors, or indirectly, in the role of societal actors that can influence political actors. Context variables shape both the formation of objectives of actor groups, as well as the broader economic, institutional and discursive context in which they aim to advance them. In this sense the framework is based on the view that policies are supplied by decision makers to fulfill a demand by certain interest groups, in line with the seminal contributions by Stigler (1971), Oye and Maxwell (1994) and Keohane et al. (1998) that pioneered the political economy of environmental policy. We do not presuppose a particular mechanism of how actors' interests are aggregated into policy outcomes, as these will vary by context and are to be determined in empirical-descriptive studies. Thus, our framework can accommodate a large variety of empirical settings and analytic perspectives. These range from developing to developed countries, and from well-governed cases that achieve outcomes which in the welfare economic perspective can be considered to be close to the social optimum, to clientilistic regimes and interest-group based explanations of public policy in which policies are adopted to serve a narrow political and economic elite. The framework does not assume rational policy design in the sense of that empirically some optimization procedure is taking place. It is applicable both in contexts where policies are implemented to predominantly serve the interests of those actors that have over-proportional influence on policy-making, or in setting where the interest of majority (and minority) voter groups are shaping policy adoption. Thus, the framework enables transparent comparison of normative social welfare perspectives on policy formulation with positive analyses focusing on interest group influence on policy formulation. It also enables policy analysis in a welfare theoretic perspective considering political economy constraints, which may or may not be relaxed, possibly over time (Pahle et al. 2017).

Table 1 provides an overview of potential societal and political actors, as well as environmental, socio-economic and strategic objectives relevant for climate and energy policy formulation. It also displays a number of factors that matter for the techno-economic, institutional, discursive, and environmental context.

<p>Societal Objectives</p> <p>Environmental Climate Change Mitigation Local Air Quality</p> <p>Socio-economic Economic costs and efficiency Employment and wages Diversifying the economy, structural change Poverty alleviation Distribution, inequality Public revenues and investments Profits</p> <p>Strategic Technology Transfer Energy Security</p>	<p>Societal Actors</p> <p>Voter groups Unions Energy-intensive industries Utilities Resource owners Industry associations Multi-national corporations, investors Civil society (e.g. NGOs) International NGOs (e.g. WWF, Greenpeace etc.)</p>
<p>Political Objectives</p> <p>Reelection Increasing influence and political power International standing</p>	<p>Political Actors</p> <p>Influential individuals (e.g. president) Key ministries and agencies across different governance levels Political parties (e.g. via parliament)</p>
<p>Context</p>	
<p>Techno-Economic Economic situation (GDP, business cycle, fiscal deficit, etc.) Fossil fuel endowments RE potential Industrial structure (e.g. share of manufacturing and energy-intensive industries)</p> <p>Institutional Organization of the power sector Representation of interest-groups Political system (e.g. democracy, parliamentary vs. presidential, electoral system) Government capacity</p> <p>Discursive Political events (champions for green policies, media attention, framing, socio-environmental conflicts, COP or similar event in country under consideration, etc.) Ideational factors (climate change knowledge, right-left polarization) Trust in Government</p> <p>Environmental Vulnerability to Climate Change Focusing events (climate-related impacts, Smog episodes, power cuts)</p>	

Table 1: Overview of actors, objectives and context factors in the political economy of climate and energy policy

3.2. Formalization

The framework can easily be formalized, which is helpful for further explicating key analytical categories and their relationships. Let there be a number of a relevant *policy objectives* that matter for *societal and political actors*, denoted by O_1^S to O_a^S and O_1^P to O_b^P , respectively, as depicted in Figure 1. The *context factors* are labeled C_1 to C_c , and the objective functions of societal and political actors G_1^S to G_d^S and G_1^P to G_e^P , respectively. Finally, we assume that the objective functions of all political actors can be aggregated into a *policy support function* J , and that the *policy packages* P_1 to P_f will be chosen that yields the maximum political support at a given point in time, i.e. results in the maximum value of J .

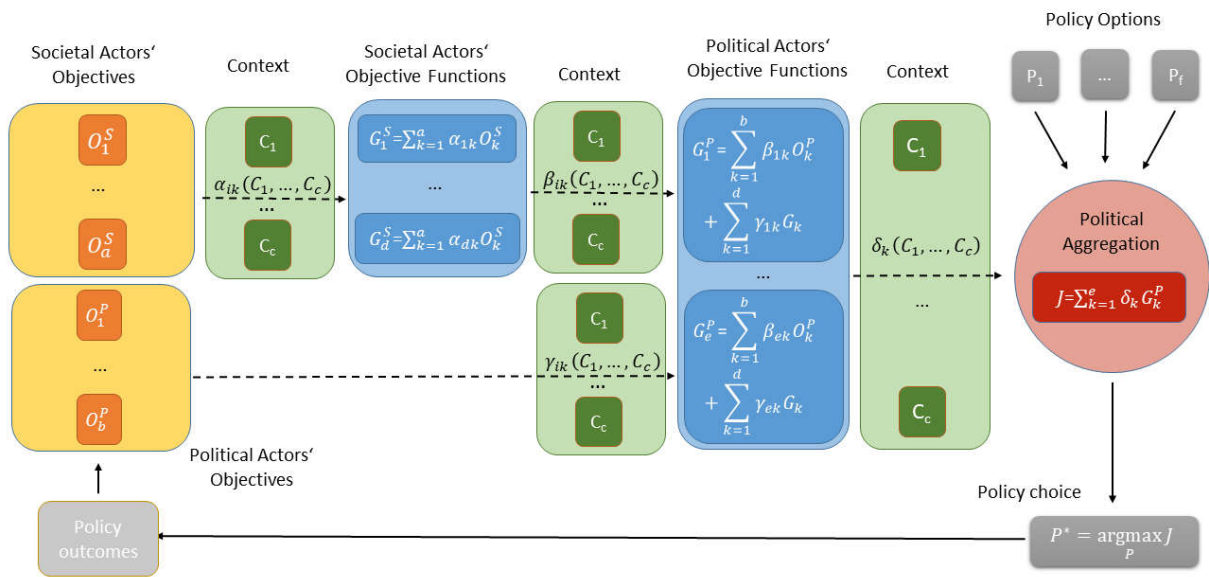


Figure 1: Graphical representation of the framework

Each societal actor's objective function G can be expressed as a weighted sum of all policy objectives (if a policy objective does not matter for a certain actor, the respective weight becomes zero). The weight α_{ik} , which states the importance of policy objective k for societal actor i , can then be expressed as a function of the context factors F , i.e. as $\alpha_{ik}[C_1, \dots, C_c]$. The objective function of societal actor i can hence be written as:

$$G_i^S = \sum_{k=1}^a \alpha_{ik}[C_1, \dots, C_c] O_k^S \quad (1)$$

In a similar vein, we regard each political actor's objective function to depend on two factors: first, on their idiosyncratic objectives, such as ensuring reelection or increasing influence, where the weight political actor i puts on objective k is given by β_{ik} . Second, we regard societal actors as influencing political actors, such that the objective function of each social actor k

enters the objective function of each political actor i with weight γ_{ik} (if an objective or societal actor is not relevant for a certain political actor, the respective weight is zero). We can again express both these weights as functions of the context factors F , i.e. as $\beta_{ik}[C_1, \dots, C_c]$ and $\gamma_{ik}[C_1, \dots, C_c]$:

$$G_i^P = \sum_{k=1}^b \beta_{ik}[C_1, \dots, C_c] O_k^P + \sum_{k=1}^d \gamma_{ik}[C_1, \dots, C_c] G_k \quad (2)$$

Finally, let us assume that all political actors' objective functions G^P can be aggregated into a political support function J . This political support function captures, in a very stylized manner, how power struggles are conducted and deals are brokered between political actors. We express J as a sum of interests weighted by each political actor's political power. We allow the weights δ to be functions of the context variables F , i.e. the degree to which the interest of political actor k influences policy decisions is given by $\delta_k[C_1, \dots, C_c]$:

$$J = \sum_{k=1}^e \delta_e[C_1, \dots, C_c] G_k^P \quad (3)$$

As each G_k^P is a function of the context factors C and societal actors' objective functions G^S , which in turn are functions of the context factors C as well as societal and political actors' objectives O^S and O^P , J can be expressed as a function of the objectives and the context factors, i.e.:

$$J = J[O_1^S, \dots, O_a^S, O_1^P, \dots, O_b^P, C_1, \dots, C_c] \quad (3')$$

We denote the set of f possible policies (in the sense of policy packages that combine different instruments, such as taxes, subsidies, performance standards, transfer payments etc.) that can be implemented by P_1 to P_f . Each policy will result in a specific outcome for each of the objectives of societal and political actors, i.e. O^S and O^P . These objectives can hence be written as functions of the policy in place, i.e. $O_1^S(P), \dots, O_a^S(P)$ and $O_1^P(P), \dots, O_b^P(P)$. Then, the policy P^* that receives the most political support under the constraint of a given set of context factors and a specific constellation of societal and political actors C will be adopted:

$$p = \underset{p}{\operatorname{argmax}} J[O_1^S(P), \dots, O_a^S(P), O_1^P(P), \dots, O_b^P(P), C_1, \dots, C_c]. \quad (4)$$

Hence, our approach can be regarded as an analogy to the comparative static approach in economic theory that describes how an equilibrium between supply and demand (in our case for policies) arises and allows an assessment of how this equilibrium would change as a result of changes in certain parameters of the system.

3.3 A framework integrating multiple perspectives

This approach does not need to presume any specific mechanism of how actors' objective functions are aggregated. Instead, it simply states that different actors have different objectives and that these actors' interests influence policy formulation in a predictable way. Hence, this framework could be used to combine different perspectives of how policy decisions are actually taken, as summarized in Table 2.

A number of studies (Joas et al. 2016; Leipprand and Flachsland 2018) aim at empirically mapping and analyzing societal actors' multiple and differing objectives in climate and energy policy formation. Approaches describing the historical evolution of institutions (Lockwood et al. 2017) can help to shed light on the question of which context factors determine the influence of different societal actors on political actors, and the influence of these political actors on the policy process. This could contribute towards better understanding political power from the perspective of co-evolving technologies and political institutions (Geels et al. 2017). The literature on the formation of social preferences can provide important insights to assess which objective matter in which way for which actors. In this regard, it has been pointed out that attitudes towards climate change depend on several socio-political factors (Capstick et al. 2015); for instance, individuals' positions are highly dependent on political orientation rather than knowledge of scientific facts (Kahan 2015).

Actor-focused approaches such as public choice theory (Cremer, De Donder, and Gahvari 2008; Habla and Roeder 2013) can be drawn upon to assess the role of voters and voter groups as the most important societal actors as well as their main objectives. The political system (e.g. presidential or parliamentary democracy) then determines how exactly their voting behavior matters for political actors. Theories of lobbying can be employed to represent the influence of powerful vested interest (Moe 2010; Aidt 2010). Lobbying can be represented by either accounting for firms' financial contributions in the objective functions of political actors (i.e., firms will contribute the more the better their demands are fulfilled), or including the strategic provision of information by firms in a way that induces policy makers to adopt regulations that are beneficial for those firms. In a similar vein, theories of corruption can further the understanding of how societal actors can exert illicit influence on political actors, and hence policy formulation, to advance their objectives (Fredriksson and Svensson 2003; Rafaty 2018).

A large strand of literature has highlighted that in the absence of credible commitment devices, long-term energy and climate policies might be subject to time-inconsistency (Kalkuhl, Steckel, and Edenhofer 2019). That is, regulators may have an incentive to deviate from previously announced targets, which creates incentives for firms to strategically, for instance by under-investment in clean energy technologies (Brunner, Flachsland, and Marschinski 2012).

Recent contributions on policy sequencing could help to shed light on the question of which instruments policy makers may employ in which order to ease political resistance from potential losers and to create winning coalitions that support the introduction of certain policies (Meckling et al. 2015; Pahle et al. 2018). For instance, it has been argued that even though carbon prices would be reasonable from an economic point of view, it might be

impossible to implement them right away, i.e. without an initial phase-in period of performance standards of renewable support schemes.

Finally, in order to describe how certain policies impact on different policy objectives, the literature on costs and benefits of different energy and climate policies (Goulder and Parry 2008), their distributional implications (Dorband et al. 2019) and potential co-benefits, such as local air quality (Nemet, Holloway, and Meier 2010) will provide useful tools for analysis requiring context-specific application.

Our framework hence seems suitable to include a large variety of perspectives focusing on different actor groups, objectives and policy aggregation functions, and interplay among them.

Dimension considered	Examples for related Literature	Integration in Framework	
Actor objectives	Joas et al. (2016), Leipprand and Flachsland (2018)	Societal and political actors' objectives.	$O^S_1 \dots O^S_a$ $O^P_1 \dots O^P_a$
Institutions and power structures	Lockwood et al. (2017), Geels et al. (2017)	Context factors.	$C_1 \dots C_c$
Social Norms and Behaviour	Kahan (2015), Jakob et al. (2017)	Weight of individual objectives for societal actors.	α
Public choice, voting	Cremer et al. (2008), Habla and Roeder (2013)	Political Actors' objectives. Weight of political objectives and influence of societal actors on political actors	$O^P_1 \dots O^P_b$, β, γ
Lobbying, vested interests	Moe (2010), Aidt (2010)	Weight of political objectives and influence of societal actors on political actors. Relative power of different political actors	β, γ , δ
Corruption	Fredriksson and Svensson (2003), Rafaty (2018)	Societal Actors' Objectives. Weight of political objectives and influence of societal actors on political actors.	$O^S_1 \dots O^S_a$, β, γ
Time-inconsistency	Kalkuhl et al. (2019), Brunner et al. (2012)	Context factors.	$C_1 \dots C_c$
Sequencing	Meckling et al. (2015), Pahle et al. (2018)	Policy Packages.	$P_1 \dots P_e$
Policy outcomes	Goulder and Parry (2008), Dorband et al. (2019), Nemet et al. (2010)	Societal and political actors' objectives.	$O^S_1 \dots O^S_a$

Table 2: Illustrative overview of how different dimensions of political economy can be represented in the framework.

3.4. Understanding policy change

How can policy change be depicted in this framework? Three different channels why policy makers may change policies over time are conceivable. First, the context factors F_1 to F_c that determine how (a) either individual objectives matter for the relevant societal and political actors, (b) how societal actors' interests influence political actors, or (c) how these political actors' interests are reflected in policy formulation may change. This may, for instance, come about due to rising incomes, structural economic change, changing beliefs regarding climate change initiated by policy entrepreneurs, focusing events such as extreme weather events or, smog episodes, as well as institutional reforms that may strengthen or weaken the power of certain key policy actors such as ministries. Second, the feasible combinations of $O^S_1(p)$, ..., $O^S_a(p)$ and $O^P_1(p)$, ..., $O^P_b(p)$ that can be achieved as a result of policy choice (that is, the functional relationship $O(p)$) might change. This could happen, for instance, as a result of cost reductions for low carbon energy sources due to technological progress, additional financing options from international climate finance, or changing political leadership. Third, learning and new ideas about policy options can expand the space of available policy packages to attain different possible combinations of $O^S_1 \dots O^S_a$ and O^P_1, \dots, O^P_b .

In order to illustrate the usefulness of our framework as a basis for case studies, the next section will demonstrate how it can be applied to structure main insights from the literature on the political economy of energy and climate policy in South Africa, Vietnam and Indonesia. In addition, Section 5 will present an outlook on how it can be applied to develop hypotheses regarding policy options to incite energy system transformation that appropriately take specific country contexts into account.

4. Applying the framework to countries investing in coal

Continued investments in coal power generation capacities are among the most important topics in energy and climate policy. Scenario analyses that calculate energy transition pathways for temperature stabilization “well below 2°C” of warming, as internationally agreed in the Paris Agreement, conclude that coal use (without CCS) needs to be phased out globally until 2050 (Luderer et al. 2018). Still, many countries invest in coal to build up their energy systems. While China and India have most recently cancelled a large share of planned power plants, other newly industrializing countries still have ambitious plans to expand their coal-fired capacities (Edenhofer et al. 2018; Shearer et al. 2018). To illustrate how our framework could serve to structure case studies in the future, we apply it – based on existing country case studies that contain relevant information in actors, objectives and context – to the political economy of energy and climate policies in South Africa, Indonesia and Vietnam. We draw on ongoing case study work and leave a full assessment of the actors, objectives and context that shape energy and climate policies in these cases for future related publications.

4.1. Objectives

In Indonesia and South Africa, an important *objective* for policy makers is to generate revenues for the national and states' budgets from coal. By contrast, Vietnam has moved from being a

net-exporter to a net-importer of coal in 2015, such that reducing the fiscal costs of imported coal (in a state-owned power generation system) is an important policy objective. In addition, international recognition to attract climate finance donors has been identified as an important goal of Vietnamese energy and climate policy (Zimmer, Jakob, and Steckel 2015).

In all three countries, despite their obvious differences in terms of governance structures, the objectives of energy security, employment opportunities, poverty eradication as well as economic and industrial development play key roles for many actor groups. Those objectives are at least partly enshrined in development plans or specific policies. For example, in Indonesia a focus on energy security is demonstrated by explicit calls for resource sovereignty, reflected in policies that cap the amount of coal that may be exported. Coal in this respect is seen as a national resource that should be used domestically to cover the (expected) growth in energy demand. In South Africa and Vietnam, coal is highlighted to have a prominent role to play in securing the reliability of electricity supply (Burton et al. 2016; Neefjes and Hoai 2017). Providing electricity access and keeping electricity prices low, both for households and industry, are key objectives to diversify the economy. In this respect, coal is explicitly seen as a means to foster industrial development, particularly in South Africa and Vietnam. In addition, in South Africa overcoming apartheid by the means of 'black economic empowerment' is an important policy goal, which is also relevant for the coal sector (Baker 2015).

All three countries have adopted explicit targets for reducing greenhouse gas emissions or at least aim to slow down their growth, as stated in their NDCs. Environmental policies are however often supervised by environmental ministries, that are considered to have less political influence. For instance, in Vietnam, environmental objectives, including climate change and air pollution, seem to have become more important for important policy makers after an accident in a steel plant that caused environmental pollution in 2017 and related public protests, (Dorband, Jakob, and Steckel in prep.).

4.2 Actors

State owned utilities are key *actors* in all three countries, namely PNL in Indonesia, EVN in Indonesia and Eskom and Sasol in South Africa. Inside governments, various ministries with partly conflicting interests and different power resources shape investment decisions in the electricity sector. For example, in South Africa the Department of Trade and Industry is considered to be more influential than the Department of Environmental affairs that would be in charge for environmental regulations (Baker, Newell, and Phillips 2014). The ruling parties ANC and the Vietnamese Communist Party, respectively, are powerful actors in South Africa and Vietnam. In Indonesia, in light of ongoing attempts to decentralize the governance structures, local governments have become more influential, particularly as they capture a part of the revenues from coal mining activities.

In addition, energy intensive industries are influential in all countries. In Indonesia, the energy intensive and export-orientated palm oil industry extensively lobbies in favor of new coal capacity to ensure cheap electricity (Ordonez et al. in prep.). For South Africa (at least in the

past) as well as in Vietnam international donors are important, both in terms of finance in the energy sector as well as in terms of general funding. In Vietnam, for example, Korean, Japanese and Chinese development banks are financing coal fired power plants, fostering technologies that are developed (and used) in their domestic markets (Chen 2017).

4.3 Context

South Africa (ranked 6th) and Indonesia (ranked 2nd) are among the top coal exporting countries globally. In Indonesia, however, high quality coal that is primarily exported is increasingly depleted and export markets in Asia and Europe are expected to shrink. This situation has provided an incentive for the – politically well-connected – owners of coal mines to lobby the government to increase coal-fired capacity in order to compensate for declining export markets by raising domestic coal demand.

Vietnam and Indonesia are both experiencing very fast increases in energy and electricity demand. For example, in Vietnam electricity demand has been rising by over 12 per cent per year since 1990 (Neefjes and Hoai 2017). At the same time electricity prices are strictly regulated and kept relatively low, both for industry consumers as well as for households with low consumption levels. In Vietnam, a history of central planning and the Communist Party's pledge to provide basic infrastructure services for the whole population at low prices perpetuates fiscal pressures due to subsidized energy consumption. Despite substantial potential for renewable energy generation, existing regulation, such as the lack of credible power purchase agreements and related policy risks for investors, makes it difficult to attract private investments in the energy sector (Neefjes and Hoai 2017).

In all three countries, the power market is characterized by monopolies on the supply side, most notably exerted by state owned companies (ESKOM in South Africa, EVN in Vietnam and PLN in Indonesia). This has led to strong personal ties between the coal industry and regulators. In South Africa, monopoly power is also observed on the demand side, where a large resource and mining conglomerate consumes 44 per cent of the country's electricity.

This short comparative exercise already provides a number of reasons why phasing out coal (and even refrain from new investments) constitutes a substantial political challenge in all three countries. It illustrates that coal is not only deeply intermingled with fundamental policy objectives, such as growth, development, poverty eradication or energy security but also receives significant political support from well-established networks and interests with deep ties to policy makers. These dominate – at least in the current situation – other actors (and their interests) that would allow for different policy narratives. While we think that this exercise demonstrates the basic applicability of our framework, it requires more in-depth case studies to fully understand the often complex objectives-actors-context relations in specific countries.

5 From description to policy

Our framework enables a descriptive account of the political economy factors shaping climate and energy policy formulation. In this section, we discuss how it could help to assess the political feasibility of options for transitioning towards a low-carbon energy system. The political economy perspective adopted here deliberately departs from the ‘first-best’ thinking of neo-classical economics. Instead of asking which outcome would be socially optimal, it posits that those policies will be adopted that best fulfill the objectives of those actors that have the greatest say in policy-making. From this angle, the social optimum would only serve as a benchmark to which to aspire, and policymakers interested in implementing the social optimum (or states close to it) would need to consider policy packages (and possibly sequences of policies over time) that maximize the political feasibility under condition of real world power politics.

New actors supporting certain policy options could affect the balance of power and accelerate policy change. Examples include the participation of civil society in public discussions and decision making, as well as nascent ‘green’ industries that demand a change in energy policies. Policy makers can play an active role in this regard, e.g. by fostering the emergence of ‘green’ industries via means of targeted subsidies and regulations (Meckling et al. 2015) – even if these may be less appealing in traditional welfare economic analysis.

In terms of underlying objectives, it is conceivable that external developments, such as technological progress or changing market conditions, allow for novel opportunities that broaden the option space for policy makers. For instance, declining costs for low-carbon energy sources permit to better meet some actors’ demand for affordable energy supply. In a similar vein, the framework highlights the potential for previously not considered policy options, such as compensation schemes that ensure political buy-in of groups that would otherwise be negatively affected by climate policy. Given that climate policy is still a relatively new phenomenon (Ostrom) and all relevant actor groups are part of a rapid learning process, there may be significant scope for increasing the politically feasible policy space via innovative policy designs.

Regarding the context in which policy decisions are taken, institutional reforms can strengthen the political influence of some actors and weaken the influence of others. For instance, liberalization of the power sector would likely decrease incumbents’ political power and provide opportunities for new entrants, and changes in the political system could allow a higher influence for green parties. Moreover, changing population attitudes can be expected to increase the demand for climate policies. Such change of attitudes could result from new scientific findings that increase the belief that climate change is a serious threat to human well-being, focusing events (such as hurricanes or smog episodes, see Karapin (2016)), a transition to ‘post-material values’ (Inglehart 2008) and more generally rising income and valuation of environmental protection.

Ideally, the information outlined above would be available in the form of a detailed toolkit for policy design in combination with examples from countries in which certain policies have been (un)successfully applied. Those interested in advancing clean energy policies could then aim at identifying those actors that can be expected to exert the highest degree of resistance to

policy change (such as key ministries, utilities, energy-intensive industries, or unions) as well as those that would likely welcome or even actively promote change (e.g. clean energy producers or NGOs). Options to alter outcomes for these actors include either alleviating negative impacts on objectives that matter for actors who would otherwise oppose policy change or promoting the objectives of supportive actors (or, most likely, a combination of both). Moreover, our framework could help to assess which institutional reforms would dampen the influence of some interest groups while at the same increasing the influence of others in a way that allows for low-carbon energy policies to be politically feasible.

6 Discussion and conclusions

Based on the idea that policy formulation can be understood as a result of demand from interest groups and supply by policy makers (Keohane, Reversz, and Stavins 1998; Oye and Maxwell 1994) this paper has proposed a framework to analyze political economy issues from the perspective of i) actors, ii) their underlying objectives, and iii) the context in which decisions are taken. Even though this framework is sufficiently general to allow application in a broad range of political economy settings, our intention was to discuss how it could be applied to analyze the formulation of energy and climate policies. Eventually, the usefulness of this framework can only be demonstrated by means of practical application to carry out case studies in selected countries.

Using this theoretical basis to conduct a large number of country case studies in a collaborative research effort would lend the credibility of an established and tested approach to each individual study. For future research, we aim to put into place such a joint undertaking to further contribute towards building up an extensive database of country experiences that can be used for comparative analysis. A role model in this regard may be the case studies conducted under the Institutional Analysis and Development (IAD) framework, originally developed by Elinor Ostrom and co-workers (2005). Rigorous comparative work would, for instance, help to better understand the reasons why countries in relatively similar situations appear to often adopt quite different energy and climate policies. Techniques to carry out systematic reviews and meta-analyses that are common in other areas but have only rather recently gained prominence in research on energy and climate policy may offer valuable methodological inputs for this kind of analysis (Minx et al. 2017).

Within such a broader research effort the framework allows to formulate hypotheses and test them in single-country as well as comparative case studies. While we leave it for further work to develop and test specific hypotheses, these may feature climate and energy policy choices (e.g. type and level of ambition of policies) as dependent variables and consider relationships among various independent variables identified by the framework. Formulation and testing of hypotheses can proceed by both deductively drawing on existing political economy theory in the field, as well as inductively using pioneer case studies applying the framework to formulate new hypotheses that can then be tested, refined, and expanded in further empirical applications. Another interesting analogy in this respect is the Advocacy Coalition Framework, which has been used to develop and test hypotheses about policy change processes for more than two decades (Jenkins-Smith et al. 2014).

With regard to value of the framework for policy-makers, a closer understanding of the political economy of climate and energy policy would also facilitate the design of politically feasible policies. That is, it could inform building 'winning coalitions' in favor of climate policies, while at the same time pre-empting political resistance by powerful interest groups that might oppose the implementation of such policies. We hope that by developing the framework and research program proposed in this paper, such efforts might build on a more robust empirical and conceptual scientific basis than what is currently available.

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