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Climate Adaptation Finance and Justice. A Criteria-Based Assessment of Policy Instruments

https://doi.org/10.1515/auk-2018-0004

Abstract: Although the international community repetitively pledged considerable amounts of adaptation finance to the global South, only little has been provided so far. Different instruments have been proposed to generate more funding and this paper aims at identifying those that are most suitable to raise adaptation finance in a just way. The instrument assessment is based on the following main criteria: fairness, effectiveness and feasibility. The criteria are applied to four instruments: contributions from domestic budgets, international carbon taxes collected at the national level, border tax adjustments as well as selling emissions allowances in domestic trading schemes. Domestic emission trading schemes and border tax adjustments achieve the best—or rather, the least bad—results. Two further findings are that (feasible) instruments are unable make agents pay for past excessive emissions and that all instruments generate rather small amounts of funding. As a consequence of the latter, adaptation finance will continue to be highly insufficient in all likelihood.

Keywords: climate change, adaptation, justice, finance, fairness, effectiveness, feasibility, policy assessment

1 Introduction

Climate change will bring serious hardship for present and future people around the globe. Adaptation to changing climate conditions is one way of avoiding, or at least reducing, some of these hardships. Although many poor people have contributed very little to climate change, they are especially vulnerable to its impacts and often lack the means to adapt accordingly. This has been referred to as a "double inequity" (Stern 2007, 29; Füssel 2010). There is considerable agreement among justice scholars that the very poor ought not to bear the burdens of climate change (see e.g. Gardiner et al. 2010). If this is accepted, a strong argument can

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be made that adaptation measures protecting core interests and rights of poorest and most vulnerable people ought to be financed by the international community (Grasso 2010; Hartzell-Nichols 2011). This may be seen as a form of *ex ante* compensation for the unjustifiable imposition of serious threats (Farber 2007).

The discussion in this paper assumes that, at least for the time being, developed countries have sufficient means to protect their poor citizens via domestic resources, and focuses on generating finance for adaptive measures in developing countries. The sums of money required are likely to be large. Two main studies on future adaptation costs in developing countries estimated costs to be in the range of US$28–67 billion p.a. in 2030 (UNFCCC 2007) and US$71–98 billion p.a. between 2010 and 2050 respectively (World Bank 2010). Scholars seem to agree, however, that these numbers present a considerable underestimate (Fankhauser 2010, 28; Narain et al. 2011, 1011; Smith et al. 2011, 989). Moreover, a recent UNEP study concludes that adaptation costs might be about US$150 billion p.a. by 2025–2030 and about US$250-500 billion p.a. by 2050—and only if the increase in global mean surface temperature is limited to 2°C above pre-industrial levels (UNEP 2014, 26). These studies estimate the costs of maintaining the status quo, in the face of climate change, rather than furthering development.

It is at least worth discussing whether the international community should take over the entire costs of the maintenance. But note two things in this regard: First, climate change often threatens core interest and rights of poor people in developing countries (Field et al. 2014, 59–60, 70–71). That is to say, adapting to climate change in developing countries will often mean protecting what people are entitled to as a matter of justice (Caney 2010b; Shue 2014). Second, the international community repetitively pledged to provide US$100 billion climate finance each year starting in 2020, half of which is supposed to be spent on adaptation (e.g. UNFCCC 2015). In light of the estimates of much higher adaptation costs in developing countries, I consider the US$50 billion as the minimum that ought to be provided by the international community.

Despite the above-mentioned agreement on climate finance, little funding has been provided so far. While it is estimated that US$14–25 billion of financial resources directed towards adaptation have been transferred to developing countries from public and private sources in 2013 and in 2014 respectively (OECD 2015, 20; UNEP 2014, 28), just about US$4 billion were provided via grants (UNEP 2014, 28). And at the recent COP23 in Bonn, parties again postponed decisions on measures to increase the reliability and predictability of climate finance (Kowalzig 2017). There also is evidence that the bulk of public funding has been provided by Western Europe alone (Piketty and Chancel 2015, 13), which is also reflected reflected in the fact that additional finance pledges, made during COP 23, for the Adaptation Fund and the InsuResilience Initiative came exclusively from Western

European countries (Wang 2017; Timperley 2017). Thus, the current *ad hoc* system is unjust because, first, funding is insufficient and, second, many wealthy countries and people provide very little or no funding at all.

Given these deficits, different instruments have been proposed to generate climate finance in general and adaptation finance in particular (see e.g. Harmeling et al. 2009; van Drunen et al 2009; Zenawi/Stoltenberg 2010; Canfin/Grandjean 2015). The aim of this paper is to assess some of these instruments from a justice-perspective. The guiding research question is how adaptation finance can be raised in a just way.[1] To answer it, *section 2* introduces and justifies criteria that are supposed to facilitate a systematic instrument assessment. *Section 3* applies the criteria to four key instruments to generate adaptation finance. *Section 4* offers a concluding assessment of the instruments and highlights some general conclusions as well as future research questions.

Before starting the investigation, please note that the aim of this paper is intended to be two-fold. First, the paper develops the mechanism of the assessment: the explication of the criteria, the systematic integration of feasibility and justice considerations, and the combining of these into an all-things-considered judgment about instruments for raising finance for adaptation. The criteria can also pertain to other issues, although this would require reformulating them and perhaps adjusting the sub-criteria that are tailored to the particular purpose of this paper. Second, the paper presents a substantive assessment of various instruments outlined in this paper. The assessment depends on many judgments and so the reader may not agree entirely with the conclusions I draw here. Even if this is the case, it is hoped that the method of assessment by itself counts as a worthwhile contribution to the literature. Also note that a detailed assessment of different instruments is impossible within one paper. Based on the criteria developed here, future research should thus provide a much more fine grained analysis of each instrument, taking into account a greater variety of possible effects and a broader data base. In this paper, my aim is to demonstrate that and how the criteria can be applied in a reasonable manner and that a comparatively rough assessment already yields important results. The assessment also identifies research gaps that need to be addressed for a more robust assessment. Finally, the paper focuses on how to raise funding. I neither justify the premise that the poor and vulnerable are entitled to considerable international adaptation finance, nor do I discuss how the funds ought to be governed and distributed once raised (but see Baatz 2017).

1 Durand and colleagues offer a similar analysis of instruments to generate finance for addressing 'loss and damage' resulting from climate change (Durand et al. 2016).

2 Assessment Criteria

In this section I propose criteria for a justice-based assessment of instruments that could be used to generate adaptation finance. My claim is that an instrument should be fair, it should be effective and it should be feasible. The following subsections specify each criterion.

2.1 Fairness

I conceptualise the fairness criterion rather narrowly. An instrument is fair if it makes the right agents pay, i.e. it tracks duties to finance adaptive measures in developing countries. Who these agents are is to be determined by a duty-bearer account. In previous work, I developed a so-called "hybrid account" (Caney 2005, 769) based on the *Polluter Pays Principle* (PPP) and *Beneficiary Pays Principle* (BPP) (2013) and further elaborated this account in more recent work (Baatz 2017). The following briefly explains the account and, based upon it, introduces the criterion of fairness.

I qualify the PPP via the concept of fair shares of emissions entitlements. It establishes that every person is entitled to a certain share of the total emissions budget (Caney 2009; 2012; Shue 2014). Only when emitting more than what one is legitimately entitled to emit one has remedial duties vis-à-vis those threatened (and harmed) by climate change. These duties can be complied with by financing adaptation as a form of *ex ante* compensation, as said above.[2] Determining fair shares, however, is very difficult and strongly depends on what kind of climate justice theory is adopted, among others. Elsewhere I argued that those leading average western consumption-intensive lifestyles exceed their fair share—many of them by far (Baatz 2014, 2016). Here, I make the simplifying, and rather generous, assumption that at least those who emit more than the world average (6.2 tCO_2-equ./year, Piketty/Chancel 2015, 15) and are not poor—as measured within the society they live in – exceed their fair share of emissions entitlements.

2 According to the fair share concept, those exceeding their fair share ought to reduce their emissions and, in addition, have remedial duties based on their past excessive emissions (though not prior 1990) (Baatz 2017). Duties to reduce individual emissions are attacked on consequentialist grounds because it is questionable whether these reductions have any positive effect. The argument in this paper is only based on the claim that exceeding one's fair share generates duties to finance adaptation. In this case, the consequentialist argument has considerably less force because even small financial amounts can make a noticeable difference for a (poor) person living in a developing country.

Since the PPP is about making 'the polluters' (here: those exceeding their fair share) provide redress according to *their* excessive emissions, it would be unfair if they had to bear the total remedial burden instead of the fraction of the burden for which they are both causally and morally responsible. However, if the polluters only cover a fraction of the total burden, climate-related threats (and harms) will remain unaddressed. Hence, the PPP does not provide a complete account of duty-bearing for it would leave some people's core rights and interests unprotected. Therefore, it should be combined with at least one further principle (in detail Caney 2010a; Heyward 2010).

As said, I proposed the BPP to supplement the PPP. It stipulates that those who have benefitted from past emissions ought to contribute adaptation finance. One major problem of the BPP is to determine who has benefited to what extent from past emissions. I argued that the only possible way around this problem is to consider all present wealth as a benefit of past emissions because these were a necessary condition for the massive accumulation of man-made capital from which present generations benefit (Baatz 2013). If correct, the BPP in effect makes wealthy people pay. At the level of operationalisation, then, there is no difference between the BPP and the *Ability to Pay Principle* (APP) that should be operationalised in the same way (Baatz 2017). Therefore, duty bearers are 'the polluters' and wealthy people. Bute note, in this hybrid account, the PPP is the primary principle; non-polluting wealthy persons only ought to shoulder the burdens that remain once the polluters have met their duties (Caney 2010a; Baatz 2013). Given that these costs are a fraction of the overall climate-related costs imposed on others by the sum of polluters, I consider it to be fair that present polluters ought to cover the majority of present costs of adaption funding.

In sum, the fairness criterion checks whether an instrument has a 'polluting component' and a 'wealth component'. Ideally, it makes both polluters and the (non-polluting) wealthy pay but the polluters to a greater extent. Given the PPP's lexicographical priority over the ability principle, making polluters pay rather than the wealthy is much fairer than the other way around. Admittedly, this is a very crude way to operationalise the duty-bearer account. However, the instruments that can be used at present in order to generate adaptation finance are unable to accurately mirror the sophisticated duty-bearers accounts proposed in the literature anyway. Rather, they roughly track emissions generating activities and/or levels of wealth. Hence, establishing this rough division of the total finan-

cial burden among the polluters and wealthy people is sufficiently specific for the assessment below.[3]

The fairness criterion can thus be formulated as follows: Fair distribution of adaptation burdens among polluters and wealthy people.

2.2 Effectiveness

Whether an instrument raises funding from those who ought to pay does not fully determine whether this instrument is the best choice from a justice perspective. In addition, the instrument ought to be effective. Effectiveness denotes the extent to which an objective is achieved. In this context, an instrument is effective if it allows for the generation of funding that is sufficient to meet adaptation goals. The fact that adaptation is not a one-time issue, but something which will be required continuously over the next decades (and centuries), adds a temporal component to whether funding is sufficient. The importance of the predictability of revenues is stressed throughout the financing adaptation literature (e.g. Persson et al. 2009; Harmeling et al. 2009; Durand et al. 2016). Criterion 2a thus asks whether sufficient funding will be generated on a predictable basis, i.e. whether it will generate at least US$50 billion per year (see *section 1*).

On its own, criterion 2a is rather limited, however. Even if sufficient funds are generated the instrument might nevertheless undermine the goal of adaptation via unintended side effects. This is the case, for example, if it results in additional GHG emissions, exacerbating climate change, or if it somehow hinders other adaptation processes (Persson et al. 2009). In order to reflect this, the effectiveness criterion also evaluates whether side effects of the instrument undermine or support the achievement of successful adaptation. However, the instrument might also negatively affect goals other than adaptation and climate change respectively. In that case, one could argue that although an instrument is problematic because of its side effects, it is quite effective as far as raising adaptation finance is concerned. Obviously, this is not an all-things-considered judgment. And even though such judgments are difficult to make in complex cases, giving policy advice based on *pro tanto* judgments that ignore significant side-effects is also problematic. An instrument that compromises other valuable goals ought not to be adopted if better alternatives are available. Therefore, the criteria should extend to all normatively relevant side effects.

3 The fact that most polluters are wealthy and vice versa further reduces the need for a sophisticated division of the total financial burdens between polluters and the wealthy.

One option to address this would be to add another criterion that assesses non-climate related side effects. Instead, I chose to formulate the effectiveness criterion so that it captures all side effects, whether or not these are related to climate change. My aim is to keep the assessment criteria as parsimonious as possible. The aggregate assessment of different side effects within the effectiveness criterion makes the overall instrument assessment easier, because fewer dimensions are considered in the comparative analysis. Also, only a limited number of normatively relevant but climate-unrelated side effects are caused by the instruments investigated here, so discussing them together with climate-related side effects does not render this assessment overly complex. Criterion 2b thus asks whether positive or negative side-effects on justice-relevant goals (climate change and other) will be caused by the instrument.

The effectiveness criterion can be summarized as follows: Achievement of the desired goal without compromising the attainment of other goals.

a) Amount: Generation of sufficient funding on a predictable basis.
b) Side-Effects: Presence of positive or negative effects upon justice-relevant goals (climate change and other).

2.3 Feasibility

In general, every normative theory must take seriously certain facts about how the world is, which restrict what is possible or feasible. This is even more the case in applied normative theory, when a theory aims at action guidance for real world agents (Lawford-Smith 2013, 244–245). Pablo Gilabert and Holly Lawford-Smith (2012, 810) point to Rawls, according to whom an important role of political philosophy is to test the limits of practical political possibility (Rawls 2001, 4–5). With respect to climate change, Pickering et al. observe "[i]f we are concerned about fairness, we will have good reason to be concerned about feasibility, since an arrangement that is fair but unfeasible may result in the persistence of an unfair status quo" (Pickering et al. 2012, 427).

While feasibility does influence which options ought to be pursued, it does not affect the normative assessment of different options. "While normative considerations such as justice, efficiency or environmental integrity determine the goal of climate policy, feasibility considerations operate on a different level. Feasibility constrains the space within which we can pursue these goals." (Roser 2015,

72) Thus, feasibility forms a category of its own, independent of both fairness and effectiveness.[4]

Gilabert and Lawford-Smith define the basic components of the concept of feasibility as follows: "It is feasible for X to φ to bring about O in Z. [...] Considering how to fill the variables [...] involves answering the following questions: 'Feasible for whom?' 'Feasibility of what?' and 'Feasible when and where?'" (Gilabert/Lawford-Smith 2012, 812) In order to answer these questions, the variables must be specified accordingly. In the present context—investigating the feasibility of instruments to raise adaptation finance—the most straightforward variable is O. O describes the outcome that is to be achieved and ranges over political states of affairs (Gilabert/Lawford-Smith 2012, 812). Here, O refers to the successful implementation of an instrument that generates adaptation finance, and φranges over the set of actions that achieves the successful implementation. The actions that bring about the implementation of an instrument are complex and multifaceted. In this work it will be impossible to retrace all the individual acts that eventually lead to the implementation of an instrument. To greatly simplify matters, I will therefore not discuss actions but rather whether actors are able to bring about O and willing to do so (see below).

When and where is the feasibility of an instrument tested, i.e. how to specify Z? This work aims at action-guidance for present agents. Moreover, compensation is needed on a global scale. Thus, the feasibility of an instrument is assessed in relation to the current international order. The results hold true as long as the key features of this order do not change significantly. The most difficult variable to determine is X—the agent for whom something is (or is not) feasible. An instrument is to be implemented at the domestic or at the international level. In both cases, national governments are key agents that make the ultimate implementation decision (domestic context) or that need to consent to is implementation within multinational institutions and often have to anchor the instrument in domestic law (international context). Obviously, governments cannot implement everything they want. Some instruments are not feasible at present because appropriate bureaucracies at the international level are lacking. Others may clash with domestic laws. I refer to these obstacles as institutional, using a broad understanding of the term 'institution' that includes both material and non-material entities, such as soft law, international legally-binding laws, or facilities to collect and channel funds. Citerion 3a thus asks whether relevant agents are able to implement the instrument given present institutions.

4 For a detailed discussion of the relation between justice and feasibility see e.g. Gilabert 2017.

However, institutional barriers do not seem to be the main reason why so little has been achieved by international climate negotiations so far. Ability and willingness are obviously not the same thing. Gilabert and Lawford-Smith thus qualify their feasibility statement ("it is feasible for X to φto bring about O in Z") by adding "given that he or she tries" (Gilabert/Lawford-Smith 2012, 815). The reason for making the feasibility assessment conditional upon trying is that it avoids letting agents off the moral hook by virtue of their lack of motivation. The feasibility assessment is supposed to capture whether X is able to realize a certain outcome, irrespective of how likely it is that she actually realizes it. When we think about what is feasible for an agent we think about what she can do, and this depends only on what her options are (Lawford-Smith 2013, 17). Feasibility is therefore not to be confused with unconditional likelihood (Gilabert/Lawford-Smith 2012, 817). Moreover, "given that he or she tries" is distinct from *everyone* trying (Gilabert/Lawford-Smith 2012, 818). The 'conditional upon trying' clause only refers to the particular agent, and others not trying may well make it unfeasible for her to reach a desired outcome. Although feasibility and motivational constraints should be distinguished (Roser 2016, 86), viewed from the perspective of a particular agent, others' (un)willingness influences the feasibility of implementing an instrument. Therefore, considering the willingness of (other) key agents is important for a feasibility analysis. Criterion 3b asks whether relevant agents are willing to implement the instrument.

Both criteria, 3a and 3b, refer to 'relevant agents'. This serves as shorthand for 'an agent within the international community that is believed to be able to effectively block the implementation of an instrument'. Which agent has *de facto* veto power is difficult to assess, especially if we take into account the fact that, in principle, one can think of different coalitions that are willing to implement an instrument without the participation of other important players. For this reason I deliberately chose the broad formulation 'relevant agents'. In principle, it includes all national governments, the respective legislatives and all multinational organizations required to implement a given instrument. On the other hand, in most cases objections will come from a dozen of influential national governments (USA, Canada, Russia, EU member states, Australia, Japan, China, Brazil, perhaps South-Africa and so on) and not from, say, Kenya or the World Bank. Investigating the feasibility of an instrument will therefore be insightful even if only looking at these key players. Hence, I will discuss whether an instrument will face opposition from these crucial agents.

In total, this discussion yields the following feasibility criterion: Likelihood of implementation.

a) Institutional: The ability of relevant agents to implement the instrument, given present institutions.
b) Political Will: The willingness of relevant agents to implement the instrument.

2.4 Summary and Further Clarifications

The above remarks result in the following set of criteria:

1. *Fairness*: Fair distribution of adaptation burdens among polluters and wealthy people.
2. *Effectiveness*: Achievement of the desired goal without compromising the attainment of other goals.
   a) Amount: Generation of sufficient funding on a predictable basis.
   b) Side-Effects: Presence of positive or negative effects on justice-relevant goals (climate change and other).
3. *Feasibility*: Likelihood of implementation.
   a) Institutional: The ability of relevant agents to implement the instrument, given present institutions.
   b) Political Will: The willingness of relevant agents to implement the instrument.

The three categories refer to distinct values: fairness concerns duty-bearers, effectiveness concerns entitlement-bearers, as wells as third parties possibly affected, and feasibility is about the likelihood of implementation.[5] In order to promote justice, all three values must be met to a sufficient degree because good scores in one category cannot compensate deficits in another. For example, a lack in funding (low effectiveness) means that the plight of the poor and vulnerable will hardly be decreased, irrespective of how fair the instrument is. Similarly, an effective but unfair mechanism means that one injustice is reduced by furthering another. Finally, a fair and effective but infeasible instrument will neither improve the unjust status quo. Therefore, I propose not to aggregate the scores an instrument yields on each criterion but to require that it should score sufficiently well on each of them (see also below).[6]

5 Both fairness and effectiveness are, at their core, normative criteria that are based on value judgments of what ought to be. By contrast, feasibility is a descriptive criterion that is to be assessed solely by empirical reasoning.

6 Many thanks to Fabian Schuppert for discussing this and related aspects with me.

Furthermore, I employ a scalar understanding of the assessment criteria. I consider this to be straightforward regarding fairness and effectiveness. For instance, instrument-1 is fairer than instrument-2 if instrument-2 ignores different emissions levels of polluters, but instrument-2 is still considerably fairer than instrument-3 that exempts the majority of wealthy polluters. Using a scalar understanding in this way allows for the raking of different instruments with respect to each criterion. Whether feasibility should be conceptualized in a scalar way is less straightforward (see the discussion in Roser 2015). Gilabert and Lawford-Smith distinguish between a binary and a scalar understanding of feasibility (Gilabert/Lawford-Smith 2012, 815). While feasibility constraints in the binary sense rule out certain outcomes, feasibility constraints in the scalar sense make the achievement of certain outcomes less likely (Gilabert/Lawford-Smith 2012, 815). They further argue that the conditions for a binary assessment which rules out an outcome as unfeasible should be demanding, because realizing very good outcomes should not be ruled out unless one is confident that these outcomes are in fact unrealizable (Lawford-Smith 2013, 254). However, if binary feasibility constraints are weakly formulated, the feasible/infeasible distinction ceases to do much work and the scalar understanding becomes more important. The latter is particularly useful where practical deliberation involves the "comparative assessment of strategies on account of their prospects for success" (Gilabert 2017, 99). I adopt Gilabert's understanding of scalar feasibility throughout according to which "A has the power to bring about O in circumstances C to the degree, or with probability, P" (Gilabert 2017, 98).

In the assessment, I will use the following scale: 'very low', 'low', 'medium', 'high', and 'very high'. This scale holds for all criteria (1.-3b) with the exception of side effects (2b), where I will distinguish between 'very negative', 'negative', 'neutral', 'positive' and 'very positive' effects. Given the above proposal to introduce a threshold, an instrument must score better than 'low' on each criterion in order to be worth pursuing. I further propose to exempt criterion 2a (whether funding is sufficient) from this requirement for two reasons. First, I will discuss specific examples of instruments (e.g. the EU ETS rather than ETS in general) some of which have a limited spatial scope. That fact that a regional implementation generates fewer revenues than a global one is unsurprising and not necessarily a drawback. If an instrument scores well on all criteria except on 2a, and if a wider implementation would compensate for this drawback, it should therefore be adopted elsewhere rather than abandoned. Second, a combination of otherwise fair, effective and feasible instruments can make up for insufficient funding that is generated by one instrument.

3 Instrument Assessment

At present, public funding for adaptation is provided along two main routes: via the fiscal budgets of national governments and via the CDM Adaptation Levy.[7] As noted above, several further instruments have been proposed to raise adaptation finance. This includes: carbon taxes, the auctioning of emissions allowances in emissions trading schemes (ETS) and financial transaction taxes (e.g. Harmeling et al. 2009; Canfin/Grandjean 2015). These instruments can either be implemented at the domestic or at the international level, which considerably influences their fairness, effectiveness and feasibility. Given that each of the instruments can be implemented very differently, and that these differences would also influence the assessment, discussing them in the abstract is less insightful than discussing specific instrument proposals. In previous work, on which this paper is based, I assessed nine such instruments (Baatz 2017). In addition to contributions from domestic budgets and the CDM Adaptation Levy, I investigated specific proposals for international carbon taxes collected at the national and international level, financial transaction taxes, border tax adjustments as well as selling emissions allowances in domestic, international and in a global trading scheme(s). Due to space limitations, this paper focuses on four instruments that I consider to be both relevant at present and/or in the near future, as well as illustrative of the different proposals that have been made so far. These are: contributions from domestic budgets, international carbon taxes collected at the international level, border tax adjustments and selling emissions allowances in domestic trading schemes.

Instruments are not further considered here if they have low political feasibility, such as international carbon taxes collected at the domestic level and auctioning emissions allowances at the international level, or if it is highly questionable that they make any significant contribution to adaptation finance any time soon. For example: the Adaptation Levy has only generated a total of US$196 million since 2009 and annual revenues are below US$5 million since 2013 (World Bank 2016, 6) and it is uncertain whether revenues potentially generated by the EU's financial transaction tax will be earmarked for financing adaptation at all.

7 The Clean Development Mechanism (CDM) aims at supporting mitigation projects in low and middle-income countries. If demonstrated that a project will not be realized in the absence of the CDM, i.e. if it is additional to a credible business as usual scenario, the project developers get so called certified emissions reductions equivalent to the emissions avoided that can be sold in emissions markets. Revenues for adaptation funding are generated by a 2% levy on the certified reductions issued to project developers. The certified reductions are given to the Adaptation Fund that cashes them on international carbon markets (UNFCCC 2017).

In the following, each sub-section will discuss one instrument. I first introduce the instrument and mention key characteristics. I then discuss the instrument's fairness, effectiveness and feasibility in turn. Please note three further points. First, the assessment presupposes normative individualism according to which "[o]nly individuals can be the ultimate point of reference of moral obligations and [...] the justificatory source of morals and ethics" (von der Pfordten 2012, 452). As it is individuals who ought to be treated in just ways, it ultimately matters how the instruments affect individuals. Given how issues like financing adaptation are organized in complex modern societies, effects on individuals are created and shaped by collective agents: governments implement instruments in certain ways and companies react to changes in regulation, e.g. via hiring/firing employees or handing down costs to consumers. Therefore, the assessment considers effects on and actions by both individual and collective agents; though the effects on collective agents only matter insofar as this will also affect individuals. In case of the feasibility criterion, it suffices to consider crucial collective agents as these decisively shape what is feasible (see *section 2.3*). This criterion assesses the likelihood of an instrument being implemented; it is not about how an instrument affects individuals.

Second, due to limits on space, I will focus on major effects presumably caused by an instrument, ignoring many minor ones that would need to be considered in a comprehensive treatment. Third, the literature usually discusses how much *climate* finance a given instrument can raise. Climate finance includes funding for mitigation and adaptation. The following assumes that the public funds raised by the instruments will be fully devoted to adaptation. If this turns out to be unfeasible, the numbers need downward adjustment. This distorts neither the assessment of the instruments nor my conclusion that too little funding will be available.

3.1 Contributions from Domestic Budgets: 'Pledge and Review'

Although budgetary contributions do not refer to any particular instrument (Zenawi/Stoltenberg 2010, 25), I discuss them as one specific way to provide funding. At present, they are highly relevant for transferring climate funds to developing countries (Pickering et al. 2015b, 149), either directly via bilateral channels or indirectly via multilateral funds.

Despite developed countries' pledges, few resources have been provided so far (see *section 1*). To make the funding of adaptation more just, scholars developed burden-sharing formulas based on existing duty-bearer accounts (e.g. Baer et al. 2007; UNFCCC 2008, 19; Dellink et al. 2009, 219). But given that theses formu-

las would imply large transfers of resources, they are highly contentious among national governments (Méjean et al. 2015, 394–395). The inability to agree on a formula to distribute emissions entitlements has been identified as one of the key reasons for the repetitive failure to agree on meaningful mitigation targets during the Kyoto and post-Kyoto process (in detail Cramton et al. 2015; see also Victor 2011; Hermwille et al. 2015). Consequently, Pickering et al. diagnose a general resistance of many countries to "formulaic approaches" and instead propose a "pledge and review" process in order to determine a countries financial contribution (Pickering et al. 2015a, 50). Given the very low political feasibility of basing countries' contributions on an agreed burden-sharing formula, the following will assess Pickering et al.'s proposal.

In accordance with the pledge-and-review approach adopted in Paris regarding voluntary mitigation commitments, the authors propose that governments "report on their projected share of the financing effort as well as the basis on which they calculated their share" (Pickering et al. 2015a, 51). A review mechanism aggregates, compares and reports on countries' pledges. It also assesses their fairness and adequacy "in terms of a range of credible effort-sharing indices. Countries falling well short on credible measures of effort would be encouraged to increase their level of effort." (Pickering et al. 2015a, 51) Strengthening the reporting helps build a common understanding and enhances transparency (Pickering et al. 2015a, 51–52). It also allows for naming and shaming those pledging very little, which might allow for some kind of soft enforcement. That the approach lacks a hard enforcement mechanism is a drawback, though the authors mention that it could be combined with border tax adjustments in order to increase the costs of making no or insufficient contributions (Pickering et al. 2015a, 52).

Fairness: If revenues are provided via the fiscal budget, the instrument lacks a direct polluter or wealth component. One could argue that wealthy agents usually pay more taxes and hence contribute larger sums. This, however, depends on the respective tax system. Often, very wealthy persons can partially avoid taxes, legally or illegally. It is uncertain to what extent contributions from the fiscal budget will make wealthy polluters pay more. This problem is aggravated by the pledge-and-review-nature of the proposal: there is a concern that countries that have contributed little or nothing to adaptation finance so far will continue to pledge little to nothing and that naming and shaming them will not lead to higher contributions. It is therefore likely that the instrument distributes financial burdens unfairly both intra- and internationally (the former depending on the domestic tax systems). In sum, then, the fairness of contributions from domestic budgets based on the 'pledge and review' proposal is low to medium.

Effectiveness: There are no specific limits to how much (or how little) funding governments can provide via their budgets. Given the voluntary nature of the pro-

posed pledge-and-review process, I am highly sceptical that funding will significantly rise under this approach. It is increasingly implausible that wealthy countries, e.g. member states of the Organisation for Economic Co-operation and Development, will make meaningful long-term finance commitments; treasuries instead tend to cut expenditure wherever possible (Grubb 2011, 1050–1051; Bowen et al. 2015, 10; Méjean et al. 2015, 395). It is also unlikely that this instrument will generate a predictable revenue stream. Past experience rather suggests that funding will be strongly influenced by changing political situations and will vary considerably. In terms of side effects, there is a danger that the pledged adaptation finance displaces existing financial transfers to developing countries, and this would violate the agreement that funding should be "new and additional" to development aid and other current financial flows (UNFCCC 2009, 5). For example, the government of the USA would face serious opposition if providing adaptation finance in more visible ways than via their aid budget (Pickering et al. 2015b, 160). This does not necessarily imply that conventional aid is partially displaced, but makes it likely.[8] Thus, the proposal will, in all likelihood, generate few to medium funds in the unpredictable fashion they are provided at present, and the side-effects are probably negative.

Feasibility: The proposal comes very close to current procedures within the United Nations Framework Convention on Climate Change, which provides the institutional framework. Besides the pledge-and-review procedure, the institutional setting in order to implement the instrument is in place. And the procedure already exists for mitigation pledges and only needs to be transferred to the financing adaptation context. Furthermore, the procedure will be acceptable to many governments, although those that do not want to make any significant contribution might oppose it. I thus think that institutional feasibility is very high and the political will is high.

Assessment:

1. Fairness: *low to medium* (depending on the domestic tax system)
2. Effectiveness
   a) amount: *low to medium* (very hard to predict)
   b) side-effects: *negative* (probably)

8 In negotiations, developed countries often pledged money for climate change funds only to later (partially) redirect and/or re-label funds that would have been provided to developing countries as aid anyway (Harmeling et al. 2009, 14).

3. Feasibility
   a) institutional: *very high*
   b) political will: *high*

3.2 International Carbon Taxes Collected at the International Level: IATAL and IMERS

The International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO)—the regulatory bodies for aviation and shipping respectively—proposed to tax emissions resulting from international air travel and marine transport (Bowen 2011, 1028). If the tax is collected via ICAO and IMO, it does not fall under the jurisdiction of particular nation states and thus allows for a uniform implementation at the international level.

A comparatively detailed proposal for an International Air Travel Adaptation Levy (IATAL) has been developed by Müller and Hepburn (Müller/Hepburn 2006). A tax on kerosene would be straightforward but is prohibited by international law and bilateral agreements. The authors therefore propose a levy on flight tickets. They develop a formula that takes both ticket price and emissions per passenger into account, considering "the ticket price as a proxy for capability, and emissions per 'notional passenger' (i.e. per available seat) as the measure of individual responsibility" (Müller/Hepburn 2006, 30). An average levy of Euro 5 per ticket could raise about Euro 10 billion if applied globally (Müller/Hepburn 2006, 31–32). The United Nations Secretary-General's high-level advisory group on climate change financing (AGF) calculates that a medium carbon price of US$25/t C would generate US$6 billion in total, and assuming that "between 25 and 50 per cent of these revenues can be earmarked for climate finance delivers an estimate of between US$2 billion and US$3 billion" (Zenawi/Stoltenberg 2010, 23).

The proposal for an International Maritime Emission Reduction Scheme (IMERS) is much less detailed.[9] Launched in 2006, it aims at establishing a "maritime greenhouse gas fund" under the auspices of the IMO, generating revenues from a fuel levy (Müller 2008a, 20). Assuming that 0.9-1 Gt of marine emissions are priced at US$25/t C, the AGF calculates total revenues to be around US$22.5 billion and US$25 billion, of which US$4 to 9 billion would be available for climate finance (in detail Zenawi/Stoltenberg 2010, 23). This would increase the price of seaborne imports by around 0.2 to 0.3% (Brahmbhatt/Steer 2015, 129). Although there are differences between IMERS and IATAL, the following assess-

9 See http://www.imers.org/ (accessed September 20, 2017).

ment is based on the assumption that both schemes are sufficiently similar to allow for a joint assessment.

Fairness: I consider the fairness of a combined IATAL/IMERS scheme to be high. The revenues result from the consumption of carbon-intensive goods and services, and morally arbitrary criteria such as a person's citizenship are irrelevant. Since there is a large degree of overlap between the group of people that fly and consume goods from abroad on the one hand and the group of wealthy individuals exceeding their fair share of emissions entitlements on the other, the scheme roughly makes the right agents pay. This argument is particularly forceful regarding the IATAL, because those who can afford to fly are usually not so low-emitting and/or poor that they ought not to pay any adaptation finance according to the duty-bearer account adopted here. Müller mentions the case of poor migrant workers in Asia as a possible counter example (Müller 2008b, 5). Ideally, such groups should be exempted from, or compensated for, paying the levy. If that proves difficult in practice, this is a (relatively small) drawback of the proposal. Moreover, IATAL indirectly accounts for different levels of wealth by factoring in ticket prices. In case of IMERS, however, a substantial tax might increase prices for basic consumption goods (clothing, household goods, food) if many of these are imported from overseas. Properly assessing these potential effects would need further study (and a more detailed proposal). Finally, neither IATAL nor IMERS address excessive historical emissions over the past two decades (in the following: past emissions).

Effectiveness: While some argue that the levies will barely affect demand and revenues will be comparatively predictable (Harmeling et al. 2009, 27; Durand et al. 2016), others claims that revenues are uncertain due to uncertain price elasticities and the scope for avoidance (Bowen 2011, 1028). Müller and Hepburn based their calculations on the presupposition that price elasticity of demand is high for short haul flights and low for long haul business flights (Müller 2006, 35–37), though this may change if virtual business interactions become common. Until then, business flights would generate predictable funding. Since the proposal will at least reduce short haul flights, its effect on mitigation is positive. The fact that it targets sectors that have largely escaped fossil fuel taxes and emissions reductions measures respectively (Bowen 2011, 1028; Wan et al. 2016) makes it especially desirable. A foreseeable negative side-effect is increased transportation costs for small island states (Bowen 2011, 1028). This might not only affect shipping/aviation companies and their wealthy owners but also the respective citizens. In order to counter such effects, the countries would need to be compensated. IMERS might also affect producers and their workforces in developing countries. On the other hand, if the IATAL did not apply to cargo and if the IMERS tax was low, it remains to be seen how much transportation costs would indeed

rise. This also needs to be further researched. In sum, I think that the amount that can be generated in a comparatively predictable fashion is medium and that the positive side-effects will outweigh the negative ones.

Feasibility: In the aviation sector, levies similar to IATAL already exist at the domestic level (Müller/Hepburn 2006, 24). A further benefit regarding institutional feasibility is that there are international bodies that are already legally permitted to collect these revenues. However, given that such international levies do not yet exist, it is uncertain which institutional difficulties surface when actually implementing them. Still, "while implementation and governance need further study, it is clear that feasible operational proposals for pricing international aviation and maritime emissions can be developed" (Brahmbhatt/Steer 2015, 140). I therefore judge institutional feasibility to be medium.

In terms of political will, Least Developed Countries have expressed their support for such a levy (Harmeling et al. 2009, 28). A study has also found that air travel passengers are willing to contribute on average Euro 23 per flight to offset CO_2 emissions (Brouwer et al. 2008). Because the main motivation for offsetting is the recognition of responsibility for climate change damages (Brouwer et al. 2008, 310), the result might be similar if willingness to contribute to adaptation rather than mitigation finance was investigated. However, many scholars think that schemes like IATAL/IMERS are unacceptable to many governments (Bapna/McGray 2008, 6–7; Zenawi/Stoltenberg 2010, 23; Müller 2015, 2). Their pessimism results from governments' deep skepticism towards international taxation in general and opposition to taxation from by the shipping and aviation industry. To make matters worse, ICAO and IMO represent platforms where those countries opposing regulation and the respective lobby groups can successfully join forces. The EU's plan to integrate all flights using European airports into its ETS was fully dismissed by the ICAO in 2013, despite the EU's willingness to make far-reaching concessions. In face of the massive opposition from China, Russia, India, Brazil and the USA, a German energy expert referred to 'disturbing results' and a 'coalition of the unwilling' (Luhmann 2013). As long as some powerful countries (USA and Russia) see such levies as an attack on their national sovereignty (Targeted News Service 2012), while others (e.g. Brazil, China, India) believe that their airlines and shipping companies should be exempted from any levy because this would violate core principles of the United Nations Framework Convention on Climate Change (Xinhua 2012), the political will to implement the instrument is low.

Assessment:
1. Fairness: *high*
2. Effectiveness
   a) amount: *medium*
   b) side-effects: *positive* (probably)
3. Feasibility
   a) institutional: *medium*
   b) political will: *low*

3.3 Border Tax Adjustments: 'Border Carbon Cost Levelling'

Michael Grubb proposed "extending carbon-pricing systems to include a measure of carbon embodied in carbon-intensive imports, and returning the revenue raised at the border to support low-carbon development and/or adaptation in developing countries" (Grubb 2011, 1051). Putting a price on carbon adds a cost factor that disadvantages producers in comparison to their competitors producing in regions without a carbon price. This disadvantage can be levelled by taxing imported goods accordingly.

Border taxes can be compatible with norms of the World Trade Organization when they do not preferentially treat domestic products, which can be ensured, for instance, by "setting a fixed requirement for importers to purchase allowances equivalent to the best available technology" (Grubb 2011, 1051; in detail Weber 2015). This is easy for goods whose production mostly involves direct emissions (e.g. cement), but more challenging for goods with a considerable amount of indirect emissions. Border levelling measures are not just relevant regarding imports, but also for producers exporting to regions without (or lower) carbon prices. In order not to disadvantage exporters, they are reimbursed when their goods leave the country via the revenues generated by import levelling (Grubb 2011, 1053). To avoid complicated accounting issues, Grubb focuses on the cement and the steel sector that together account for a third of global industrial emissions and 12% of total emissions. Using the EU ETS as his model case, and assuming that EU cement and steel producers would have to pay €15-30/t CO_2 for all their emissions, they would have to pay €5–10 billion annually in domestic auctions. In this scenario, the EU would receive about €2.5–5 billion per year from border levelling (Grubb 2011, 1054).[10]

10 These numbers ignore possible export reimbursements. The "EU and OECD export virtually no cement" but the EU is a steel exporter, mostly to other OECD countries (Grubb 2011, 1054).

Fairness: As with all carbon pricing tools, the proposal makes consumers of carbon-intensive products pay. If producers cannot pass on all additional costs to consumers, for instance because alternative product types become more attractive, they will shoulder part of the burden as well. Eckersley argues that border carbon levelling measures are unfair because developed countries shirk their leadership role by implementing the instrument (Eckersley 2010, 381–383). Given that Grubb's proposal is supposed to (i) raise funding for poor people in developing countries paid for by the citizens of developed countries, (ii) allow for stricter mitigation goals in developed countries and (iii) has marginal effects on developing countries' economies (see below), this claim is unpersuasive. One drawback according to my fairness criterion is that border adjustments do not address past emissions and account for wealth only indirectly (to the extent that emissions and wealth are correlated).

Another concern is the impact on poor EU citizens. Border adjustments could increase commodity prices (although this may be ameliorated if only steel and cement imports are taxed) and would probably increase construction costs. Whether higher construction costs affect rental prices is difficult to estimate as housing policies, property speculation and regional factors such as urbanization have significant impacts on the rental market. Here, studies assessing the likely effects on citizens from border adjustment are required. A further possible drawback is that, depending of scope of the border adjustments, the instrument only address some sources of emissions (e.g. cement and steel production), ignoring many polluting activities and hence polluters. In sum, fairness is medium to high, depending on the scope of the instrument and on whether indirect effects on poor citizens occur and how they are mediated.

Effectiveness: The instrument would generate modest but non-trivial revenues (Grubb 2011, 1054). Predictability is, again, uncertain as it depends on the carbon price, and this has varied considerably in the EU ETS. The amount of funding generated on a predictable basis is thus low. In terms of side-effects, border carbon cost levelling reduces carbon leakage and thus weakens a major obstacle towards more ambitious mitigation policies at the domestic level. Countries that introduced carbon prices have largely exempted emissions-intensive industries from pricing because they feared competitive disadvantages for these industries (and possible leakage as a consequence). With border adjustments they could remove some of these exemptions and generate considerable revenues in addition via a higher carbon price (Grubb 2011, 1053, 1055). Another advantage is that

Revenues would thus need downward adjustment. On the other hand, export tax adjustments are controversial, as they might not be in line with WTO rules (Weber 2015, 416).

they improve the competitiveness of low-carbon and carbon-efficient products in countries with carbon prices. To the extent producers in countries without a carbon price export their goods to countries with a price they, too, face an incentive to become more carbon efficient.

Possible negative side-effects concern 'indirect leakage', as well as the burden on the poor in developing countries. The instrument would increase costs for industries using taxed products (here cement and steel), and might thus cause leakage in industries further downstream (Perthuis 2011, 113). Another form of indirect leakage might occur when production in countries with no or lower carbon prices is shifted from more carbon efficient production for exports to less carbon intensive productions for the domestic market (or other markets with no/low carbon prices). In a modelling study by Jakob et al., leakage increases when the EU introduces border tax adjustments for Chinese products due to this effect (Jakob et al. 2013; but cf. Böhringer et al. 2012). Poor people can be affected by higher commodity prices in developed countries or by reduced economic activity in developing countries. According to Grubb, the economic impact on developing countries' economies is negligibly small (Grubb 2011, 1056). Again, more studies would be required to provide robust answers. The net balance of side-effects is very difficult to estimate given the scarce evidence in terms of possible leakage. I think that allowing developed countries to implement more stringent mitigation policies and raise additional revenues outweighs the possibility of 'indirect leakage'. If these revenues allow the EU (and other countries using the instrument) to transfer more resources to the international level, this would promote trust and enhance cooperation. Hence, I judge the side-effects to be positive.

Feasibility: In general, the institutional feasibility is high because the administrative system largely exists. Most countries already have some border tax adjustments in place, e.g. to address differing value-added tax levels (see Neuhoff 2011, 195). The political will is more difficult to assess. Grubb's proposals can be interpreted as a win-win-situation for countries that have introduced or want to introduce carbon prices and those that benefit from adaptation finance. A further advantage from the point of view of developing countries is that most costs are borne by consumers in high-income countries. This is in line with China's long-term position to adopt a more consumption-based approach (Grubb 2011, 1055), and border adjustments might be more acceptable to developing countries if restricted to a narrow set of carbon-intensive commodities (Neuhoff 2011, 197). In all likelihood, opposition would come from consumers and/or producers of goods covered by carbon prices, depending on the elasticity of demand (Grubb 2011, 1055), and by high-income countries objecting to significant carbon pricing. There is certainly a risk that border adjustments are viewed as protectionism (Perthuis 2011, 113; similarly Weber 2015, 411). Thus, there is wide agreement that

such measures must be discussed and implemented through international cooperation (Hepburn and Stern 2008, 273; Neuhoff 2011, 197; Roser/Tomlinson 2014, 241, 245). Perhaps, after the Paris Agreement in which countries have explicitly stated the will to decarbonise their economies, moderately raising carbon prices for some sectors is no longer dismissed as a bizarre environmentalist's pipedream. I consider political feasibility to be medium.

Assessment:
1. Fairness: *medium to high* (depending on its scope and effects on poor citizens)
2. Effectiveness
   a) amount: *low*
   b) side-effects: *positive* (but difficult to estimate)
3. Feasibility
   a) institutional: *high*
   b) political will: *medium* (but very difficult to estimate)

3.4 Selling Emissions Allowances in Domestic Trading Schemes: The EU ETS

If an ETS is established and the emissions allowances are (partially) auctioned, the revenues can be (partially) earmarked for adaptation finance.[11] ETS already exist in the EU, Australia, New Zealand and South Korea, as well as some regional schemes in the USA, Canada, China and Japan (IPCC 2014, 1163). I focus here on the EU ETS because it has existed for more than ten years and some early evaluations are already available.

The EU ETS was the first multinational carbon pricing mechanism and is robust insofar as no industrial actor covered by the scheme imagines returning to the *status quo ante* (Perthuis 2011, 116-117). The scheme now is in its third trading phase (2013–2020), in which total emissions allowances are scheduled to decrease by 1.74% per year, which would amount to a 21% decrease of allowances in 2020 compared to 2005 (Umweltbundesamt 2015). In the third phase, the scheme covers power generation, several industry sectors such as steel, cement, paper, chemicals, and intra-European flights. At the beginning of the third phase, 40% of the emissions certificates were auctioned and the rate is planned to further increase until 2020 (European Commission 2016a). Producers of electricity must already purchase all allowances—albeit with exemptions for countries that have

11 I assume that readers are familiar with the basic functioning of an ETS.

a high portion of coal in their electricity mix (mostly in Eastern Europe) (European Parliament 2009, 76). Allowances free of charge are no longer grandfathered, but rather allocated based on a technology benchmark (European Commission 2016b). 80% of emissions certificates for the manufacturing industry are allocated for free, due to fear of carbon leakage and job losses respectively (European Commission 2016a).

In 2013, €3.6 billion were generated by auctioning certificates and "Member States reported using €3 billion for climate-related purposes. Of this a minor part [15% and 0.5 billion respectively] was used for international climate finance" (Canfin/Grandjean 2015, 59). If around 25% of EU ETS revenues are earmarked for international climate finance, this could generate about €3.5 to 5 billion per year between now and 2030 (Canfin/Grandjean 2015, 59).

Fairness: Who ultimately pays revenues strongly depends on the design of the ETS. In the EU, industries covered by the scheme price in additional costs that are eventually born by the consumers of their products. The instrument is fair insofar as EU citizens, who are high-emitters[12] and wealthy from a global perspective, pay to the extent that they consume certain carbon-intensive goods. But the fairness of generating revenues via the EU ETS is reduced because both wealth and past emissions levels are ignored. Worse, evidence suggests that less wealthy persons are disproportionally burdened compared to wealthier ones because allowances were allocated for free initially:

> "[T]he EU ETS has created large-scale wealth transfers from taxpayers to firms, who have reaped substantial windfall profits. Rather than support suppliers, customers, or employees, these windfalls have largely been retained by shareholders, who are wealthier than the average taxpayer. The consequence is that it seems almost certain that the EU ETS has been significantly regressive." (Caney/Hepburn 2011, 27)

Caney and Hepburn further argue that the scheme is likely to remain regressive until 2020, given that governments seem unable or unwilling to recycle auction revenues to (poorer) citizens (Caney and Hepburn 2011, 27). Does the regressive character also imply that the poor are burdened? Although that cannot be precluded, evidence from the USA suggests that effects on the poor are absorbed by social safety nets (Blonz et al. 2012). If so, the regressive character is most problematic for the (lower) middle-class. ETS are in principle fair because the instrument makes polluters pay to the extent they consume carbon-intensive goods and the negative effects on the poorest EU citizens are usually compensated by social

12 Poor French and Germans emit about 7 t/$CO_{2\text{-equ.}}$ p.a. (Piketty/Chancel 2015, 30); that is, probably almost all non-poor French and Germans exceed their fair share of emissions entitlements.

safety nets. But I consider the fairness to be only medium because of the unfair distribution of the burden among the group of duty-bearers.

Effectiveness: The ETS would create large amounts of revenues if the EU sticks to its plan to auction an increasing number of allowances (European Parliament 2009, 74). At present, however, few revenues are generated for climate finance. In terms of side-effects, the scheme enhances mitigation but the effect is small under current conditions (Perthuis 2011, 117). The "environmental effectiveness has been compromised to a large extent by a structurally lenient allocation of permits that was driven by the necessity for institutional and political feasibility" (IPCC 2014, 1164). At the same time, this 'lenient allocation' has avoided negative side-effects such as leakage or a general increase in commodity prices. The main achievement of the EU ETS rather consists in the establishment of (i) a blueprint that others can follow (Perthuis 2011, 117) and (ii) a robust framework that allows for substantial mitigation in the future. A further general benefit of trading schemes is that they facilitate emissions reduction at lower costs than carbon taxes or simple regulation. Besides all its shortcomings, the EU ETS is commonly credited for having achieved just that (Hintermann et al. 2016, 15).

Auctioning more allowances would considerably raise the scheme's effectiveness (Hepburn 2009b, 379f; Neuhoff 2011, 81) and would generate more revenues that could be earmarked for adaptation finance. An open question is whether the European Commission, Parliament and member states are willing to earmark funding accordingly. If the EU sticks to its current policy plans, the ETS will become increasingly effective and raise more revenues over the coming years. Whether this will also increase undesirable side-effects depends on how revenues are recycled and on how carbon prices develop elsewhere. In sum, the EU ETS generates a low amount of adaptation finance but its side-effects are positive.[13]

Feasibility: Given that the EU ETS including the earmarking of revenues for adaptation finance is already implemented, both institutional and political feasibility are very high.

13 According to Aldred, ETS are both unfair and ineffective (2012; 2016). Given that even superficially addressing Aldred's thoughtful arguments would take up too much space here, I discuss them in separate work (Baatz 2017; but also see Caney 2010c; Caney/Hepburn 2011; Page 2011; Gosseries 2015).

Assessment:
1. Fairness: *medium*
2. Effectiveness
   a) amount: *low*
   b) side-effects: *positive*
3. Feasibility
   a) institutional: *very high*
   b) political will: *very high*

4 Concluding Assessment

This final section brings together the results from *section 3*, draws some general conclusions and highlights further research needs. The EU ETS and Grubb's proposal for border carbon cost levelling are the only instruments that score better than low/negative in all categories except 2a (amount); only they meet the threshold (see *table 1*). Domestic ETS and border tax adjustments do not only represent a somewhat fair, effective and feasible way to generate adaptation finance, they are also more promising in combination. Implementing border adjustments can increase the effectiveness and feasibility of an ETS because it dampens fears of reduced competitiveness, and thus allows for a more stringent emissions cap and auctioning more allowances. The additional revenues make it possible to provide more adaptation finance and to counter some of the undesirable side-effects of higher carbon prices, while a lower cap makes it possible to demonstrate the leadership that developing countries, civil society and academics all too often demand from the developed world. I think that these benefits outweigh the possible drawback of an increase in emissions in other regions.

Many argue that a global carbon price is an efficient means to curb GHG emissions (e.g. Nordhaus 2013; MacKay et al. 2015). However, the introduction of a uniform global carbon price faces substantial political challenges and would negatively affect the global poor. It is unrealistic that a uniform price will emerge in the foreseeable future, leaving us with a patchwork of varying prices and many regions without a carbon price at all. Grubb's proposal fits the 'carbon price patchwork reality', being a measure that both reduces the negative effects of this patchwork and raises adaptation finance. This combination of features makes it attractive.

Instrument	Specific Proposal	Expected Revenues per year	Fairness	Effectiveness a) Amount b) Side-Effects	Feasibility a) Institutional b) Political Will
Contributions from domestic budgets	'Pledge and Review'	N/A	low to medium	a) low to medium b) negative	a) very high b) high
International carbon taxes collected at the int. level	IATAL and IMERS	US$ 6 - 19 billion (in 2020)	high	a) medium b) positive	a) medium b) low
Border tax adjustments	'Border Carbon Cost Levelling'	€ 2.5 - 5 billion (present)	medium to high	a) low b) positive	a) high b) medium
Selling emissions allowances in domestic trading schemes	EU ETS	€ 0.5 (present) - 5 billion (in 2030)	medium	a) low b) positive	a) very high b) very high

Fig. 1: Summary of the instrument assessment

I therefore conclude that policy-makers ought to use ETS and border tax adjustments to raise adaptation finance. Where ETS are already implemented, governments ought to earmark more revenues for that purpose. Moreover, existing ETS, especially the EU ETS, should be improved by auctioning a larger proportion of allowances, by adopting longer trading periods to increase predictability and by introducing minimum and maximum emissions allowance prices (Hepburn 2009a, 382-383; Nordhaus 2013, 241; IPCC 2014, 1167). Carbon taxes could also be sufficiently fair and effective but have proved less politically feasible than ETS so far. Consequently, a simple advantage of emissions trading is that several schemes already exist and can be linked with each other over time (Whitesell 2011, 222). A lot of energy and commitment has been invested in ETS and during the process of implementation and further improvement policy makers have learned significant lessons (Hepburn 2009a, 382). This speaks in favour of using existing ETS to generate funding for adaptation (and to mitigate GHG emissions) and to improve, extend and link the schemes over time. At the same time, this does not speak against implementing a carbon tax where no ETS is in place—should political will come to be sufficient.

Another finding of the assessment is that most instruments do not address past emissions. Contributions from domestic budgets are an exception because they can be based on a formula that takes past emissions into account. This 'formulaic approach' is not feasible, however (see Section 3.1),[14] and I do not see another way to take past emissions into account. If this is correct, adaptation finance cannot be raised (partially) based on agents' past emissions and, hence, whether and to what extent the PPP can be applied to past emissions is less relevant in this context. The assessment has also shown that the funding that will be raised by any one of the instruments discussed here is highly inadequate in all likelihood. For that reason governments should, arguably, continue to provide funding via their budgets. Pickering et al.'s 'pledge and review' proposal is a reasonable first step to improve the current ad hoc system, despite the instrument's remaining drawbacks.[15] This claim is based on the assumption that the reduced injustice of delivering very little adaptation finance outweighs the possibly low fairness and effectiveness when providing additional funding in this way.

14 In addition, the approach would not target 'past polluters' directly. Whether these ultimately pay would depend on how governments allocate burdens domestically.

15 But I am unconvinced by their suggestion of combining budgetary contributions with border tax adjustments. Since budgetary contributions do not raise the price for carbon, border adjustments could not be justified with reference to different carbon prices and instead must be implemented as a kind of punitive tariff—and this would in turn throw up the legal and political issues that border carbon cost leveling tries to steer clear of.

The latter finding might be interpreted as a general unwillingness of wealthy and high emitting countries and their citizens to provide meaningful amounts of adaptation finance. On the other hand, a recent study finds that citizens from the USA and Germany agree that their country contributes 10% of total funding (US$100 billion in the study) if resources are used effectively by recipient countries, if decisions on funding allocations are made jointly by recipients and givers and if funds are used for both mitigation and adaptation (Gampfer et al. 2014). Compared to the other factors, the perceived fairness of the burden sharing has by far the largest effect on acceptability, with free-riding by other industrialized countries leading to a drop in support (Gampfer et al. 2014, 122). The authors' finding that citizens do not object to adaptation finance in principle is at least one reason for optimism. In addition, it shows that fairly sharing the burden among duty-bearers also matters in terms of political feasibility.

The instrument assessment is based on many uncertain assumptions. In order to improve the empirical basis of the assessment, future research should especially address the direct and indirect effects of border tax adjustments and carbon taxes in the shipping and in the aviation sector. And it should investigate how the institutional and political feasibility of both instruments could be increased.

Acknowledgment: I would like to thank Nancy Tuana for valuable feedback on early versions of the criteria. David Morrow and Fabian Schuppert kindly provided very useful comments on an earlier version of this text paper. Thanks also to Anton Leist and an anonymous reviewer for further important recommendations as well as Clare Heyward for numerous stylistic improvements and conceptual remarks. Finally, I am indebted to the German Federal Environmental Foundation (DBU) for providing me with a doctoral grant.

References

Aldred, J. (2012), The Ethics of Emissions Trading, in: *New Political Economy* 17, 339–360

— (2016), Emissions Trading Schemes in a 'Non-Ideal' World, in: Heyward, J. C./D. Roser (eds.), *Climate Justice in a Non-ideal World*, first edition, Oxford, 148–168

Baatz, C. (2013), Responsibility for the Past? Some Thoughts on Compensating Those Vulnerable to Climate Change in Developing Countries, in: *Ethics, Policy & Environment* 16, 94–110

— (2014), Climate Change and Individual Duties to Reduce GHG Emissions, in: *Ethics, Policy & Environment* 17, 1–19

— (2016), Reply to my Critics: Justifying the Fair Share Argument, in: *Ethics, Policy & Environment* 19, 160–169

— (2017), *Compensating Climate Change Victims in Developing Countries—Justification and Realization*, Ph.D. thesis, University of Greifswald

Baer, P./T. Athanasiou/S. Kartha (2007), *The Right to Development in a Climate Constrained World: The Greenhouse Development Rights Framework*, Heinrich Böll Foundation, Berlin

Bapna, M./H. McGray (2008), *Financing Adaptation: Opportunities for Innovation and Experimentation*, URL: http://pdf.wri.org/financing_adaptation.pdf [12.01.09]

Blonz, J./D. Burtraw/M. Walls (2012), Social Safety Nets and US Climate Policy Costs, in: *Climate Policy* 12, 474–490

Böhringer, C./B. Bye/T. Fæhn et al. (2012), Alternative Designs for Tariffs on Embodied Carbon: A Global Cost-effectiveness Analysis, in: *Energy Economics* 34, 143–153

Bowen, A. (2011), Raising Climate Finance to Support Developing Country Action: Some Economic Considerations, in: *Climate Policy* 11, 1020–1036

Brahmbhatt, M./A. Steer (2015), Mobilizing Climate Finance, in Haites, E. F. (ed.), *International Climate Finance*, London, 135–150

Brouwer, R./L. Brander/P. van Beukering (2008), 'A Convenient Truth': Air Travel Passengers' Willingness to Pay to Offset their CO2 Emissions, in: *Climatic Change* 90, 299–313

Caney, S. (2005), Cosmopolitan Justice, Responsibility and Global Climate Change, in: *Leiden Journal of International Law* 18, 747–775

— (2009), Justice and the Distribution of Greenhouse Gas Emissions, in: *Journal of Global Ethics* 5, 125–146

— (2010a), Climate Change and the Duties of the Advantaged, in: *Critical Review of International Social and Political Philosophy* 13, 203–228

— (2010b), Climate Change, Human Rights and Moral Thresholds, in: Humphreys, S. (ed.), *Human Rights and Climate Change*, Cambridge–New York, 69–90

— (2010c), Markets, Morality and Climate Change: What, if Anything, is Wrong with Emissions Trading?, in: *New Political Economy* 15, 197–224

— (2012), Just Emissions, in: *Philosophy & Public Affairs* 40, 255–300

—/C. Hepburn (2011), Carbon Trading: Unethical, Unjust and Ineffective?, in: *Royal Institute of Philosophy Supplements* 69, 201–234

Canfin, P./A. Grandjean, (2015), *Mobilizing Climate Finance. A Roadmap to Finance a Low Carbon Economy*. Report of the Canfin-Grandjean Commission June 2015, URL: www.cdcclimat.com/IMG/pdf/exsum-report_canfin-grandjean_eng.pdf [19.09.17]

Cramton, P./A. Ockenfels/S. Stoft (2015), An International Carbon-Price Commitment Promotes Cooperation, in: *Economics of Energy & Environmental Policy* 4, 51–64

Dellink, R./M. d. Elzen/H. Aiking et al. (2009), Sharing the Burden of Financing Adaptation to Climate Change, in: *Global Environmental Change* 19, 411–421

Durand, A./V. Hoffmeister/R. Weikmans et al. (2016), *Financing Options for Loss and Damage: A Review and Roadmap*, DIE Discussion Paper 21/2016

Eckersley, R. (2010), The Politics of Carbon Leakage and the Fairness of Border Measures, in: *Ethics & International Affairs* 24, 367–393

European Commission (2016a), Auctioning, URL: https://ec.europa.eu/clima/policies/ets/auctioning/index_en.htm, [12.11.16]

— (2016b), *The EU Emissions Trading System (EU ETS)*, URL: https://ec.europa.eu/clima/sites/clima/files/docs/factsheet_ets_en.pdf, [06.12.16]

European Parliament (2009), Directive 2009/29/EC of the European Parliament and of the Council, in: *Official Journal of the European Union 140/63*, URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0063:0087:EN:PDF, [20.01.17]

Fankhauser, S. (2010), The Costs of Adaptation, in: *WIREs Climate Change* 1, 23–30

Farber, D. A. (2007), Basic Compensation for Victims of Climate Change, in: *University Of Pennsylvania Law Review* 155, 1605–1656

Field, C. B./V. R. Barros/K. J. Mach et al. (2014), Technical Summary, in: Field, C. B./V. R. Barros/D. J. Dokken et al. (eds.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge–New York, 35–94

Füssel, H.-M. (2010), How Inequitable Is the Global Distribution of Responsibility, Capability, and Vulnerability to Climate Change: A Comprehensive Indicator-based Assessment, in: *Global Environmental Change* 20, 597–611

Gampfer, R./T. Bernauer/A. Kachi (2014), Obtaining Public Support for North-South Climate Funding: Evidence from Conjoint Experiments in Donor Countries, in: *Global Environmental Change* 29, 118–126

Gardiner, S. M./S. Caney/H. Shue et al. (2010), *Climate Ethics: Essential Readings*, New York

Gilabert, P. (2017), Justice and Feasibility: A Dynamic Approach, in: K. Vallier/M. Weber (eds.), *Political Utopias: Contemporary Debates*, Oxford, 95–126

—/H. Hawford-Smith (2012), Political Feasibility: A Conceptual Exploration, in: *Political Studies* 60, 809–825

Gosseries, A. (2015), What's Wrong with Trading Emission Rights?, in: Moss, J. (ed.), *Climate Change and Justice*, Cambridge, 89–106

Grasso, M. (2010), *Justice in Funding Adaptation under the International Climate Change Regime*, Dordrecht

Grubb, M. (2011), International Climate Finance from Border Carbon Cost Levelling, in: *Climate Policy* 11, 1050–1057

Harmeling, S./C. Bals/W. Sterk et al. (2009), *Funding Sources for International Climate Policy. A Criteria-based Analysis of the Options Discussed under the UNFCCC*, URL: http://www.germanwatch.org/klima/fundso09e.pdf [19.0917]

Hartzell-Nichols, L. (2011), Responsibility for Meeting the Costs of Adaptation, in: *Wiley Interdisciplinary Reviews: Climate Change* 2, 687–700

Hepburn, C. (2009a), Carbon Taxes, Emissions Trading and Hybrid Schemes, in: Helm, D./C. Hepburn (eds.), *The Economics and Politics of Climate Change*, Oxford, 365–384

— (2009b), International Carbon Finance and the Clean Development Mechanism, in: Helm, D./C. Hepburn (eds.), *The Economics and Politics of Climate Change*, Oxford, 409–432

—/N. Stern, (2008), A New Global Deal on Climate Change, in: Oxford Review of Economic Policy 24, 259–279

Hermwille, L./W. Obergassel/H. E. Ott et al. (2015), UNFCCC Before and After Paris—What's Necessary for an Effective Climate Regime?, in: *Climate Policy* 2015, 1–21

Heyward, J. C. (2010), *Environment and Cultural Identity. Towards a New Dimension of Climate Justice*, Dissertation, Oxford

Hintermann, B./S. Peterson/W. Rickels (2016), Price and Market Behavior in Phase II of the EU ETS: A Review of the Literature, in: *Review of Environmental Economics and Policy* 10, 108–128

IPCC (2014), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, URL: http://www.ipcc.ch/report/ar5/wg3/, [19.09.17]

Jakob, M./R. Marschinski/M. Hübler (2013), Between a Rock and a Hard Place: A Trade-Theory Analysis of Leakage Under Production- and Consumption-Based Policies, in: *Environmental and Resource Economics* 56, 47–72

Kowalzig, J. (2017), Climate Finance at COP23: Results at a Glance, URL: http://www.germanclimatefinance.de/2017/11/24/climate-finance-cop23-results-glance [10.01.18]

Lawford-Smith, H. (2013), Understanding Political Feasibility, in: *Journal of Political Philosophy* 21, 243–259

Luhmann, J. (2013), Verstörende Ergebnisse, in: *klimaretter.info*, URL: http://www.klimaretter.info/meinungen/standpunkte/14763-verstoerende-ergebnisse [19.09.17]

MacKay, D. J. C./P. Cramton/A. Ockenfels et al. (2015), Price Carbon—I Will if you Will, in: *Nature* 526, 315–316

Méjean, A./F. Lecocq/Y. Mulugetta (2015), Equity, Burden Sharing and Development Pathways: Reframing International Climate Negotiations, in: *International Environmental Agreements: Politics, Law and Economics* 15, 387–402

Müller, B. (2008a), *International Adaptation Finance. The Need for an Innovative and Strategic Approach*, URL: http://www.oxfordenergy.org/pdfs/EV42.pdf [12.01.09]

— (2008b), *International Air Passenger Adaptation Levy (IAPAL). Thirteen Questions and Answers*, URL: http://www.oxfordclimatepolicy.org/publications/documents/ecbiBriefIAPAL13Q&As.pdf [06.05.10]

— (2015), *Finance for the Paris Climate Compact. The Role of Earmarked (sub-)National Contributions*, URL: http://www.oxfordclimatepolicy.org/publications/documents/CS-PB1-Finance_for_Paris_Climate_Compact.pdf [19.09.17]

—/C. Hepburn (2006), *IATAL—An Outline Proposal for an International Air Travel Adaptation Levy*, URL: http://oxfordenergy.org/pdfs/EV36.pdf [23.03.11]

Narain, U./S. Margulis, S./T. Essam (2011), Estimating Costs of Adaptation to Climate Change, in: *Climate Policy* 11, 1001–1019

Neuhoff, K. (2011), *Climate Policy after Copenhagen: The Role of Carbon Pricing*, Cambridge–New York

Nordhaus, W. D. (2013), *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World*, New Haven–London

OECD (2015), *Climate Finance in 2013–14 and the USD 100 Billion Goal. A Report by the Organisation for Economic Co-operation and Development (OECD) in Collaboration with Climate Policy Initiative (CPI)*, URL: http://www.oecd.org/environment/cc/OECD-CPI-Climate-Finance-Report.htm [29.09.16]

Page, E. A. (2011), Cashing in on Climate Change: Political Theory and Global Emissions Trading, in: *Critical Review of International Social and Political Philosophy* 14, 259–279

Persson, Å./R. J. T. Klein/C. Kehler Siebert et al. (2009), Adaptation Finance under a Copenhagen Agreed Outcome, URL: http://www.oxfordclimatepolicy.org/publications/documents/sei_adaptation_finance_persson.pdf [06.05.10]

Perthuis, C. D. (2011), *Economic Choices in a Warming World*, Cambridge–New York

Pickering, J./F. Jotzo/P. J. Wood, (2015a), Sharing the Global Climate Finance Effort Fairly with Limited Coordination, in: *Global Environmental Politics* 15, 39–62

—/J. Skovgaard/S. Kim et al. (2015b), Acting on Climate Finance Pledges: Inter-Agency Dynamics and Relationships with Aid in Contributor States, in: *World Development* 68, 149–162

—/S. Vanderheiden/S. Miller (2012), 'If Equity's In, We're Out'. Scope for Fairness in the Next Global Climate Agreement, in: *Ethics & international Affairs* 26, 423–443

Piketty, T./L. Chancel (2015), Carbon and Inequality: from Kyoto to Paris, in: Paris School of Economics, URL: http://piketty.pse.ens.fr/files/ChancelPiketty2015.pdf [19.09.17]

Rawls, J. (2001), *The Law of Peoples: With 'The Idea of Public Reason Revisited'*, Cambridge/MA

Roser, D. (2015), Climate Justice in the Straitjacket of Feasibility, in: Birnbacher, D./M. Thorseth (eds.), *The Politics of Sustainability. Philosophical Perspectives*, New York, 71–91
— (2016), Reducing Injustice within the Bounds of Motivation, in: Heyward, J. C./D. Roser (eds.), *Climate Justice in a Non-Ideal World*, Oxford, 83–103
—/L. Tomlinson (2014), Trade Policies and Climate Change: Border Carbon Adjustments as a Tool for a Just Global Climate Regime, in: *mental* 75, 223–245
Shue, H. (2014), *Climate Justice: Vulnerability and Protection*, Oxford
Smith, J. B./T. Dickinson/J. D. B. Donahue et al. (2011), Development and Climate Change Adaptation Funding: Coordination and Integration, in: *Climate Policy* 11, 987–1000
Stern, N. (2007), *The Economics of Climate Change: The Stern Review*, Cambridge
Targeted News Service (2012), *Committee Approves Bill to Block European Tax On Flights In U.S. Airspace*, URL: http://www.aviationpros.com/news/10753828/committee-approves-bill-to-block-european-tax-on-flights-in-us-airspace [19.09.17]
Timperley, J. (2017), *COP23: Key Outcomes Agreed at the UN Climate Talks in Bonn*, URL: https://www.carbonbrief.org/cop23-key-outcomes-agreed-un-climate-talks-bonn [10.01.18]
Umweltbundesamt (2015), *Der Europäische Emissionshandel*, URL: http://www.umweltbundesamt.de/daten/klimawandel/der-europaeische-emissionshandel [04.05.16]
UNEP (2014), *The Adaptation Gap Report. A Preliminary Assessment*, URL: http://web.unep.org/adaptationgapreport/sites/unep.org.adaptationgapreport/files/documents/agr_full_report.pdf [03.10.16]
UNFCCC (2007), *Investment and Financial Flows to Address Climate Change*, URL: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf [11.05.10]
— (2008), *Views Regarding the Work Programme of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, URL: http://unfccc.int/resource/docs/2008/awglca1/eng/misc01.pdf [12.12.16]
— (2009), *Fulfilment of the Bali Action Plan and Components of the Agreed Outcome. Note by the Chair*, URL: http://unfccc.int/resource/docs/2009/awglca5/eng/04p01.pdf [08.01.17]
— (2015), *Adoption of the Paris Agreement, Draft Decision*, CP. 21 (FCCC/CP/2015/L.9/Rev.1), URL: https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf [02.11.16]
Van Drunen et al (2009), *Climate Change Scientific Assessment and Policy Analysis. Financing Adaptation in Developing Countries. Assessing New Mechanisms*, URL: http://edepot.wur.nl/300644 [19.09.17]
von der Pfordten, D. (2012), Five Elements of Normative Ethics—A General Theory of Normative Individualism, in: Ethical Theory and Moral Practice 15(4), 449–47
Victor, D. G. (2011), *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*, Cambridge
Wan, Z./M. Zhu/S. Chen et al. (2016), Pollution: Three Steps to a Green Shipping Industry, in: *Nature* 530, 275–277
Wang, Y. (2017), *Action and Financing Commitments Announced at COP 23*, URL: http://sdg.iisd.org/news/action-and-financing-commitments-announced-at-cop-23/ [10.01.18]
Weber, R. H. (2015), Border Tax adjustment–Legal Perspective, in: *Climatic Change* 133, 407–417
Whitesell, W. C. (2011), *Climate Policy Foundations: Science and Economics with Lessons from Monetary Regulation*, New York
World Bank (2010), *The Economics of Adaption to Climate Change. A Synthesis Report*, URL: http://siteresources.worldbank.org/EXTCC/Resources/EACC_FinalSynthesisReport0803_2010.pdf [03.10.16]

World Bank (2016), *Adaptation Fund Trust Fund: Financial Report Prepared by the Trustee (as at 30 June 2016)*, URL: https://www.adaptation-fund.org/wp-content/uploads/2016/09/AFB-EFC-19.11-Trustee-Financial-Report.pdf [19.09.17]

Xinhua (2012), *China Bans Airlines into EU Carbon Scheme*, Beijing, URL: http://news.xinhuanet.com/english/china/2012-02/06/c_131392849.htm [12.11.16]

Zenawi, M./J. Stoltenberg, (2010), *Report of the Secretary-General's High-Level Advisory Group on Climate Change Financing*, URL: https://unngls.org/index.php/consultations/climate-finance/405-4156 [12.12.16]