



**Prof. Dr. Felix Ekardt, LL.M., M.A.  
Jutta Wieding, M.A.  
Assisted by Anika Zorn, B.A.  
Research Unit Sustainability and Climate Policy, Leipzig/Berlin**

# **Paris Agreement, Human Rights and Climate Litigation**

Legal opinion issued by Solarenergie-Förderverein Deutschland  
Final version Jan 4th, 2018

Research Unit Sustainability and Climate Policy (FNK Leipzig/ Berlin) is committed to research, teaching, project work (for public and non-profit clients), political consulting, media and public relations especially in the fields of (1) sustainability law/ environmental law and sustainability policy/ environmental policy; (2) interdisciplinary sustainability issues, transformation processes towards more sustainability, social learning; (3) theory of justice/ human rights/ constitutional law on international, European and German level; (4) governance issues/ development of policy instruments on international, European, German and regional level.

Prof. Dr. Felix Ekardt, LL.M., M.A. is founder and director of the FNK since 2009; furthermore since 2002 professor, since 2009 at Rostock University, Faculty of Law as well as the interdisciplinary faculty there and the Leibniz Science Campus Phosphorus Research Rostock. Jutta Wieding, M.A. and Anika Zorn, B.A. work at FNK in association with Rostock University in the context of the issues of this study.

## Preface

This legal opinion analyses the reach of the – legally binding – targets of the Paris Agreement which are widely overlooked or underestimated. Therefore, the relationship between the Paris Agreement and the precautionary principle respectively the due human rights protection of life and health with regard to climate change is crucial.

The research was done in autumn 2017 on behalf of the German Association for the Promotion of Solar Power (Solarenergie-Förderverein Deutschland e.V./ SFV). It represents the opinion of the authors and not necessarily in all parts that of SFV. All involved agreed on the goal to provide an impartial assessment of the legal state. This legal opinion is given on grounds of 15 years of work on the matter, documented in detail in my habilitation thesis “Theory of sustainability” (Original: „Theorie der Nachhaltigkeit: Ethische, rechtliche, politische und transformative Zugänge – am Beispiel von Klimawandel, Ressourcenknappheit und Welthandel“, 3<sup>rd</sup> ed. 2016).

This legal opinion presents the scientific findings of the authors and is not a legal consulting for any individual person, who sues in a specific case under the respective circumstances (under the specific legal system of their country). Because final statements on individual cases cannot be made without the specific knowledge of all case-related details. Also, there is always the possibility that a court of justice of any kind will in a specific case come to differing (whether materially convincing or not) conclusions than this study. The text is purposely held in gender-neutral language; where this is not the case, all genders are included.

Leipzig, in December 2017/ February 2018

Felix Ekardt

## Summary

The Paris Climate Agreement (PA) of December 2015 has been publicly received with both praise and criticism. Both overlook its most ambitious legally binding target limiting global warming to well below 2 degrees and better to 1.5 degrees compared to pre-industrial levels (art. 2 para. 1 PA). This study elaborates on the scope of this target and its consequences for climate policies.

- This study shows (in the overlap of the PA, the legal precautionary principle and human rights guarantees), that moving towards global zero emissions within a shorter timeframe than generally assumed is legally required.
- Furthermore, it will be shown that policies even have to aim at staying within 1.5 degrees global warming. Thus, well below 2 degrees (and not at 2 degrees) compared to pre-industrial levels is not sufficient.
- From a legal point of view, existential issues such as climate change require policies which are suited to reach the temperature target with high probability. The study also shows, that existing climate projections and forecasts have a tendency to be too optimistic (but even standard climate projections summarized in this study suggest global zero emissions within the next one or two decades in order to stay below 2 degrees or even better 1.5 degrees).
- All this also poses big challenges also to the EU and Germany, both of which see themselves as good examples in terms of climate measures (despite the continually big per capita ecological footprint). In view of the objectives, Germany and the EU have to raise their emission reduction pledges under the PA quickly and drastically in accordance to the periodical adaptation of nationally determined contributions. This is thus not merely a matter of wishful thinking, but rather a matter of legal obligation without which the target of the PA will be dramatically violated.
- The political climate discourse has to part with certain alleged certainties. There is no “2-degree target” anymore, but something substantially more ambitious. Furthermore, the nationally discussed targets of the respective governments are mostly far from the requirements of art. 2 para. 1 PA. Even if they were reached – which is e.g. in Germany not the case –, we would still not win grounds on substantial climate protection. The whole climate debate, as it is had (also by civil society organisations), is based on false assumptions.

- Art. 2 para. 1 PA is legally binding, but not directly enforceable by means of climate actions. However, human rights (which contain basically the same requirements regarding climate change) are enforceable. And these rights include a precautionary principle derived from human rights. Also, art. 2 para. 1 PA facilitates interpreting respective national constitutional, administrative, and civil law in favour of ambitious climate protection obligations. This might make it easier to insist on enforcing existing climate obligations, appeal activities harmful to the climate and hold big energy corporations partially accountable for the consequences of climate change.

## Content

Preface .....	3
Summary .....	4
Content .....	6
1. Research issue, basics of the Paris Agreement and its legally binding nature..	7
2. Climate policy between art. 2 and art. 4 PA - global zero emissions in just a few years instead of the end of the 21 <sup>st</sup> century? .....	9
3. Lack of clarity: Base year, certainties, climate sensitivity, frictions of scenarios - and a precautionary principle strengthened by human rights .....	11
4. Legal resolution of the relationship between art. 2 and 4 PA .....	18
5. The Paris objective and climate policy up to date .....	21
6. Relevance for current and future litigation cases .....	24
Bibliography .....	26

## 1. Research issue, basics of the Paris Agreement and its legally binding nature

According to a broad scientific consensus (IPCC 2014a; IPCC 2014b; for overview see Ekardt 2016a: § 1 B.; Ekardt 2018a), the earth is facing global warming by 3 to 6 degrees Celsius compared to pre-industrial levels in the turn of the 21<sup>st</sup> century. This is primarily caused by human induced high greenhouse gas emissions, most of which – putting aspects of land use aside – are caused by intensive use of fossil fuels in sectors like energy, production, agriculture, heating, power and transportation. Focussing on the power sector, as is mostly done in Germany, is therefore not enough. This, by natural sciences and economics estimated, degree of climate change has the potential to cause massive economic damage, big migration movements, existential threats to millions of people and lastly violent disputes over diminishing resources such as food and water. So far, it is little known that reducing greenhouse gas emissions (especially, but not exclusively from fossil fuels) is also the central solution to ocean acidification as another upcoming environmental problem. Those emissions are therefore also cause for the frequently flagrant danger to marine ecosystems.<sup>1</sup>

In December 2015, nations worldwide agreed to a new global climate agreement. Commonly, the Paris Agreement (PA) has been welcomed enthusiastically, especially after the success of the negotiations was doubtful. At the same time, there are questions to how effective it will be. Generally, all nations are required to take more ambitious measures to stop climate change (mitigation) and also to adapt to consequences of unavoidable climate change (adaptation) and to provide financial aid for countries harmed by climate change (loss and damage). Still under negotiation are the details of the PA and concrete emission reduction pledges of countries which are voluntary in their quantity and undermined by unclear calculation methods and procedures (more on the discourse with further references Ekardt/ Wieding 2016).

This study will however not focus on the much discussed issue of further defining the details of the PA, but rather take a closer look at the overarching target and its implications. It will provide an analysis of the legally binding target which limits global warming to “well below 2 degrees Celsius above pre-industrial levels” and pursuing “efforts to limit the temperature increase to 1.5°C above pre-industrial levels” (art. 2 para. 1 PA). On the other hand, Art. 4 para. 1 PA states “In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach

---

<sup>1</sup> Another cause of ocean acidification are pollutant emissions. They, too, result from fossil fuel use in industry, transportation and agriculture. Ocean acidification and climate change are therefore closely interlinked issues – the latter reinforcing the degradation of marine ecosystems. More on ocean acidification and its governance see Ekardt/ Zorn 2018.

global peaking of greenhouse gas emissions as soon as possible..., so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century.” Looking at these two indisputably legally binding Norms from a perspective of physics or meteorology, potential contradictions come to mind. One is the fact that art. 2 PA might require a more rapid decarbonisation than art. 4 PA. Another contradiction occurs as the norms potentially imply much further commitments to reduce emissions than have been subject of public discourse. This calls for clarification.

We will do a legal interpretation (more on this globally practised legal method Ekardt 2018a and Ekardt 2016a: § 1 D. III. 3.<sup>2</sup>) of art. 2 and 4 PA while considering latest estimates from natural sciences by means of a literature analysis of the emission reduction implications of those targets. This enables us to determine the actual commitments that states made in Paris – and how possible contradictions might and must be resolved. Such analyses will show more clearly than ever to which extent states have to reduce their emissions. According to art. 3 and art. 4 PA, national commitments (nationally determined contributions, NDCs) are to be reviewed regularly. NDCs serve the purpose to achieve the overall target. If not sufficient, states are legally required to raise them gradually. This study also addresses how to cope with scientific uncertainty, the role of climate scenarios and define “pre-industrial level” which is elevated to a legal term in art. 2 PA.<sup>3</sup>

The current political debate in all known countries is focussed exclusively on the voluntarily set NDCs and maybe on the fact that missing said objectives would be regrettable (or embarrassing). However, national climate targets might be, even if met, inadequate. And possibly, this is not only cause for regret, but a violation of the PA – and of guaranteed human rights. This hypothesis will be pursued in the following.

---

<sup>2</sup> Legal norms are interpreted grammatically, systematically, teleologically and historically. This means according to their literal meaning, their relation to other legal norms, their purpose and their evolution. Usually, grammatical and systematic interpretation is applied because the other two approaches are prone to several problems; more on this with further references Ekardt 2016a: § 1 D. III. 3.

<sup>3</sup> The analyses of the PA add a normative base, specification and higher liability to the debate about UN Sustainable Development Goals 2030 (SDG; more elaborate Ekardt 2018a). Because the SDGs include access to modern energy for all, food security and access to water, and have thus many links to climate change and effective climate protection policy. However, they are not legally binding as such, and in parts either vague or even contradict each other. The latter applies e.g. in achieving environmental objectives while maintaining and nurturing economic growth.

## **2. Climate policy between art. 2 and art. 4 PA – Global Zero emissions in just a few years instead of the end of the 21<sup>st</sup> century?**

What does it actually mean to reach a balance of emissions and sinks by the end of the 21<sup>st</sup> century (art. 4 para. 1 PA) and to keep global warming well below degrees? What is the difference for implementation if staying within 1.5 degrees (art. 2 PA)? The answers partially depend on the empirical question how much time mankind has to reduce their emissions enough to stay within the temperature limits. The possible conflict between those two norms also depends on the question how they are legally interpreted: What is meant by “well below” 2 degrees? The wording suggests about 1.7 or 1.8 degrees as temperature limit, as it has to be significantly – “well” – below 2, but more than 1.5 degrees. “Pursuing efforts” towards 1.5 degrees does not mean that this objective can legally be easily dismissed. Rather, actual measures have to be taken, which try to reduce more emission than necessary to stay with 1.7 or 1.8 degrees. The wording does not clarify the scope of these measures. Its evolution, meaning the negotiation process leading to the PA, however suggests that 1.5 degrees are actually to be achieved, unless this is already impossible. We will see later in chapter 4 that there is back up for this interpretation in basic rights.

Substantially, art. 2 PA establishes a different target than all prior negotiations and also the public debate, in which the 2-degree target was proposed. It goes largely unnoticed so far, that this has potentially drastic consequences: Much more ambitious emission reductions on a global scale. This is why the timescale of “second half of this century” for decarbonisation in art. 4 para. 1 PA might be too long to stay within the temperature limits. So, what is a more realistic scenario? To determine the emission reductions correlating to a certain temperature target, the Intergovernmental Panel on Climate Change (IPCC) works largely with certainties. Estimates are used as well, in order to speak about future issues and because the development of the climate depends on numerous factors which are relevant, but not equally known (more on the resulting problems in chapter 3). The IPCC context calculates climate developments in emission budgets, emission pathways or ppm, respectively ppb concentrations in the atmosphere<sup>4</sup> (for more see Buhofer 2016).

The objective to limit global warming to well below 2 degrees in art. 2 para. 1 PA calls for zero emissions globally within about two decades, according to IPCC data. The data of this global community for natural science climate research predicts

---

<sup>4</sup> The abbreviations ppm respectively ppb stand for parts per million and parts per billion and express the amount of gas molecules in relation to the total number of molecules in dry air. 391 ppm therefore mean 391 CO<sub>2</sub> molecules per million air molecules.

the maximum of global emissions with equal global per-capita emissions; in order to stay within 1.5 degrees, zero emissions have to be reached within one decade. These IPCC estimates are used e.g. by Höhne et al. (2016; likewise Rahmstorf 2017; Ekardt/ Wieding/ Henkel 2015; Rogelj et al. 2016). Basis are greenhouse gas emissions (depending on the kind of gas stay in the atmosphere for years) and findings on the relation between greenhouse gas concentration and global temperature from 2014. On grounds of these data, the probable global warming is projected. These papers use scenarios, which stay below 2 degrees with 66 percent certainty and within 1.5 degrees with a 50 percent certainty, based on a remaining budget of about 250 GtCO<sub>2</sub> in 2014 (Höhne et al. 2016; IPCC 2014 had calculated with 1000 GtCO<sub>2</sub> from 2012 for the significantly higher target of 2 degrees; see also Peters 2017). Looking at research outside of the IPCC, budget calculations sometimes diffusely refer sometimes to 1.5 degrees, sometimes to 2 degrees. They vary between 150, 590, 1050 and 1240 GtCO<sub>2</sub>, however, base years vary and also whether all greenhouse gases (expressed in carbon dioxide equivalents) or only carbon dioxide is included (summarised by Rahmstorf 2017; Peters 2017; Figueres et al. 2017; Rogelj et al. 2017; further more recent views in Schellnhuber et al. 2016; Rahmstorf/ Levermann 2017; Berger et al. 2016; Canadell et al. 2017; Andersson/ Broderick 2017; Steininger/ Meyer 2017). Considering these findings and the call for 1.5-to-1.8-degree target, art. 2 para. 1 PA requires global zero emissions within ten to twenty years (depending also on the emission pathways and the assumed climate sensitivity). Thus, there is prima facie a contradiction between art. 2 para. 1 PA and art. 4 para. 1 PA. The first norm is very ambitious, the latter only to a limited extent. Especially art. 2 para. 1 PA challenges all climate policy so far. This requires further analysis in the next chapters.

### **3. Lack of clarity: Base year, certainties, climate sensitivity, frictions of scenarios – and a precautionary principle strengthened by human rights**

Scenarios based on various assumptions are cause of widely varying results. The talk of probabilities and budgets therefore does not completely answer the degree of real obligation that results from art. 2 para. 1 PA. This will be addressed first. Furthermore, it will be shown that uncertainties do not necessarily imply – as sometimes thought – that effective climate policies are at the discretion of governments. Rather on the contrary, as will be argued in the following.

Climate modelling, estimates and assessments are always subject to uncertainties which explains the widely varying results of differing models, assumptions and scenarios (IPCC 2014b: 155; Tollefson 2015; Rahmstorf 2017; Peters 2017). Looking at all different models, as done in the IPCC Assessment Reports, helps to react to this phenomenon (Schmidt 2007; Rahmstorf 2017). The models are so complex and based on so many assumptions (which are usually little transparent for outsiders or even for the scientific community), that a comparison of all details would exceed the limits of a primarily legal analysis. However, the obvious question is, whether a government inactive with regard to climate policies can simply follow the most favourable scenario for them. Even considering that liberal-democratic constitutions require politics to base their decisions on facts that are as sound as possible, it is quite obvious that there are political margins where research meets uncertainties (Meßerschmidt 2000; Ekardt 2016a: § 5 C. II. 2.; Calliess 2001; Ekardt 2018a; Susnjar 2010). In the following, we will see two things: *For one, there are several indications that current calculations are too liberal. Therefore, realistic projections or predictions have to be based on the scenarios with smaller budgets. Secondly, from a legal point of view, politics must not take substantial risks when it comes to climate change, because of its existential role for humankind.*

It is correct that a calculation of future climate developments involves factors which can lead to vagueness. Generally, predictions of the future can never be absolutely certain. This is especially true in view of the highly complex issues of sustainability often acknowledged. The size of the projected budgets depends on several assumptions. In order to calculate the significance of a norm like art. 2 para. 1 PA, it is crucial whether the assumption is to lower emissions right away or whether they will continue rising for some years. One of many further factors contributing to uncertainty is the accumulation of short-lived aerosols in the atmosphere, which lead to delayed climate effect of anthropogenic greenhouse gas emissions (Albedo effect). Another one is the storage capacity for CO<sub>2</sub> in oceans. Oceans are especially crucial, because they warm up slowly and in several layers.

The colder they are, the higher is their storage capacity for greenhouse gas emissions. Positive side-effect is that e.g. methane with a very high climate effect dissolves in the atmosphere within ten years. If human-induced CO<sub>2</sub> emissions were to suddenly stop, however, the aerosols – polluting particles – would also disappear from the air, thus speeding up the warming process (more detailed Mauritsen/ Pincus 2017). The Gross National Product and population development are another cause for the range of detailed predictions respectively projections (Drouet/ Emmerling 2016; extensively on regional scenarios also Rose et al. 2017).

Also, the issue of climate change is interlinked with other major social issues like economic growth, digitalisation, international trade, globalisation, automatization, etc. etc. Development in those issues is again each dependent on many and complex variables. All this cannot be fundamentally solved by the models and scenarios they are based on. Scenarios are neither a definitive prediction (which is impossible), nor scenarios are able to consider all possibility scopes of future developments. They are even less normative (further problems such as non-transparent basic assumptions are analysed in Ekardt 2017; exemplary despite exhaustive and thorough work Bodirsky et al. 2015 and Wiebe et al. 2015<sup>5</sup>). When, due to uncertain variables and unknown events, it is not possible to determine an exact likelihood of an occurrence, budgets provide a (frequently very thorough) estimate instead of a real calculation in the stricter sense. Because it is not possible to do math with unknown probabilities, not even with great expertise.

Even if the future climate is not entirely predictable, there is a strong indication to granting the smaller remaining budgets highest empirical validity:

- *Firstly*, many calculations are based on limiting global warming to 2 degrees, which is less ambitious than staying “well below 2 degrees” in accordance to art. 2 para. 1 PA. Following a 2 degrees pathway will not only lead to higher budgets, but also to underestimating the extent of the challenge – zero emissions within a short period of time. The longstanding discourse on the compatibility of economic growth and environmental protection for instance widely ignores this by not choosing the required level of ambition (in detail Ekardt 2016a: §1 B. III.; Hoffmann 2015: 12 et seq.;

---

<sup>5</sup> Raftery 2017 et al. assume that their figures can be validated by referencing comparable calculations from the past: The model used for an extrapolation starting in 1950 and 1980 each running for 30 years showed even with the great emission’s increase in China between 2000 and 2010 a 90 percent accuracy with real developments. Whether this will work for the much longer period until the end of the century is uncertain.

Jackson 2011: 81-83; Piketty 2015: 29 et seq.; Moreno/ Speich Chassé/ Fuhr 2015: 28; with little criticism Paqué 2010: 96 et seq.).

- *Secondly*, not all budgets include non-carbon-dioxide emissions. Even so other greenhouse gases do not remain in the atmosphere as long as carbon dioxide, they cannot be disregarded in their effect on the climate (Buhofer 2017). Concluding the need for action in terms of greenhouse gas emissions from a carbon-dioxide-only budget, the scope of the problem is artificially reduced.
- *Thirdly*, budget calculations become rather liberal by setting the base year of the “pre-industrial level” (art. 2 para. 1 PA) rather late, meaning when climate change had already set in. This leads to an underestimation of human-induced global warming.<sup>6</sup> Generally, a baseline is needed to make consistent calculations. A base year between 1860 and 1880 is most commonly used in calculations of the temperature limit, however, 1750 is also mentioned (Peters 2017; Rahmstorf 2017). This leads to the question, when exactly industrialisation respectively the increase of emissions actually started. The IPCC draws the line initially in the year 1750 (IPCC 2013: 1456). However, calculations and estimations of the average global warming are based on the year 1850 respectively 1870, because there is little temperature data on the time prior to the 19<sup>th</sup> century. Also, data which does exist is limited to the Northern hemisphere (IPCC 2013: 953-1028, 1029-1136; IPCC 2014a: 64). The increase of carbon dioxide before 1850 accounts for a temperature rise of 0.1 to 0.2 degrees Celsius (Schurer et al. 2017). On the bottom line, defining “pre-industrial level” is merely a free-floating empirical discussion about the emissions level of the respective time. But looking at the term “pre-industrial level” in the PA as a legal document, it seems mandatory to assume 1750 as base year. Because this is when the industrial revolution in Western countries actually started – and not as late as between 1860 and 1880.
- *Fourthly*, existing calculations seem also quite liberal, if taking other assumptions on climate sensitivity in comparison. Equilibrium climate sensitivity (ECS; more detailed Buhofer 2016) indicates the temperature rise if CO<sub>2</sub> equivalents in the atmosphere double. It is therefore an important reference for climate modelling and lastly also in determining the temperature limit of art. 2 para. 1 PA (IPCC 2013: 1451). According to IPCC (2013:

---

<sup>6</sup> An overview of different types of scenarios is provided on <https://www.iea.org/publications/scenariosandprojections/>. IPCC data is also compiled on <https://www.carbon-brief.org/analysis-only-five-years-left-before-one-point-five-c-budget-is-blown>.

16), the ECS is probably between 1.5 and 4.5 degrees Celsius. Newer studies by Friedrich et al. (2016) and Storelvmo et al. (2016) suggest that the ECS has been underestimated and might be at the higher end of the range or even above it. Paleoclimatic research showed for instance that climate sensitivity changes with the state of the climate. In warm phases (such as we are in right now), the ECS is significantly higher – according to the calculations of Friedrich et al. (2016) 4.88 degrees Celsius – thus clearly above the IPCC range. Storelvmo et al. (2016) find in their study that the amount of solar radiation reflected by clouds into space is not as high as assumed so far. Instead, more radiation penetrates the cloud layer and warms the earth more strongly. Depending on the cloudiness, climate sensitivity is up to 1.3 Kelvin higher than so far expected (Mauritsen/ Pincus 2017).

- *Fifthly*, budget calculations are based on accepting a high probability of missing the temperature limit. However, it astonishes to live with success probabilities of 50 or 55 percent (even if 100 percent certainty will obviously never be reached when dealing with future situations). Therefore, we need to consider: Some critical tipping points like the melting of the Greenland or the West Antarctic ice shield, or the coral bleaching will probably even occur if the temperature rise stays well below 2 degrees (Frieler et al. 2012; Rahmstorf/ Levermann 2017: 3-4). A target range between 1.5 and 1.8 degrees guarantees therefore *by no means* landing in an array, which leaves a margin for error.

These points strongly suggest that a smaller budget, requiring decarbonisation within just a few years, is called for in art. 2 para. 1 PA in light of empirically realistic predictions respectively projections. This allows for further legal assertions. There are two legal aspects which underline furthermore the obligation to take low risks of substantial damage, which means taking fast and drastic climate protection measures:

(a) It has to be pointed out that governments cannot accept staying within 1.7 to 1.8 degrees, but has to aim at 1.5. As said before: The obligation to make “efforts” towards the 1.5-degree target does legally not allow for an easy dismissal of this objective. Much rather, actual measures have to be taken to achieve more reductions than probably required for a 1.7- or 1.8-degree target.

(b) Human rights contain the obligation for climate protection to secure elementary preconditions of freedom, which are life, health and subsistence (more detailed Ekardt 2016a: §§ 4, 5; Rajamani 2010; Knox 2013; Skillington 2012; Ver-

heyen 2005; Ekardt 2018a; generally, on environmental protection also Unnerstall 1999; Schmidt-Radefeldt 2000; Calliess 2001; Koch 2000<sup>7</sup>). This obligation is at the same time explicitly recalled in the preamble of the PA – knowingly that

---

<sup>7</sup> More detailed on the human rights background especially Ekardt 2016a; Ekardt 2018a. The climate problem shows particularly that possible consequences of climate change will affect various subjects under human right protection. This protection is guaranteed under national, supranational and international law. Consequences include increasing food and water scarcities in some parts of the world, increasing natural catastrophes, increasing armed conflicts and civil wars as well as a push on migration due to these circumstances. These affect most obviously the right to life and health as well as subsistence/ food/ water. Because these legal guarantees apply, it is not necessary to relive the both vague and never satisfyingly finished discussion whether there should be an explicit right to a healthy environment. The focus on environmental human rights is underlined by the fact that human-rights-basis for environmental policies are plausible even without considering the individual guaranties for life, health, food, water, etc. Basic rights are founded on the concept of freedom. In the environmental context, traditionally mostly economic freedom of those living here today are considered, therefore focusing on use and exploitation of the environment. However, the issue merits the additional interpretation that freedom-based basic rights also include the elementary physical preconditions to freedom. *Because* without minimum subsistence and without life and health, it is not possible to make sense of freedom.

Many environmental impairments evolve over a long period of time and frequently across national borders. But protection of human rights applies wherever. Some human rights standards might suggest that human rights are limited to the territory of one particular state. However, this does not answer the question at hand, which is the exact meaning of territory. For instance, whether the allowed or tolerated greenhouse gas emissions of a country including their impact on other countries and future times remain at a state's discretion or not. Much is to be said for including an intertemporal and global dimension in the concept of freedom immanent to human rights and the just derived protection of elementary preconditions of freedoms by way of legal interpretation. Because future people are naturally going to be humans – and already young people are as well as people in other countries – and thus subjects to human rights. And the right to equal freedom has to be applied right where it is endangered: In a high-tech, globalised world increasingly across time periods and state borders.

Furthermore, the mentioned legal notion of “protection of (preconditions of) freedom” suggests (in connection with different grammatical reasons), that human rights contain an entitlement to (governmental) protection against other citizens (not only in exceptional cases). This means for example a protection against environmental damage like climate change, harmful to my freedom and its preconditions *by the authorities against other citizens* (whose – state-licensed or tolerated – activities are usually source of environmental exploitation). There is no way to see the recognition of protection rights as undermining parliamentary influence of policy options. It is the purpose of parliamentary decisions – in other words: laws – to mediate between colliding spheres of freedom. The balancing rules are also derived from human rights and mark the frame of eligible democratic decisions. With regard to balancing, protection rights are not structured differently from defending rights: It is true for both categories of rights that a constitutional court is hardly ever allowed to limit parliament to one single option, but instead is supposed to identify actions which are in no way admissible (“anyways, not like this”). The sum of balancing rules is often referred to as proportionality assessment; however, some of them are frequently overlooked, especially the one explained next in the main text.

global warming interferes with food and water security and will therefore (alongside more natural catastrophes) increase the likelihood of migration movements and wars over shrinking resources. This will endanger the foundations of human civilisation. While it is true that balancing human rights obligation to climate change is *prima facie* left to political margins (for instance due to the contradicting freedom rights of enterprises and consumers), which is only limited by those weighting rules which have to be complied with, one of these rules states that political margins of decision-making end where political action or non-action will endanger the liberal-democratic system as such (more detailed Ekardt 2016a: § 5 C. I.; Ekardt 2018a; on further rules also Calliess 2001 and Susnjar 2010). This is exactly the effect unchecked climate change might have. For this reason, ambitious climate policies are obligatory in view of human rights.

This raises the question how strongly and how quickly emissions have to be reduced. It is obvious that all those developments described are well possible, however not in all details definitely certain to occur. But, basic rights protect not only against certain dangers, if the danger is at the moment of occurrence irreversible; and exactly this is the case with climate change. Otherwise, the protection provided by basic rights runs empty (Koch 2000; Ekardt 2016a: § 5 C. II. 2.). Human rights thus contain a precautionary principle; even if this were disputed, it remains undisputed that the precautionary principle (also) exists independently of human rights on national, EU and international law. This is manifest e.g. in the Framework Convention on Climate Change (FCCC) in art. 3 para 2 FCCC, in the Treaty on the Functioning of the European Union (TFEU) in art. 191 TFEU or in the German Constitution (Grundgesetz/ GG) in art. 20a GG. Precaution means taking measures in view of long-term, cumulating or uncertain damages (Arndt 2009; Maurmann 2008; Monien 2014; directly in the scope of the precautionary principle Ekardt 2016a: § 5 C. II. 2.). All this applies to climate change. The connection to human rights only served to emphasise (and provide grounds for litigation) what is already enshrined in the precautionary principle: The bigger the impending damage in its occurrence, the more ambitious the necessary protection measures have to be. Also, at the cost of mentioned goods like economic freedom. Therefore, in dealing with existential dangers, it is not enough to accept moderate probabilities for their defence, even if 100 percent certainty can naturally never be reached regarding future events.

Therefore, it is a legal obligation in the debate on level of ambition required by the PA, to focus on the rather pessimistic figures. This means accordingly, taking extensive measures (globally) for a short-term decarbonisation.<sup>8</sup> It follows that

---

<sup>8</sup> Furthermore, using the balancing rules derived from human rights guarantees for freedom and preconditions of freedom (suitability, necessity, efficiency, polluter-pays principle and many more), it is possible to determine not only a common obligation to preserve the climate but also

even the (in view of the statements in chapter 2) 10 to 20 years on average remaining to achieve the decarbonisation are rather too generously estimated. This is despite the already drastic efforts needed to meet the huge challenge of reaching zero-emissions within one or two decades in all sectors: Power, heating, fuels, agriculture and plastics (on the issue of economic feasibility of decarbonisation in contrast to a business-as-usual scenario with all its possible catastrophic consequences Ekardt 2016b with further references).<sup>9</sup>

---

draw rough conclusions for burden sharing. Ostensibly, this might not seem important, given that the objective is zero-emissions for all states anyhow. It is however, to answer questions of allocation of expenses for globally necessary measures in mitigation, adaptation and loss and damage. EU member states like Germany have emitted high amounts of greenhouse gases per capita, which are still in the atmosphere. This increases the urgency for action in these countries to go beyond the required respectively increases the obligation to bear the costs of measures taking the Global South. More detailed in Ekardt/ Wieding/ Henkel 2015; Rahmstorf 2017; Ekardt 2016a: § 5 C. IV.; Ekardt 2018a – and briefly in the paragraph second to last.

<sup>9</sup> It is not possible to make a more exact statement, as much as some would wish to do so. If we stated that “maximum” efforts are required, the degree of obligation would still remain unclear. Should we not turn off all electric appliances, which are not directly essential to our lives right away? Should we not reduce the supply of animal food products to a tenth of what it is now immediately? Those questions are far from only touching on technology, but imply – besides the commitment to resolve the remaining unclarity – a balancing process which sometimes drastic interventions we have to endure for an effective climate protection. Determining the exact extent of actions under the premises of limited (!) fact-based and balancing-related vagueness, can only be done by elected politicians in order to preserve the democratic process and the system of checks and balances. Therefore, neither constitutional lawyers nor engineers will do. Yet, as seen above, the margin of action remains quite limited. More generally on liberal democratic checks and balances under given circumstances Ekardt 2016a: § 5 B.-C.; Calliess 2001; Susnjar 2010; Ekardt 2018a.

#### 4. Legal resolution of the relationship between art. 2 and 4 PA

Substantially, art. 2 PA has a very ambitious indication. And its indication is different from the 2-degree target which had been grounds of negotiations and public discussion until then. So far, this fact has had little attention, despite the drastic consequences – that is to say short-term immense emission reductions on a global scale. The additional target of art. 2 para. 1 PA to pursue efforts to limit global warming to 1.5 degrees, adds severity to the already strong indication. Parties to the PA “aim to reach” peaking emissions “as soon as possible”, and neutralise emissions completely within the second half of the 21<sup>st</sup> century according to art. 4 para. 1 PA. This, however, will not be soon enough to stay within the targets of art. 2 para. 1 PA. Therefore, there is a legal contradiction between art. 2 para. 1 and art. 4 para. 1 PA, which requires to determine the priority through legal interpretation. Some arguments suggest a priority of art. 2 para. 1 PA. They are mainly result of systematic interpretation, thus a norm interpretation, which considers the connection between different norms.

- In favour of the priority of art. 2 para. 1 PA stands firstly, that it is an overarching objective. Art. 4 PA deals subordinately with concrete strategies in order to achieve this objective. Art. 3 and art. 4 para. 1 PA literally state this twice. The point of orientation, and therefore prior norm is therefore art. 2 PA.
- From the perspective of history and purpose of the norm, art. 4 para. 1 PA means above all (even if the wording includes all states, due to the term “Parties”) that developing countries and emerging countries (not, however industrialised countries) should still have time to reduce their emissions. This is also reflected in art. 4 para. 4 PA. For developing countries, this is not possible without violating art. 2 para. 1 PA. Anyhow, the fact that primarily one group of states is meant, shows two things: Art. 4 para 1 PA has a rather operative and serving character. For industrialised countries in particular, it is highly doubtful whether art. 4 para. 1 PA is intended to stand in contradiction to art. 2 para. 1 PA.
- A third, systematic point can be framed as follows: If interpreting the norm hierarchy in favour of art. 4, art. 2 would still be violated. If, on the other hand, interpreting in favour of art. 2, art. 4 PA is not violated – it is rather overachieved, as art. 4 PA does not prohibit to be faster than formulated. The phrase “keep well below 2 degrees” in art. 2 PA underlines also that emissions cannot rise indefinitely and then brought back to a level accommodating the temperature level. Art. 3 PA clearly states that states have to comply with art. 2 PA by continually increasing their level of ambition

(on the current level of efforts in the following chapter). It reads: „As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts as defined in Articles 4, 7, 9, 10, 11 and 13 with the view to achieving the purpose of this Agreement as set out in Article 2. The efforts of all Parties will represent a progression over time, while recognizing the need to support developing country Parties for the effective implementation of this Agreement.“

- A fourth systematic reason speaks for the priority of art. 2 PA over art. 4 PA: The PA is in its legal systematic a concretisation of the FCCC, respectively an implementing legal treaty within the FCCC. Especially art. 2 FCCC contains the overarching objective of all international climate law to prevent dangerous anthropogenic disruptions of the global climate. This disruption can, as shown previously, only be prevented if art. 2 para. 1 PA is treated priority to art. 4 para. 1 PA, because the indications in art. 4 para. 1 PA would allow for such a substantial global warming. According to art. 31 para. 3 Vienna Convention on the Law of Treaties, such a systematic interpretation of the PA in light of other legal acts of international law is explicitly part of the interpretation process. This is all the more true, as human rights guarantees also point in that direction as seen earlier.

One issue has to be added on the side-lines. Neither art. 2 para. 1, nor art. 4 para. 1 PA explicitly contain a statement regarding the phase-out of fossil fuels in electricity, heating, transportation, plastics and mineral fertilisers in favour of renewable energy, energy efficiency and frugality, despite the problematic role of fossil fuels. The statement to neutralise emissions which they do contain could, at first sight, intend to employ geo-engineering, instead of phasing-out oil, gas and coal. Geo-engineering refers to interventions in the atmosphere or the oceans (or storing sequestered CO<sub>2</sub> underground, e.g. from coal power plants), in order to reduce solar radiation or increase the storage capacity for greenhouse gases. The discussion of these technologies is too complex to be reflected in this paper en passant. But, when those options prove to be impossible to implement, at latest, a phase-out of fossil fuels and the transition to 100 percent renewable energy, increased energy efficiency and maybe even frugality will become imperative (and in their quantity limited, directly available compensation measures like re-wetting dried wetlands to neutralise emissions which will remain even after the complete phase-out of fossil fuels). And all timelines indicated by art. 2 para. 1 PA suggest this. Respective technologies are currently not ready for the market – which is why the discussion about possible high costs and risks (and their compatibility with art. 2 para. 1 PA, the precautionary principle and human rights) is

rendered unnecessary for the most part (on the controversy on negative emissions UNEP 2016; Ekardt 2016a: § 1 B.; Höhne et al. 2016: 11-12; Smith et al. 2016; Hennig 2017).

The findings above are not invalidated by the possibility that reaching the target of art. 2 para. 1 PA might just not exist and therefore the issue of the relationship between the norms is allegedly solved differently. Even though the impossible cannot be legally required, as seen elsewhere in more detail (Ekardt 2016a: § 3 G.; Ekardt 2018a), this is probably not the case with the target of art. 2 para. 1 PA. It would only be defined as impossible, if natural laws suggested that. As far as we know today, this impossibility does not (yet) exist. Also, the findings cannot be dismissed by the popular statement (see for instance Knutti et al. 2016) that it were useless to define targets at all. Because art. 2 para. 1 PA contains one and is legally binding.

Equally false is the indication that not all objectives in law are also legally binding; because, in contrast to other objectives e.g. to generally protect the climate, art. 2 para. 1 PA is clearly and unmistakably formulated. Art. 3 and art. 4 para. 1 PA underline that art. 2 para. 1 PA contains the binding basis of all climate measures. And even less valid is the counter-argument that most states envisaged art. 2 para. 1 PA merely as soft – media-effective, but without legal consequences – lyrics when they adopted it. Because law applies in its wording and the system of norms and not some motivational findings in their evolution.

Some might finally counter: Is the PA not rendered insubstantial by the exit of the U.S.? Art. 28 PA states on the matter: “(1) At any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary. (2) Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.” Whereas the withdrawal will not affect the whole existence of the Agreement, because there is no termination intended, after it has once entered into force. If the ratification of the U.S. itself is called into question, an immediate exit would be possible. This, however, has not been done. If questioning a ratification, which has already been deposited (as was done in October 2016), would merit a withdrawal under international law and at the time call off the entry into force due to the lower amount of emissions which are globally accounted for, is highly doubtful. Disregarding these legal observations, the question of legality must be raised in light of human rights protection, if states with high emissions withdraw from international climate policy efforts.

## 5. The Paris objective and climate policy up to date

Disregarding the far-reaching and legally binding target of limiting global warming to 1.5 to 1.8 degrees, national contributions are not sufficient, financial pledges to cover the costs caused by implementing the Agreement are vague and sanction mechanisms within the framework of the PA are simply non-existent (more on this and the following with further references Ekardt/ Wieding 2016; Ekardt 2016; also Hennig 2017; avant la lettre Becker/ Richter 2015). Essentially, all states will miss the ambitious temperature limit of art. 2 para. 1 PA by far, based on their national climate targets and still more drastically their policy instruments. The Emissions Gap Report of the UN Environmental Program evaluates, whether the sum of all NDCs submitted so far will account for the necessary paradigm change to achieve the PA objectives. Basis is firstly the 2-degree target (not yet adapted to art. 2 PA “well below” 2 degrees) and secondly the 1.5-degree target. It shows that current efforts are not enough (UNEP 2016; UNEP 2017a; also e.g. Höhne et al. 2016; Rogelj et al- 2016; Ekardt/ Wieding/ Henkel 2015; see also Figueres et al. 2017).

If assuming the usually discussed parameters for burden sharing (primarily capacity and historic responsibility for emissions produced since 1990, see also on this art. 4 para. 4 and 9 PA), EU states such as Germany would have to reduce more emissions than they are currently emitting. Financing the rest of emission reductions in the Global South would imply double-digit billion Dollar amounts annually. Possibly raised even more by high payments for adaptation and compensation for climate-change damages. This may add up to minus 162 percent emission reduction obligation even for the 2-degree target (plus a lower probability for the 1.5-degree target) and a target year of 2050 for Germany (based on IPCC 2014 and Schellnhuber 2015 in detail: Ekardt/ Wieding/ Henkel 2015: 6 et seq.). In practice, this means e.g. zero-emissions plus two-digit billion-Dollar obligations for Germany per year just for mitigation measures in the Global South. If assuming the “well below 2 degrees” or the 1.5 degrees of the PA, these figures increase further.<sup>10</sup> The deficiencies of climate policies to achieve art. 2 para. 1 PA by states like Germany and the EU as a whole (but practically in all other states as well) is already anticipated in art. 3 and art. 4 PA. Because considering the very ambitious legally binding target in art. 2 para. 1 PA, it seems rather contradictory to allow states to submit voluntary national emission reductions to implement the overall objective. However, these NDCs have to be increased over time. *Therefore, for*

---

<sup>10</sup> The issue, which strategies should be pursued to achieve those reductions is not focus of this analysis. In other words, the question how many reductions can be achieved by technical consistency and efficiency solutions and when frugality and negative emissions have to be used (each with its pros and cons). More detailed on this e.g. Ekardt 2016a; Ekardt 2018a and briefly on negative emissions above and on the limitations of technology below.

*instance Germany and the EU have to raise their level of ambition fast and drastically (and, for all we know, most other states as well).*

Referring to the EU, or Germany, as a good example in terms of climate policies has not even had merit in the past, despite some singular successes (critically Becker/ Richter, *Momentum Quarterly* 2015: 3 et seq.; Hennig 2017; Ekardt 2016a: § 1 B. III.; Moreno/ Speich Chassé/ Fuhr 2015: 13 et seq.; Ekardt 2016b). That the negotiating parties have not reached a better result in Paris bears witness of that: In Paris, the EU has pledged minus 40 percent greenhouse gas emissions by 2030 as (supra-)national climate contribution according to art. 4 para. 2 PA. This is far from the level of ambition of the EU-supported temperature limit in art. 2 PA. If Western industrialised countries had pledged significantly higher reduction targets and higher financial support of developing countries in mitigation, adaptation as well as loss and damage, clearer climate obligations for the global community would have been feasible. It is a fact that for instance the EU and Germany still account for per capita emissions of a multiple of what is climate-friendly in terms of the temperature limit. This is despite all the discussions and approaches. The achieved relative emission reductions (on an absolute high level) since 1990 are largely based on statistical euphemisms, which translate – taking the emissions of per capita consumption – into an emissions increase (to prevent repetition see again a more detailed contribution with further references in Ekardt 2016a: § 1 B. III.; Ekardt 2016b; Becker/ Richter 2015; Ekardt/ Wieding 2018). How the EU could, along with other progressive states, address fossil fuels in all sectors and within the timelines implied by art. 2 para. 1 PA (if necessary combined with border adjustments to states, which do not participate), is not shown in detail in this study to avoid repetition (see with further references Ekardt 2016a: § 6 E.; Hennig 2017; Bosnjak 2015; Ekardt 2018a; in parts also von Bredow 2013).

The political climate discourse, thus, has to part with some alleged certainties. The “2-degree target” for instance, does not exist anymore, but something substantially more ambitious. Furthermore, the policy targets, on which the national climate discourse is based, are far from the requirements of art. 2 para. 1 PA. Even if they were reached – which is currently e.g. in Germany not the case –, nothing much would be achieved. The whole political discourse in government (also in many NGOs and even scientific institutions such as the Potsdam Institute for Climate Impact Research, PIK) is therefore based on inadequate assumptions.

One obvious explanation, why (aside from complex behavioural research finding; on those Ekardt 2016a: § 2; Ekardt 2017) the scope of art. 2 para. 1 PA is neglected, will be sketched here in short, as it has been elaborated elsewhere (on this and the whole chapter Jackson 2011; Paech 2012; Ekardt 2016a: § 1 B. V.; Ekardt 2016b; Hennig 2017; Stengel 2011; Scheidler 2015). The temperature limit

of art. 2 para. 1 PA raises, if implemented seriously, the issue of compatibility with economic growth. Economic growth as basis of modern society is challenged as soon as a more frugal lifestyle becomes part of climate policy, besides improved technologies in order to achieve the ambitious targets. However, economic growth is currently crucial for central social institutions like employment, retirement funds and the banking system (more detailed in Ekardt 2016a: § 1 B V.). However, this does not change the findings on the obligations from art. 2 para. 1 PA – especially considering the devastating economic consequences of climate change.

Therefore, the legally binding Paris long-term objective requires the states to not only gradually, but also drastically increase their reductions pledges. It also forces a holistic discussion about the future of human economies and societies, which becomes unavoidable. If states currently try to achieve those rises in ambition since COP 23 of November 2017 in many small working groups – according to the Talanoa principle derived from Fijian –, hope remains that the dimension of the problem is adequately reflected. A clear obligation to do so exists.

## 6. Relevance for current and future litigation cases

As has been stated, all states including Germany and the EU have to set their own reduction commitments and increase their level of ambition as regular adjustment according to the PA. Therefore, keeping climate targets is not only preferable, but a legal obligation towards the objective of the Paris Agreement. Failing to do so is a drastic violation.

Finally, we will take a look at the consequences of these violations on current and possible future litigation cases that deal with climate change. Since political initiative was missing, different stakeholders groups have attempted to bring climate change to courts for the past years (a detailed overview is found in UNEP 2017b and Boom/ Richards/ Leonard 2017). They are not so much targeting projects which are harmful to the climate such as roads or lignite mines, as has been done in the past. The new development regards suits which either aim at compelling governments and parliaments to more committed action against climate change, or to demand complete compensation for the damages of climate change from states or energy corporations.

The subject of those suits and the variety of questions raised in different legal systems are too manifold to elaborate them in this paper (see UNEP 2017b and Boom/ Richards/ Leonard 2017 for a detailed overview and further literature). However, to conclude, we will summarise the role that art. 2 PA might play in those suits:

- Art. 2 PA is legally binding. However, because the norm does not provide an individual right to defined persons, it is not directly suable by individuals. The PA does not even provide enforcement options between states, if it is violated.
- But it is possible to sue for the enforcement of human rights. By including the precautionary principle, it also becomes suable (detailed on human rights and human rights cases, as well as to the issues following see Ekardt 2016a; Ekardt 2018a). Despite only few arguments, it is undeniable that courts in most countries are hesitant to allow using human rights enforcement against climate change.
- The PA raises chances of human rights suits. Even so contracts in international law, such as the PA, are in practice international environmental administrative law and as such lower in the legal hierarchy (further on the matter Ekardt 2016a, § 7 B.) than human rights on international, European and national level. Therefore, the PA cannot change human rights. It can

however indirectly support certain contents of human rights, even more so, as the PA itself refers to human rights in its preamble. It is almost undisputed that climate change is a threat to elementary rights which are prerequisite to freedom such as food, water etc. Art. 2 para. 1 PA is evidence that the community of nations interprets the facts in a way, which merits immediate and urgent action. This paves the way for courts to support this interpretation (which could have been derived from human rights alone).

- Furthermore, art. 2 para. 1 PA can be used to interpret national climate regulation in an ambitious sense, in order to harmonise different legal levels (systematic interpretation).
- Suits against climate-harmful projects of all sorts, such as coal power plants, can refer to art. 2 para. 1 PA in interpretation of existing climate protection requirements for given plants, and, if necessary, toughen them.
- Also in liability cases against single big energy corporations, art. 2 para. 1 PA supports the favourable interpretation of the applicable national liability law in civil law. Because the PA underlines the international consensus of scientific facts and that there is immediate call for action.

## Bibliography

The date in parenthesis marks the last access of a link (dd.mm.yyyy).

- Anderson, K./ Broderick, J. (2017): Natural Gas and Climate Change, (12.12.2017).
- Arndt, B. (2009): Das Vorsorgeprinzip in der Europäischen Union, Berlin: Duncker & Humblot.
- Bauriedl, S. (ed.) (2016): Wörterbuch Klimadebatte, Bielefeld.
- Becker, B./ Richter, C. (2015): Klimaschutz in Deutschland – Realität oder Rhetorik?, Momentum Quarterly, pp. 3-20.
- Berger, J./ Günther, D./ Hain, B. (2016): Das Übereinkommen von Paris – ein wichtiger Wegweiser für eine lebenswerte Zukunft und einen Politikwandel in Deutschland, Zeitschrift für Umweltpolitik und Umweltrecht (Sonderheft), pp. 4-12.
- Bodirsky, B./ Rolinski, S./ Biewald, A./ Weindl, I./ Popp, A./ Lotze-Campen, H. (2015): Global Food Demand Scenarios for the 21<sup>st</sup> Century, PLOS ONE, DOI:10.1371
- Boom, K./ Richards, J.-A./ Leonard, S. (2017): Climate justice. The international momentum towards climate litigation, (12.12.2017).
- Bosnjak, N. (2015): Ein Emissionshandelssystem der ersten Handelsstufe. Rechtliche, politische und ökonomische Aspekte eines Gesetzgebungsvorschlags, Marburg: Metropolis.
- von Bredow, H. (2013): Energieeffizienz als Rechts- und Steuerungsproblem. Unter besonderer Berücksichtigung der erneuerbaren Energien, Marburg: Metropolis.
- Buhofer, S. (2017): Der Klimawandel und die internationale Klimapolitik in Zahlen, München: Oekom.
- Calliess, C. (2001): Rechtsstaat und Umweltstaat, Tübingen: Mohr Siebeck.
- Canadell, P./ Le Quéré, C./ Peters, G. (2017): We can still keep global warming below 2°C – but the hard work is about to start, The Conversation, <https://theconversation.com/we-can-still-keep-global-warming-below-2-but-the-hard-work-is-about-to-start-72075>, (02.08.2017).
- Drouet, L/ Emmerling, J. (2016): Climate policy under socio-economic scenario uncertainty, Environmental Modelling & Software 79, pp. 334-342.
- Ekardt, F. (2018a): Sustainability. Transformation, Governance, Ethics, Law, Heidelberg: Springer, in print.
- Ekardt, F. (2018b): Ökonomische Bewertung – Kosten-Nutzen-Analyse – ökonomische Ethik. Eine Kritik unter besonderer Berücksichtigung von Nachhaltigkeit und Klimaschutz, Marburg: Metropolis, in print.
- Ekardt, F./ Zorn, A. (2018): Ozeanversauerung, Meeresumweltrecht, Klimavölkerrecht und die Menschenrechte, Jahrbuch des Umwelt- und Technikrechts, in print.

- Ekardt, F./ Wieding, J. (2018): The temperature target of the Paris Agreement and the forgotten aspects of a meaningful energy transition, in: Mathis, K. (ed.): Energy Law and Economics, Heidelberg: Springer, in print.
- Ekardt, F. (2017): Rezension zu Dieckhoff, Modellierter Zukunft und Dieckhoff/Leuschner, Die Energiewende und ihre Modelle, Zeitschrift für Umweltpolitik und Umweltrecht, pp. 282-285.
- Ekardt, F./ Wieding, J. (2016): Rechtlicher Aussagegehalt des Paris-Abkommen – eine Analyse der einzelnen Artikel, Zeitschrift für Umweltpolitik und Umweltrecht (Special Edition), pp. 36-57.
- Ekardt, F. (2016a): Theorie der Nachhaltigkeit. Ethische, rechtliche, politische und transformative Zugänge – am Beispiel von Klimawandel, Ressourcenknappheit und Welthandel, 3<sup>rd</sup> edition (= 2<sup>nd</sup> revised edition) Baden-Baden: Nomos.
- Ekardt, F. (2016b): Zur Verteidigung ökonomischer Politikinstrumente gegen ihre Freunde und Kritiker: Analysen des Hauptinstruments der Transformation zur Nachhaltigkeit, Momentum Quarterly, pp. 224-242.
- Ekardt, F./ Wieding, J./ Henkel, M. (2015): Climate Justice 2015 – BUNDposition, Berlin, (02.10.2017).
- Figueres, Christiana et al. (2017): Three years to safeguard our climate, Nature 546, 28.06.2017, (21.10.2017).
- Friedrich, T./ Timmermann, A./ Tigchelaar, M./ Timm, O./ Ganopolski, A. (2016): Nonlinear climate sensitivity and its implications for future greenhouse warming, Science Advances, (02.08.2017).
- Frieler, K./ Meinshausen, M./ Golly, A./ Mengel, M./ Lebek, K./ Donner, S./ Hoegh-Guldberg, O. (2013): Limiting global warming to 2°C is unlikely to save most coral reefs, Nature Climate Change 3, pp. 165-170.
- Hennig, Bettina (2017): Nachhaltige Landnutzung und Bioenergie. Ambivalenzen, Governance, Rechtsfragen, Marburg: Metropolis.
- Höhne, N./ Kuramochi, T./ Sterl, S./ Röschel, L. (2016): Was bedeutet das Pariser Abkommen für den Klimaschutz in Deutschland? New Climate Institute/ Greenpeace, Berlin.
- Hoffmann, U. (2015): Can Green Growth really Work – and what are the True (Socio-)Economics of Climate Change?, Berlin.
- IPCC (2013): Climate Change 2013. The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Cambridge, New York.
- IPCC (2014a): Climate Change 2014. Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva.

- IPCC (2014b): Climate Change 2014. Mitigation of Climate Change. Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Cambridge, New York.
- Jackson, Tim (2011): Wohlstand ohne Wachstum, München: Oekom.
- Knox, J. (2013): Report of the Independent Expert on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment, UN Doc. A/HRC/25/53, 30.12.2013.
- Knutti, R./ Rogelj, J./ Sedláček, J./ Fischer, E. (2016): A scientific critique of the two-degree climate change target, *Nature Geoscience* 9, pp. 13-18, (02.08.2017).
- Koch, Thorsten (2000): Der Grundrechtsschutz des Drittbetroffenen, Tübingen: Mohr Siebeck.
- Le Quéré, C. et al. (2016): Global Carbon Budget 2016, *Earth Syst. Sci. Data*, 8, pp. 605-649, <https://doi.org/10.5194/essd-8-605-2016>, 2016 (24.09.2017)
- Mauritsen, T./ Pincus, R. (2017): Committed warming inferred from observations, *Nature Climate Change*. 7, pp. 652–655, 31.07.2017, <http://www.nature.com/nclimate/journal/v7/n9/full/nclimate3357.html> (24.09.2017)
- Maurmann, D. (2008): Rechtsgrundsätze im Völkerrecht – am Beispiel des Vorsorgeprinzips, Baden-Baden: Nomos.
- Meßerschmidt, K. (2000): Gesetzgebungsermessen, Berlin: Verlag Arno Spitz.
- Monien, J. (2014): Prinzipien als Wegbereiter eines globalen Umweltrechts? Das Nachhaltigkeits-, Vorsorge- und Verursacherprinzip im Mehrebenensystem, Baden-Baden: Nomos.
- Moreno, C./ Speich Chassé, D./ Fuhr, L. (2015): Carbon Metrics. Global Abstractions and Ecological Epistemicide, Berlin: Heinrich Böll Stiftung, [https://www.boell.de/sites/default/files/2015-11-09\\_carbon\\_metrics.pdf](https://www.boell.de/sites/default/files/2015-11-09_carbon_metrics.pdf) (08.02.2016).
- Millar, R. et al. (2017): Emission budgets and pathways consistent with limiting warming to 1.5° C, *Nature Geoscience*, DOI: 10.1038/NGEO3031 (18.09.2017).
- Peters, G. (2017): How much carbon dioxide can we emit?, Cicero, (02.08.2017).
- Paech, N. (2012): Befreiung vom Überfluss, München: Oekom.
- Paqué, Karl-Heinz (2010): Wachstum! Die Zukunft des globalen Kapitalismus, München.
- Peters, G./ Andrew, R. M./ Karstensen, J. (2016): Global environmental footprints: A guide to estimating, interpreting and using consumption-based accounts of resource use and environmental impacts. Nordic Council of Ministers, Copenhagen, (24.09.2017)
- Peters, G. (2017): How much carbon dioxide can we emit?, CICERO, 16.03.2017, (21.10.2017).
- Piketty, T. (2015): Das Kapital im 21. Jahrhundert, Bonn: BpB.

- Raftery, A. E./ Zimmer, A./ Frierson, D.M.W./ Startz, R./ Liu, Peiran (2017): Less than 2°C warming by 2100 unlikely, *Nature Climate Change*, Vol. 7, S. 637–641 (31.07.2017). <http://www.nature.com/nclimate/journal/v7/n9/full/nclimate3352.html> (24.09.2017)
- Rahmstorf, S. (2017): Die Koalitionsgespräche und das deutsche Emissionsbudget, *Spektrum Scilogs*, 17.10.2017, (21.10.2017).
- Rahmstorf, S./ Levermann, A. (2017): 2020. The Climate Turning Point, pp. 3-5.
- Rajamani, Lavanya (2010): Rights-based Perspectives in the International Negotiations on Climate Change, *Journal of Environmental Law*, S. 391-429.
- Rogelj, J. et al. (2017): Differences between carbon budget estimates unravelled, *Nature Climate Change* 6, pp. 245-252.
- Rogelj, J. et al. (2016): Paris agreement climate proposals need a boost to keep global warming well below 2 degrees Celsius, *Nature* 534, pp. 631-639.
- Rose, S./ Richels, R./ Blanford, G./ Rutherford, T. (2017): The Paris Agreement and next steps in limiting global warming, *Climatic Change* 142, pp. 255-270.
- Scheidler, F. (2015): *Das Ende der Megamaschine. Geschichte einer scheiternden Zivilisation*, Wien: Promedia.
- Schellnhuber, H.-J. (2015): *Selbstverbrennung. Die fatale Dreiecksbeziehung zwischen Klima, Mensch und Kohlenstoff*, München: C. Bertelsmann Verlag.
- Schellnhuber, H.-J./ Rahmstorf, S./ Winkelmann, R. (2016): Why the right climate target was agreed in Paris, *Nature Climate Change* 6, pp. 649-653.
- Schmidt, G. (2007): Climate models produce projections, not probabilities. The uncertainty in climate modeling, *Bulletin of the Atomic Scientists*, (03.08.2017).
- Schmidt-Radefeldt, Roman (2000): *Ökologische Menschenrechte*, Baden-Baden: Nomos.
- Schurer, A./ Mann, M./ Hawkins, E./ Tett, S./ Hegerl, G. (2017): Importance of the pre-industrial baseline for likelihood of exceeding Paris goals, *Nature Climate Change*, <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate3345.html?foxtrotcallback=true#ref2> (01.08.2017).
- Skillington, Tracey (2012): Climate Change and the Human Rights Challenge. Extending Justice beyond the Borders of the Nation State, *International Journal of Human Rights*, pp. 1196-1212.
- Smith, P. et al. (2016): Biophysical and economic limits to negative CO<sub>2</sub> emissions, *Nature Climate Change* 6, pp. 42–50, 07.12.2015, doi:10.1038/nclimate2870 (24.09.2017).
- Steininger, K./ Meyer, L. (2017): Das Treibhausgas-Budget für Österreich, (12.12.2017).
- Stengel, O. (2011): *Suffizienz. Die Konsumgesellschaft in der ökologischen Krise*, München: Oekom.
- Storelvmo, T./ Tan, I./ Zelinka, M. (2016): Observational constraints on mixed-phase clouds imply higher climate sensitivity, *Science*, Vol. 352 Issue 6282, pp. 224-227.

- Susnjar, Davor (2010): Proportionality, Fundamental Rights and Balance of Powers, Brill: Leiden.
- Tollefson, J. (2015): Is the 2 °C world a fantasy?, Nature, (03.08.2017).
- UNEP (2016): The Emissions Gap Report 2016. United Nations Environment Programme (UNEP), Nairobi.
- UNEP (2017a): Emissions Gap Report 2017. United Nations Environment Programme (UNEP), Nairobi, (12.12.2017).
- UNEP (2017b): The Status of Climate Change Litigations. United Nations Environment Programme (UNEP), Nairobi, (12.12.2017).
- Unnerstall, Herwig (1999): Rechte zukünftiger Generationen, Würzburg: Königshausen & Neumann.
- Verheyen, Roda (2005): Climate Change Damage and International Law, Berlin and others: Springer.
- Wiebe, K. et al. (2015): Climate change impacts on agriculture in 2050 under a range of plausible socioeconomic and emissions scenarios, Environmental Research Letters, doi:10.1088/1748-9326/10/8/085010.