Ecology and Justice

Contributions from the margins

Edited by Mladen Domazet

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Acknowledgments

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Preface

For the organisation that sets up political ecology in the centre of its interest and action, intersection of ecology and justice appears to be the ideal point of departure. Volume in front of you is another milestone in the collective and institutional journey we have started in 2015 with 1st IPE Annual Conference that focused on climate justice. Since then, global climate roller coaster has changed many positions, but also abruptly accelerated. While interpretations of direction it takes are highly disputable and they vary, from images of almost unstoppable race to the bottom and therein the collapse of global ecosystem which does not have necessary conditions to recover, to glimpses of hope that are based on significant policy U-turns in some corners of the world, and which make the environmental burden of humanity lighter and lighter.

If, sticking to the signs of hope, we even dared to ignore the scientific data that more and more support scenarios of unstoppable pace of global catastrophe, we would still have concerns whether these environmental improvements would be just and fair for people across the Planet. Papers collected in this volume, demonstrating variety of manifestations of unjust distribution of environmental and social costs, clearly advocate integral approach both for Nature and for People. With clarity they show that ecology is not only mirroring social inequalities but also serves as a battleground for claiming and re-claiming justice wherever it is ignored, violated or absent, wherever it generates new losses and vulnerabilities. There are multiple layers of these battlefields, from ethical claims and political statements to voluminous scientific production and grass root resistances. However, legal system placed to protect the Planet is not yet fit to permanently ensure justice that is sometimes temporarily compensated for by political actions against variety of abusers or violators.

For justice, both for Nature and for People, to be present and protected we need a thorough deconstruction of current legal order which justifies extractivism, pollution, exclusion and enclosure of the Commons. It requires more orchestrated and disobedient action of social and political forces which can ensure justice across all geographical, sectoral and disciplinary boundaries. With papers presented here, as with our core research and policy work, IPE joins these efforts to regenerate our societies and recover our eco-systems.

Vedran Horvat
Managing Director
Institute for Political Ecology

INTRODUCTION

Re-reading the Anthropocene in Ecology and Justice

Mladen Domazet

Institute for Political Ecology, Zagreb

Part I

Introduction and overview of the book

> *The concept of progress should be anchored in the idea of catastrophe. The fact of "it going on" is the catastrophe: not what is in each case in front of us but what is in each case given.* (Walter Benjamin as cited in SUVIN 2011)

> *And obsolescence is indeed modernity's equivalent of perdition and hellfire. That is why this era's most potent invocation of damnation, passed down in an unbroken relay from Hegel and Marx to President Obama, is the malediction of being 'on the wrong side of history'.* (AMITAV GOSH, The Great Derangment)

Another volume on the combined ecological and moral global crises is needed because the Anthropocene, a techno-scientific label proposed by the specialists in Earth system sciences just after the turn of the millennium, is now an essential conceptual framework within which to decry the constraints and the potentials of contemporary natures and societies. Given the catastrophic outlook of the Anthropocene condition, the catastrophe of now rather than of distant tomorrow (cf. Walter Benjamin as cited in SUVIN 2010; 2011), to envision 'progress' researchers and authors must illuminate the interrelationship between ecology and justice. And they must do so in a way that represents both the universal connection within Humanity, and the plurality of conditions of self-realization of different human communities. The future deterministically derived from the simple reading of the Humanity-Nature clash of the Anthropocene narrative is one of ecological

collapse and increasing injustice, a non-future from the perspective of aspirations to critical rationalism and human equality, an an unacceptable future for many for whom the collapse through overexploitation and unjust subjugation are already the catastrophic conditions of the present. The current development path is leading towards the future of instability and injustice, whilst existing injustices are already ecologically irrational and disingenuous towards expressed goals of emancipation and development.

Average global warming of about 1°C since the Industrial Revolution is already overwhelming many of the world's most vulnerable peoples' resilience responses. For most of them it is not the first time they face hardships, external stresses and disturbances, but the combined effect of the environmental, economic and political aspects of climate change (the physical process behind the more popular 'warming') is stronger than the mobilization of the combined resources at their disposal to continue striving for a better life. Moreover, it is outright denying anyone under such extended duress the hope of progress, as a planned and desirable deviation from things going on as they are (SUVIN 2011). It is frustrating erstwhile ambitions. Typhoons in the Pacific have destroyed housing stock of indigenous communities; severe droughts in Africa and the Middle East have driven hunger, migration and conflict; intensified forest fires in Eurasia, the Americas and Australia are destroying livelihoods and common infrastructure; recent flash floods in the Western Balkans have left thousands of the vulnerable residents homeless (IPE 2015). Debt crisis and the flailing economic growth in the developed economies of the 'First World' are dispossessing communities of the emancipatory infrastructure and removing instruments of self-reproduction from the younger generations. According to the last IPCC report the warming (increase in the overall energy retention) of the climate system is unequivocal, and the rise in the anthropogenic greenhouse gas emissions that drives it has over the last few decades been dominantly caused by economic growth rather than population growth (IPCC 2014).

This is now evident even in the regions side-lined to the core of global capitalist world-system, the highly developed but comparatively poor semiperiphery, Second World or *Zweite Welt*. Due to its relatively recent, and perhaps thus less entrenched, inclusion into the growth ideology that replaced the ideology of progress (WHW, 2011) it may still offer a different perspective on the inevitability of the global climate catastrophe. In a human world-system, a set of intersocietal networks in which material flow and cultural interactions (economy, conflict, migration, culture etc.) are important for the reproduction of the internal structures of the components that the system consists of, it is possible to distinguish gradients between core and periphery based on those flows (WALLERSTEIN 1979). Semiperiphery

is an intermediate location in an intersocietal core-periphery structure, and was added as a further category to Wallerstein's original world systems structure by Chase-Dunn and Hall (1997). These societies mix both core and peripheral forms of organization and humans-nature interaction; and have a transformative potential to influence the core regions in the way that peripheral regions alone do not (DOMAZET and MARINOVIĆ JEROLIMOV, 2014; DOMAZET and ANČIĆ, 2017). Likewise, *Zweite Welt* is a space of possible 'cognitive estrangement' whose explorations of the familiar themes can lead to a new perspective on what is given and what is constructed in the narrative of human development. The texts in this book initiate that step, even when they talk of the well-known facets of the current predicament.

The predicament of all the regions of the world-system is the seemingly inescapable paradox of the Anthropocene (STEFFEN et al. 2011), with global climate change as its most iconic phenomenon. The paradox, a statement seemingly strikingly implausible, but which in fact conveys an important truth, is that the seeds sown by the generation and continuous improvement of new useful knowledge (scientific and technological) (MOKYR, 2017) have grown into a geological moment when planetary constraints start to almost instantaneously undermine all the achievements of that useful knowledge. To respect the planetary constraints humans seem to have to give up on the centuries of 'development' that allowed them a broader realization of their aspirations, to willingly 'dumb down', or face the unjust and calamitous disintegration of the natural systems they overwhelmingly rely on. If the technological proliferation in the West, that eventually stands behind most of the contemporary development even in the sphere of pure inter-personal relations, was made possible by the changing attitudes to the natural world and the support for institutions that stimulated diffusion of useful knowledge, is also the main driver (via economic growth) of the catastrophic climate change in this century; how can we hope to have the benefits of one without the downsides of the other?

The contributions to this volume elaborate at greater length how the paradoxical situation might have arisen or how its key ontological categorisations might have shaped it as a paradox. In **Greening the Juggernaut** Daniel Hausknost shows how the key structures of the modern state, an institution also created through useful knowledge, are preventing the necessary transformation of their communities' interaction with the environment. Whilst in the core industrialised societies institutions that attend to environmental management and conservation have become the legitimate segment of state activity, he questions whether today's environmental state is able to deal with fundamental sustainability problems like climate change and biophysical limits to economic growth. He argues that there is a structural 'glass ceiling' of environmental transformation that inhibits

the emergence of a more profoundly ecological state that would be able to do so. This is because of the necessary connection between the emergence of the growth imperative as the legitimation imperative of the state, and the expansion of the fossil energy system of the industrial era. A full democratisation under such legitimation imperative was possible only at a high level of fossil energy affluence. The paradox is eventually reached via the fact that any serious 'sustainability imperative' (a desire to slow or halt the climate catastrophe, for example) would be incompatible with the existing structure of state imperatives, which is functionally dependent on an unsustainable energy system.

In **Part II** of this **Introduction** I go on to elucidate how a different ontology of the Anthropocene predicament, alongside the alternative retelling of the development narrative, can point out the nodes of the current energy-society nexus which are not necessary (though are well entrenched) for the connection between the emancipation provided by investigation, manipulation and exploitation of natural phenomena and regularities, and the present world with a higher risk of catastrophes, diminishing ice cover, higher sea-level and chaotic weather. This part also introduces political ecology, the covering narrative framework of the entire book, as a combination of ecology and political economy applied to relations between humans and natural systems. A review of different framings of the present condition of injustice and imbalance in the material cycles of the living planet, presents the explication of political economic factors behind destruction of natures, questions epistemological processes behind conceptual frameworks used to describe the humans-in-nature, and exposes which ontological constructs necessitate the paradoxical, rather than merely problematic, nature of the Anthropocene.

Connecting to alternative narratives of how the crises could have gotten this far given the rapid expansion of the knowledge of nature and human-nature interaction from early modernity to today, knowledge that portrayed different natures' responses to interventions, as well as the possibility for their manipulation, Marija Brajdić Vuković presents disciplinary differences among young scientists in Croatia along the lines of climate change concern. In **Climate change concern, anthropocentric worldview and the techno-scientific context of young researchers** she shows that technical and biotechnical researchers differ significantly from those in other disciplines (including such 'innumerate' researchers as the ones in humanities) and the general public of the same age. As a disciplinary group they exhibit lower concern over climate change and greater trust in techno-optimism to provide the 'solution' to the climate change part of the Anthropocene paradox. As there is no reason to assume special case for the Croatian young researchers (under the age of 45), and given their

comparatively high level of global collaboration, this is a worrying finding for the overall role of sciences in informing the content and instrumental value of 'useful knowledge' on the most important physical aspect of the Anthropocene.

This is especially important given the role of engineers and bioengineers in shaping the use and production of techno-scientific artefacts which to a large extent mediate and often lock-in our interaction with the non-human world. In light of Bonneuil and Fressoz's (2016) exposition of the *Agnotocene*, the deliberate sidelineing of scientific warnings about future climate change, Brajdić Vuković's analysis of anthropo- vs. eco- centeredness of different scientists' value-sets is an indicative opening into the cognitive and social structures behind particular scientific cultures' paralysis in the paradox situation. Overall, this is a research where the semiperipheral position is relied on to sharpen instructive divisions out of which to reconstruct the paradox-smashing ontology for the Anthropocene narrative, and she includes recommendations for education policy in this respect.

On top of the scientific, materialist story of what is happening to the humans and the planet, and how the history of modernity may have reached this state, there is a contemporary justice-oriented relationship between different peoples of the world. In reaching the international political agreement to guide future action to avoid catastrophic climate change and allow the aspirations to increased wellbeing and the maintenance of the established social institutions, a compromise was found through the principle of common but differentiated responsibilities. Melita Carević, in **The principle of common but differentiated responsibilities and its transformation in the Paris Agreement** analyses the transformation that the principle went through from the early 1990's and the foundation of the global climate change regime under the UNFCCC, until the 21st Conference of the Parties to the UNFCCC (COP21), which resulted in the adoption of the *Paris Agreement*. The principle was an initial recognition of different historic and current responsibilities for carbon air-pollution of different nation states, and the differing economic capabilities to engage with climate change mitigation and adaptation between the 'First World' and 'Third World' blocs. But the principle itself became unsuitable within a few decades when some gigantic emerging economies became the biggest greenhouse gas emitters. A new balance of the principle of common but differentiated responsibilities had to be struck and Carević shows that the current Agreement contains a more nuanced form of differentiation in favour of developing countries, the 'Second' and the 'Third' worlds of today.

Pinija Poljaković and Karin Doolan take a direct step further, reporting on the research conducted with the Kenyan civil society organisations concerning global climate (in)justice, in **'Punished for a crime you did**

not commit': climate (in)justice as understood by Kenyan civil society representatives. As researchers strongly connected to the European semiperiphery, Poljaković and Doolan take an empirical look into how people working on climate change issues in Kenyan civil society organisations understand climate justice, whilst explicitly admitting both their own climate justice agenda and the political aspects of their research. By doing that they set out from the clear and firm foundations in sociology, but use the tools that allow them to merge with the broader instrumental toolbox of political ecology, and be understood across disciplines when addressing the part of the bigger question: what is the speaking, representative Humanity in the Anthropocene like. By turning their research lens onto culture and economy distant and in many aspects different from their own, they are honest about the value of 'the ethic of otherness' and the importance of listening to the concerns of those soonest affected by global climate injustice. Instructively for the readers of developed European core and semiperiphery alike, Poljaković and Doolan find that Kenyan interviewees recognise that vulnerability to climate change cannot just be reduced to the Global North-Global South dichotomy, but rather that there are vulnerable communities within each. As a contribution to an edited volume this text provides yet another empirical reason to turn hitherto *alternative* social imaginary of global climate justice into the *dominant* social imaginary for the world-ecology (MOORE, 2015).

Finally, Drago Župarić-Iljić shows how the vulnerable communities of Western Balkans, thus right on the doorstep of the Global North and European core region, have responded through migration to the catastrophic flash floods of May 2014. In **Environmental change and involuntary migration: environmental vulnerability and displacement caused by the 2014 flooding in South-Eastern Europe** he acknowledges the complex connections between environmental change and the proximal economic, social, political and demographic causes of contemporary migration of whole human populations. Župarić-Iljić uses the case of the May 2014 floods to untangle the connections between the ultimate environmental and the proximal social causes, and their role in migration as one of the forms of coping with overwhelming external pressures. He also acknowledges that environmental change does not affect different states and different segments of the population within the same state in the same way, and looks for overlaps between environmental and socioeconomic vulnerabilities. In that he provides further empirical foundation for the ontological shift required of political ecology to frame the human-nature interactions in a way that allows the perspective of dissolution of the paradox of the Anthropocene.

Part II

> *There is already an official narrative of the Anthropocene: 'we', the human species, unconsciously destroyed nature to the point of hijacking the Earth system into a new geological epoch. In the late twentieth century, a handful of Earth system scientists finally opened our eyes. So now we know; now we are aware of the global consequences of human action.* (C. BONNEUIL and J-P. FRESSOZ, The Shock of the Anthropocene)

> *Concepts that have proven useful in ordering things easily achieve such an authority over us that we forget their earthly origins and accept them as unalterable givens. Thus they come to be stamped as "necessities of thought," "a priori givens," etc. The path of scientific advance is often made impassable for a long time through such errors. For that reason, it is by no means an idle game if we become practiced in analyzing the long commonplace concepts and exhibiting those circumstances upon which their justification and usefulness depend, how they have grown up, individually, out of the givens of experience. By this means, their all-too-great authority will be broken.* (A. Einstein 1916, p. 102; as cited in HOWARD 2004)

Explanation and the Anthropocene

Back in 1987, Blaikie and Brookfield (1987) marked out 'political ecology' as an intellectual approach, a knowledge-construction and refinement activity, that combines the research methods and knowledge from scientific disciplines of ecology and political economy to address the relations between society (i.e. humans) and land-based resources (i.e. nature). But it was also concerned, more broadly than the standard human ecology might have done, with the relations and norms they rest on (including moral ones, i.e. (in)justice) between social groups and classes with regards to their differing access to and use of those resources. Many people in different intellectual endeavours work on these matters without committing themselves to a formally established discipline of Political Ecology, and indeed these practitioners do not expend great effort to determine what the orthodoxy of the field is. Robbins perceives them as practitioners within a community that does not insist on a single Theory or Method, but share a lot of conceptual tools which are well rooted in research practices around the globe (ROBBINS, 2012). Those of commons research (as institutions), materialism and associated Marxism (surplus and accumulation), feminist development,

environmental history, post-colonial studies and sciences studies are to greater or lesser degree reflected in the contributions to this volume.

Yet there is so much subsistence, control, learning, conflict and contraction and expansion of various kinds going on in the everyday interactions between 7+ billion humans and the global biosphere, and between those 7+ billion humans themselves (with consequences for the biosphere), that a new way of putting some of that interaction into one sentence is needed. A way of conceptualizing and explaining the outcomes end possibilities resulting from multi-scale analyses, social differentiations, material cycles and metabolisms, and power flows. Not a new theory or method, but a provisional name and discourse for a field so broad that "it seems easier to say what it is, than what it is not" (BLAIKIE, 2008, p. 766). Political ecology could do worse than to try to construct this based on the experience of paradigmatic unifications in material sciences the modern era, a systematic grasp of the essential transformations behind the Anthropocene condition through generalization of the utmost necessities of the change process and the sketches of the essential ontology behind them. For our basic stories, need people and things undergoing change; a change that is unexpected and reveals more about the things and actors than was known before (GOTTSCHALL 2012).

In the history of scientific practice, as rational exploration of natures in search for the refinement of 'useful knowledge', an impasse that arises from paradoxical situations can be overcome through deliberate paradigm change. The paradigm change can come about from a construction of a new, or substantially refined old, model causal-mechanical relations between well-defined basic ontological categories. How things that there are, things that are the essential make-up of the experienced phenomena, lawfully interact with each other and wider boundary conditions to produce the phenomena experienced. But a more challenging paradigm change is required when for various reasons no such model, or model-refinement, is forthcoming. These are principle-based explanatory narratives that maintain minimal and vague implicit ontological categories, but focus on the articulation of self-evident principles constraining changes observed in the phenomena. In such cases the model of causal-mechanical relations does not exist, and is only to be refined at a later stage of explanatory deepening and unification with a broader range of phenomena.

Bub (2000) summarises the difference between the causal-mechanical model and a principle generalization in the following way. The causal-mechanical model begins with certain hypothetical elements, the elementary entities in terms of which it attempts to construct models of more complex processes representing the phenomena that we directly observe. The fundamental problem for such an explanatory framing is how to synthesize

the broad complexity of the phenomena (and the different experiences of them) out of the hypothesized fundamental entities, i.e. how to reduce the complex phenomena to the properties and interactions of those entities. The starting point of a principle-generalization, on the other hand, is a set of empirical 'laws' or principles which summarise the basics of the unexceptionable generalizations of the experienced phenomena. The fundamental task for such explanations is to derive a set of formally expressed necessary conditions or constraints on possible phenomena, which can be seen as fundamental laws behind the observed empirical generalizations. It aims to explain what the world must be like, what the necessary constraints on all possibilities must be, if certain generalizations are to be recognised as fundamental universal constraints on human interactions with nature and other humans. The fundamentals of ecology and justice.

The story of how we got here contains different ontological categories to make a model depending on whether it is told from the explanation of 'uneven and combined development' (cf. ANIEVAS and NISANCIOGLU 2015), ecohistory (cf. POMMERANZ 2009), material and energy flow accounts (cf. FISCHER-KOWALSKI and HABERL 2007), World Systems Theory (WALLERSTEIN 1974), political Marxism (cf. BRENNER 1977), postcolonial studies (cf. MARTIN 2013; MARTINEZ-ALIER 2002) and the like. These are all self-standing theoretical schools aof thought, with their own constructive ontological models. A unifying principle-based explanatory narrative should point to a 'connecting thread' through historical epochs and socio-geographic contingencies in order to point out what changes dramatically at the onset of the Anthropocene.

The comprehensive historical narratives of the sedentary civilisation development-path can be connected through the basic ontological categories implicit in their accounts of historical changes: (1) technological mechanisms of energy conversions, (2) social structures of distribution of the said energy and maintenance of the technological mechanisms, and (3) the governance strategies that supervise and project-in-time the energy conversion technology. Technological mechanisms of energy conversions (1) include all the 'mechanisms' that turn solar energy into human homeostasis, such as human digestion, food-gathering, cooperative hunt, agriculture or hydroelectric generator. They are broad, complex and deliberately vague. Likewise, social structures (2) and governance strategies (3) are vague, but cover the organisation of a cooperative hunt and its preparation (the community that supports the actual hunters), agricultural labour and its preparation, accumulation of social surpluses as resilience against natural yield oscillations, education for productive employment and, crucially, institutions and narrative justifications for employing particular technologies and distribution.

These structures make up the time-protracted processes of the 'useful knowledge' expansion, 'development', and 'self-perpetuating growth' of

modernity along the same principled constrictions, not the actual societies and civilisations embodying the contemporary state of the human-nature interactions at any given time. But again, this *Meccano*-style modelling is important here only to indicate that the potential for overall global equilibrium-restoration is not just through the modification in one of the components 1-3, as the present predicament has evolved through contingent changes in each of the components. With rise in population and material wellbeing, energy available for technologically-feasible conversion for human needs was always everywhere externally constrained as a given. Within very recent history, which is most relevant for the Anthropocene narrative of Great Acceleration (SPETH 2008), gambles on technological change (component 1), and imperatives of growth and strategies of control over future energy access (interaction of components 1 and 3) have dominated in order to make the unpalatable deep social structural change (component 2) unnecessary even in the nominally socialist societies (WEINER 2009).

Our most important principle insight at this stage, then, is to open up the view of the historical changes that conclude with the Anthropocene paradox, an unsustainable condition for interconnected human population of today, as an outcome of reflexive relation between any two of components 1-3, and not just a consequence in components 2 and 3 of the changes occurring in 1. Of course, historical perspective surveyed below will eventually be most concerned with the missing ingredient that remains a black-box presence, the human agency behind the changes that components 1-3 undergo. What drives the initial impetus for such change, under what conditions, and why? The search for connecting culture component, the pervasive self-perception of a lot of humans as to what they aspire to in life and how they are able to go about fulfilling those aspirations, both for natural and for social reasons, remains for the time being just denoted as Enlightenment ideal(s). That way our understanding of the condition and its option begins to rest on a listing of the necessary conditions or constraints on events that describe simply and self-evidently what the world must be like for the unwanted outcomes not to take place, rather than a game of counterfactual *what-might-have-been* if particular humans made different choices. That way we don't frame our understanding in the constructive ontology of how the paradox[1] had arisen, but an explanatory generalisation of the principles that constrain and define the desired, ecologically sound

1 I owe the use of the term 'paradox' to describe the focus of the Anthropocene critique to Oscar Krüger's research on the *Paradox of Sustainability and the Convivial Alternative*, initiated during his fellowship term at the Institute for Political Ecology in Zagreb; and to Saul Kripke's work on the 'paradox of rule following' in later Wittgenstein (*Wittgenstein on Rules and Private Language*, Cambridge MA, Harvard University Press , 1982).

and just world. This is a fiery intellectual 'friction' that has the potential to give rise to the "voice that speaks from [a disciplinarily] straddling perspective" (DOMAZET et al. 2014, p. 67) such as political ecology envisages.

The narrative of a dire predicament of the current human population under the pressures of the Anthropocene puts all the humans in the same bag, regardless of the benefits of the Great Acceleration that they did not or do not enjoy. This story, in caricature form, has the balance-preserving (and potentially vengeful) Nature as the controlling guardian, and the Humanity as the misbehaving or poorly understanding protégé or a rebellious deviant. Alternatively, the guardian is portrayed as weak and frail, a former master reduced to a withering slave through Human emancipation and ingenuity. These caricatures simplify in an attempt to better explain, for they draw on the essential features of the Humanity-Nature bivalence, and the reduction of non-human nature to either correction through constraints or a victim of humanity's unreflexive progress drive.

Several features of such a narrative are important for the kind of intellectual work that his book aims to do. When Humanity is portrayed as a unified historical and political body, we end up hiding the vast inequalities in wealth and power that characterise the contemporary 7+ billion people on the planet. Educated and well-situated few then end up speaking for all, in terms of constructing a history how we got to the present state, and what ought to be done to overcome it (DOMAZET et al. 2014). Whilst it is unrealistic to expect that the 7+ billion will ever have a simultaneous access to such a discussion, it is both fair and intellectually prudent to try to include more than one possible perspective into it. To some extent everything a person does affects everyone else, though to a rapidly negligent degree outside one's immediate community. The standard narrative of the atmosphere as a global commons into which the excess CO_2 produced in energy generation of contemporary existence is dumped, is a good case in point. Though your recent drive to the organic food market is not one of the *causes* of the climate catastrophe, along with many other such daily activities it contributes to it.

All those affected by my contemporary contribution to the global CO_2 emissions cannot feasibly have a voice in my immediate energy consumption decisions, but bearing in mind that asymptotically they are connected to those decisions through both historical precedents and future awareness of the climate change effect of carbon has a bearing on my immediate choices and longer strategies. In the same sense, we needn't pretend that simply stating that there is no unified Humanity, a 'We' that drives the Anthropocene global processes and has the power to implement changes (DOMAZET et al. 2014), in itself gives a democratic power to the 50% of present human population with as much wealth as the 8 richest men (for they

are all men) in the world (OXFAM 2017). What it does is open an intellectual perspective upon which understanding of the aspiration, expectations and experiences of those 50%, or any other subset of human population with more or less power might be included.

In other words, whilst ontological replacements (or mere expansions) of categories in an explanatory narrative, do not in themselves and immediately present a 'more truthful' model of how things are in the world, they allow for an understanding of the present (theory-mediated[2]) experience that has greater potential of approaching such verisimilitude in further abstraction. Put simply, ontological exercise has a potential to be a better model simply because it includes some essential categorical features that the simple Humanity-Nature bivalence lacks. Historically, including the political and social struggles taking place to reach the present status of both development and environmental devastation, points to the contingent choices that led to the present perplexing state. It opens the space for a debate as to which contingencies can be abandoned in the future, and which must be kept, in order to change the status quo into a more desirable one. More desirable according to more human groups and not just the most dominant vision of Humanity as uniquely emancipated over the last 500 years of (predominantly) European history.

Changing the concept of Nature into a better understanding of natures that are always, and always have been, a part of human-described world-ecologies of greater or lesser spatial extent, plays the same intellectual role. Understanding that nature is neither a corrective guardian who will teleologically take matters into 'its own hands' now that Humanity has 'messed up', nor a passive victim that will simply shuffle off the world stage now that Humanity 'has beaten it'; will also allow us to both view the history of global world-ecology as one of trials and errors, as well as to strategize the possible futures with a better understanding of human-environment interactions. We end up with a picture of more than one possible community in even more possible interactions with an environment shaped by previous interactions and likely to respond in a limited range of ways to the

2 Theory-mediated here, as we are talking of the description of the planetary system and its sustainability, which for most of us falls beyond the immediate everyday experience and is a part of some theory-laden understanding of how things are in the world built on the aggregation of vast quantities of immediate experiences and data records. Whilst we are sometimes stunned by extreme weather events, sudden weather pattern changes or difference between immediate experience of a biotope and our memory of it from several decades past ("There used to be much more birds here!"), climate change and Anthropocene are not directly experienced in their complex totality.

projected future ones. Abstraction by way of persistent necessary ontology, albeit vaguely denoted, allows for a focus on essential conceptual categories in which to express the principles constraining scope of historical changes. Principles as self-evident generalizations uniting histories, material circulation through a diversity of biotopes, and economic activities within the global world-system.

Crisis is often defined in texts of this type as a period of instability leading to a correction and a more stable state in the future. A period of learning, or of replacement of the weakest links. Whilst it can theoretically lead to a total shutdown, perhaps in the form of a collapse (DIAMOND 2005), it is more standardly retrospectively framed as a bottleneck out which lessons were drawn, and upon which improvements were implemented. But the overuse of the term for a situation in the present, especially in various discursive practices of the last decades (crises of fossil fuels, real-socialist economies, global capitalist economy, Asian tiger economies, democracy in the West, environment in China, development etc.) also invokes the feeling of a dire dead-end and apolitical disempowerment. It would all be well, and something could be done, if we weren't in a crisis. Within the contemporary scientistic reading of the world, establishment of a crisis then often leads to invocation of apolitical technocratic strategies that only technical experts trained in the disciplines in which the root of the crisis is identified (economists, hydrologists, climatologists, conservationists, political scientists) can propose and implement (MITCHELL 2002; BECK 2010). This is crisis seen as a malady which calls for a highly specialised surgeon. And to be effective in the most straightforward modern sense, the surgeon has to attempt to localise the source of the malady and to remove it.

This is an apt parable for a simplistic reading of the Anthropocene in which Humanity's propensity for broadly understood development (as an instrument of emancipation), resulted in the systemic destabilising of non-human Nature. This, in turn, is now undercutting that very development and threating to bring down the whole process. So the Anthropocene becomes a geological period, in fact a comparatively brief geological micro-epoch in which humans realize their inherent humanity (as a species group), only to see it all destroyed by non-human organic and inorganic nature which cannot coexist with humanity thus realized. A slight variation is the one in which the self-realized humanity exterminates or significantly reduces the disobedient nature, by increasingly replacing its contribution to humanity's lived experience with ingenious artefacts. An ideal outcome, and perhaps the dominant optimist hope within this caricature, is the one where ingenious humanity discovers and makes artefacts that can undo the damage that development, the self-realization of humanity, is doing to the natural world. This optimistic narrative thus enables the co-existence, a

separate one save for the planetary location within the wide galaxy and the universe, of the self-realized humans and the pre-human nature, without mutual destruction or belligerent triumph for either. Even less caricatured versions of the Anthropocene narrative have these essential characteristics.

It is worth stressing here that I do not aim to deny the political usefulness of the Anthropocene narrative. In its basic form it does warn of a specific state of Earth's history as well as the condition of most humans alive today. It is my experience from gatherings such as the Paris Climate Summit (COP21) that Anthropocene-illiterate populations often feel the climate change more than the educated global elites, simply by experiencing significant variations away from the trends on which their immediate culture is based. Likewise, with the broader environmental change, instigating localised environmental conflicts (cf. MARTINEZ-ALIER 2002). 'Climate change' is just a scientific and globally universal name for the Great Disruption (GHOSH 2016) that is widely felt, and causally connected in a scientific narrative. For a lot of people alive today, life is drastically different from what they were taught to expect based on the experience of generations before them. That is not say that all associated disruptions are experienced through the changes in weather and agricultural patterns, but even for those who recently migrated to a recent megalopolis, where weather does not have a prominent influence on their daily struggles, life is different from what they might have expected it to be in their childhood. Even for the most institutionally shielded from change, special subgroups which pride themselves on dogmatically adhering to some chosen status quo, there is what Speth (2008) calls a Great Acceleration if they ever care to look beyond their chosen confines.

That in itself is a useful warning that a discussion about development, growth, technological innovation, freedom, Humanity and Nature ought to be had. Whilst philosophically perennial, such discussion is likely strategically very important now, as there are several billion frustrated human lives here and now; knowing and understanding that their life conditions can and should have been different, but unable to reach the instruments to implement the desired change. There is also a Sixth Great Extinction underway, drastically reducing the biodiversity of the contemporary organic non-human nature with which the present human species has evolved. And conditions for a dramatic and sudden climate change are in place. But the fact that there is a measureable change noticeable in the lives of many people, does not in itself verify the narrative of Anthropocene as a viciously circular battle between essential dispositions of Humanity and Nature. Let's briefly review how such narrative is constructed, and evaluate why it has such broad appeal.

Deterministic evolution of a paradox?

The geologically motivated narrative, most famously presented in the systemic and planet-encompassing breach of constraints of naturally non-renewable resources (such as phosphorus) or a imbalance in long-term stable circulation of specific elements (such as carbon, cf. ROSTON 2009) by Rockström and colleagues (2009), and famously termed as the new era of functioning of different ecosystems and associated transport and circulation of matter, the Anthopocene (STEFFEN, CRUTZEN and MCNEILL 2007; STEFFEN et al. 2011; ZALASIEWICZ, STEFFEN and CRUTZEN 2012); states that after eons of very gradual change many a rapid change is occurring in a geological eyeblink. And this change is driven by activities integral to overall development and maintenance of existence of the human species (with all the inequalities inherent in the development levels, appropriation and commodification of everything). Up to 50% of the Earth's land surface is now exploited by humans (thus not intact and left to non-human Nature), over 50% of planetary freshwater is used by humans, over 25% of natural 'fish' production also. Energy use by humans has increased by more than 10-fold in just the last 100 years (FISCHER-KOWALSKI, KRAUSMANN and PALLUA 2014), more artificially produced nitrogen is put into agricultural production than is appropriated naturally by all other terrestrial Nature (ZALASIEWICZ et al. 2010). It is not unheard of in the history of the planet that a particular species or genus of organisms has become so intertwined with other biophysical circulation so as to change the geological eras of the entire planet (ROSTON 2009), but the intensity of change in a short period of time and the scale of the impact make this a "remarkable episode in the history of the planet" (ZALASIEWICZ et al. 2010, p. 2231).

But most importantly, the elements of this narrative point to the significant and sudden change within human historical timeframe, where the biophysical conditions have been comparatively stable, allowing most human historical activities to take the place against the "background of a wholistic [sic], organicist cycle that the human might perturb but with which it can remain in balance and harmony, in the end, by simply withdrawing from certain excesses" (WARK 2015, Preface). A rupture in the Humanity – Nature interaction will now damage Humanity itself, after Nature undergoes mostly physically deterministic changes as consequence of this rupture. This rapture is primarily evident from the geologically sudden change in the number of humans, and the appropriation of materials and production of effectively non-recyclable waste in a geologically short time period. Whilst fossil records show the radical changes of the past happening over millions of years, the contemporary change seems to take just about 150 years. Even in Marxian thought this is labelled as a metabolic rift, a

Human-induced break in the Nature's cycles of molecular flows with clear intent at Human development or at least self-maintenance (or reproduction in historic terms) (FOSTER 2000; but see also MOORE 2015 for a slightly different reading of metabolism and rift).

But the breaking of the cycles is worrying for the very maintenance and reproduction of Humanity, as most of the materials used for it are not created but extracted, removed from their role in Nature's cycles. Even the fossil fuels, as carbon stored for tens of millions of years outside of the short-term cycles of contemporary ecosystems, cannot just be taken out of their remote storage and utilised into nothingness but for useful work. Through combustion they are converted to additional carbon dioxide for the already existing carbon cycle operating in Nature. Humanity does not produce even the basics such as water, nor is any food produced without water. As Capra and Mattei (2015: 53) point out, "[the] control and accumulation of [materials] for future consumption was and remains a key element of political tension and the principal motivation for human institutional development". What is more, over the last 150 years we have reacted to the consequences of rifts by endeavouring to recreate the missing stages in the cycle (for example, the nitrates from the soil) by artificial/industrial processes "causing further metabolic rifts elsewhere" (WARK 2015, Preface). The Anthropocene and its iconic global upswing curves is just a recognition of the global accumulation and reach of metabolic rifts for which there is now no industrial remedy without upset of the overall Humanity.

In a standard Anthropocene narrative this new situation came about from a noble desire of some human elites to dedicate themselves to bettering their (material) lot through careful observation and imitation of nature, which effectively suffused throughout all of Humanity: a dedication to construction and application of "useful knowledge" to beget more useful knowledge (MOKYR 2017). These were the early modern European natural philosophers, rooted in the European elite culture which underwent a rapid and radical intellectual change from striving to reconstruct past greatness (the classical Ancient civilisation) to commitment to improving immediate future through newly constructed empirical understanding. Even though it is easy to immediately spot the Euro-centeredness, appeasement of colonialism and straightforward pessimistic Malthusianism of this narrative, what concerns us here is the near-inevitability of its central tenets for the contemporary existence of Humanity. Whilst, on a purely material level, Humanity, as some abstract collection of humans alive round about now, could exist without the excesses of contemporary social metabolism (the private jets, the tropical ski-slopes), very few would willingly assent to give up the water toilets, gas cookers or smartphones. Those who do not have them now (and this is a large part of Humanity) are dedicated to ob-

taining them in the near future, or would be dedicated to that goal given a chance. The genie (of growth) is out of the bottle and much of its offerings are seemingly out there for the taking, with payment postponed or transferred to very distant cousins.

With slight rephrasing Mokyr (2017) can be seen as saying that Humanity's appropriation from Nature grows largely because its collective knowledge about Nature's resources, and the associated cyclical processes these resources are involved in, increases and can be used to extract these resources for human wants or patching up of established metabolic rifts (cf. artificial fertilizers, large scale irrigation projects). Mokyr maintains that the only historical situation where technological construction based on this knowledge and associated cultural beliefs became "sustained and self-propelling to the point of becoming explosive and changing the material basis of human existence more thoroughly and more rapidly than anything before in the history of humans on this planet" (2017, Epilogue) was the Western (European) Industrial Revolution. Previous technological improvements have led to leaps which then remained stable for a long time, without further self-propelling growth. And the major cultural change he sees behind this material shift and its consequent global follow-ups is the Enlightenment and its implications for technological innovation. Historians and anthropologists may see many faults with a fairy-tale narrative of Enlightenment and universal emancipation, from forceful inclusion into the world-economy in lieu of civilisation, to blind Faustian dedication to artificial control of material flows without proper consideration of long-term consequences. But again, as with the 'useful knowledge' above, now that the genie is out of the bottle the desire to 'return' to small agricultural subsistence communities without recourse to modern artefacts is not widespread, and its rejection is largely based on invocation of the emancipation potential inherent in the Enlightenment thought.

By that I mean Pagden's (2013) contention that critical rationalism as base of science and technology of Industrial Revolution, is a consequence of the cultural Enlightenment's ambition to create a historically grounded, as opposed to dogmatically accepted, understanding of world-ecology (as system of Humanity and Nature, or at least of We and Our Environment) which leads to the universal social metabolism and cultural foundation. This universal needn't be a uniform straight-jacket, but a basic blueprint that rapidly realises the potential to make "all individuals independent, autonomous, freed from above and below, self-knowing, and dependent solely for each other for survival" (PAGDEN, 2013: 315). We could take each of these characteristics apart one by one to illustrate their associated downsides, we can doubt the historical reality of their instantiation due to subversion of the Enlightenment ideals through 'development'; but it is hard

to knock them down as entirely worthless and abhorrent altogether. They are related to the Enlightenment legacy of creating the narrative for Humanity in a conceptual framework broader than the immediate biophysical environment, our own patch of ground, immediate metabolic and interpersonal practices and kin-group.

So the standard narrative of the Anthropocene has at the root the conceptual paradox similar to the religious narratives of the fall and redemption of the imperfect and weak Humans. Self-knowledge and emancipation have inexorably lead us to an explosive accumulation of metabolic rifts, which have now reached global proportions and will undercut the very historical self-reproduction of Humanity through wiping out of most of Nature. Without external salvation, a *deus ex machina* or abundance of exoplanets on which to start over, Humanity is faced with an impossible choice between a willing collective self-mutilation and one performed on us by Nature's shut-down of the background "wholistic organicist cycles" of materialisation of incoming solar energy. There is no room on this planet for Nature to co-exist with the self-realised Humanity, and there is no way for such Humanity to exist at all without Nature. A truly global and possibly ultimate crisis, as far as We are able to tell.

A way out of the paradox is to view the Anthropocene crisis in terms different from a simple Humanity's expansion against Nature in a zero sum environment of a finite planet. Not by a partial refinement of one or all of those entities into subdivisions of winning and losing human groups, more or less resilient ecosystems and material cycles, or a redefinition of finitude of the planet along multiplication of aspects of reality (patching up of rifts with artificial substances or without a particular substance); but by retelling of the story showing the contingencies of material and cultural instantiations of the Enlightenment ideals that created the present crisis step by historical step, rather than as a geological deterministic effect of a noble cultural cause. Transformations of energy, distribution channels of that energy within human communities and human world-system, and governance institutions directing and maintaining that transformation and distribution will play an important role. We could also focus on the 500 years of vaguely European-dominated modernity through historical transformations, but against the near-frozen stability of a geological eyeblink. On such scale Nature is demoted to natures, multiple and changing voiceless participants in different human world-ecologies. This is not so as to reduce their importance in energy transformations or distribution, but to acknowledge their hitherto absence from governance institutions and deliberations.

The resulting narratives would point out to the historical invocations of damaging effects of human modifications of the environment for pur-

poses of, broadly speaking, economy. These have appeared regularly in 18th, 19th and 20th centuries within the same elites that perfected and utilised the culture of Enlightenment 'understanding of nature' and 'useful knowledge'. The specific mark of our present Anthropocene is the holistic impact of the change of the composition of the entire planet's atmosphere even from regionally localised pollution. The heat trapping molecules in the atmosphere have effectively doubled[3] and reached levels unmatched for 3 million years (BONNEUIL and FRESSOZ 2016), leading to climate change as change in cycles mainly occurring in the atmosphere (ROSTON 2009). Meanwhile the land and sea have also changed so as to become less resilient to the effects of their interaction with the climate, through biodiversity loss and the major changes to the carbon cycle between living organisms and non-living reservoirs. Cycling of other elements through the world-ecology has also been significantly altered (STEFFEN et al. 2011). But is this a deterministic outcome of the emancipation rooted in the Enlightenment?

A deterministic narrative often needs a causal-mechanical model of substances or objects in interaction in spatiotemporal isolated (closed) system, an extension of the "mechanical theory of maximum sustainable yield" (BONNEUIL and FRESSOZ 2016, following HOLLING 1973). A different perspective looks for resilience rather than maintenance of an imagined equilibrium, a sort of silent 'tragedy of change' that structurally determines the choice of what is kept and what is given up with time (FUNTOWICZ and RAVETZ 1990; POLIMENI et al. 2008). It informs of what has changed or could have changed, under the constraints imposed by general limiting principles and coarse ontological structure. Did expanding natural science and variety of existence then straightforwardly bring all humans of today and tomorrow to the impossible choice of regression or extinction? As Bonneuil and Fressoz (2016, Chapter 3) show scaling in and out through historical epochs can greatly alter the mechanical elements that make up such a deterministic narrative, proposing different initial and final stages of the Great Acceleration, and thus altering the narrative. A choice of key determinants thus becomes partly provisional, and the outcomes of a selected cultural or even essentially human impetus no longer necessary. Self-destruction or neo-colonialism no longer need to be historical outcomes of desire for emancipation and empirical understanding.

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3 A gross oversimplification of the complex interplay of various greenhouse gases and changes in their concenration in the atmsophere, but one that can serve the purpose here. Whilst CO2 concentration is primarily tracked, the interppay with the increase of more potent heat-trapping gases such as methane and nitrous oxide, brings us to the doubling effect statement.

The alternative narratives of how the Anthropocene crisis came about are then staged through conflicts, a struggle for redefinition of governance institutions, within subset of the aggregated humanity, and often within the very narrow band of humans with education and emancipation to engage in strategies of justice and change. Far from setting all humans on the course of necessary contribution to total destruction or self-imposed isolation and solitary perdition, the Enlightenment ideals have through the modern era contributed to opposition and possibly a slow-down of culturally assured destruction. We could review the narrative of conflicts across the planet resulting from colonial expansion and enforcement of monocultures, movements of materials through laissez-faire global trade, privatization of the commons, explosion of combustion and pollutant chemical industry, urbanization and transport intrusion, for a non-linear path to the current crisis (BONNEUIL and FRESSOZ 2016). But more importantly, such narrative would not see the Anthropocene as concluding in irresolvable paradox, but as a spectrum of possible futures contingent on the lessons and scars from the preceding conflicts.

The very same humans capable of learning and aspiring to improve some aspects of their existence (from health to heat), have also fought to limit or extinguish pollution, materially wasteful technological innovations, impositions of exhausting work-rhythms, destruction of ancient and mature ecosystems etc. Faced with the historical extent of this opposition and its cultural power, as vested in the popular and influential intellectuals (E. P. Thompson, K. Marx, C. Fourier, V. Hugo, Lord Byron, J. S. Mill, A. de Tocqueville, L. de Launay, E. Friedrich, J. Ruskin, M. Gandhi, A. Huxley, H. Arendt, the Frankfurt School, R. Carson to name but a few in this ungrateful form of listing; cf. BONNEUIL and FRESSOZ 2016, Ch. 11), the intriguing aspect of the Anthropocene narratives becomes not the inevitability of landing in the paradox, but the secret of victory of industrialist and 'progressive' elites accumulating the increasingly larger and larger share of the embodied energy resulting from controllable transformations of solar energy input.

A possible alternative narrative would see the modern era as the continuous process of appropriation of new cheap human labour and cheap natural input, so as to accumulate the embodied energy and use it to define the governance institutions for the further appropriation and distribution of energy through the world-ecology system. The progress based on sustained and self-propelling growth would then rest as much on the unequal ecological exchange with the 'pre-Enlightened' world, as it would on the application of useful knowledge to bettering the lot of one's own community. Unequal ecological exchange (a form of a distribution of energy) might indeed be the major explanatory tool behind both the inequalities in wealth

of contemporary capitalism and the extent of metabolic rifts on the planet created for human (not all humans', though) benefit. A rematerialized and ecologized history of capitalism as much as the history of accumulation and spread of useful knowledge and the expansion of human population: a narrative of historical Capitalocene instead of paradox of Anthropocene (MOORE 2015). This narrative would run through the historical and very much active deliberate uses of knowledge to create the worldview in which Nature is external to human existence and insensitive to extraction because of its effectively infinite complexity (BONNEUIL and FRESSOZ 2016). Some humans have worked on convincing other humans that this or that intervention will not have the feared negative impact, and have used the benefits and lock-in created by implemented technologies to strengthen that position.

Moreover, we'd see in such alterative narratives deliberate proliferation of increasing consumption of obsolescent artefacts and coerced mass-spread of formerly luxurious artefacts, with associated environmental impact (BONNEUIL and FRESSOZ 2016). Again, these processes were not blind adherence to mis-applied ideals of emancipation, but a structured replacement of access to governance through controlled distribution of energy. From the perspective of creation and maintenance of consumer society strategically well-positioned social groups use energy distribution channels to both appropriate more energy and to retain control over governance institutions by simulating participation in these institutions through appropriation of particularly fashioned embodied energy. The energy embodied in the artefact, lately an industrial product, as symbol of social status (position in energy distribution structure) satisfying the supposed inherent "avarice, or the desire of gain" (David Hume, as cited in MOKYR 2017; cf. also BONNEUIL and FRESSOZ 2016, Ch. 7).

And finally, the role of real physical conflict between groups of humans might be a part of such a narrative, with military technology taking up large segments of energy of increasingly energy-rich communities (often represented by 'the state'); thus providing the material tools for the physical control of the institutions for governance of energy distribution. War-making, and the associated maintenance of its necessary energy distribution, can be shown to take increasing amounts of the transformed solar energy as we approach the Anthropocene paradox (BONNEUIL and FRESSOZ 2016, Ch6), thus making the sudden Humanity's expansion against nature into a much older cancer eating out different parts of that very Humanity. The paradox then is the final destination of the victors, a particularly minded subgroup, not of the whole Humanity *per se*.

Carbon and Capitalism – a 100 times faster geological cycle

When viewed from an interplanetary distance, nonetheless, the central component of the Anthropocene paradox, the metabolic rift that we are most perplexed at patching, closing or replacing, is the great change in the biospheric carbon budget. With the utilisation of fossil fuels for energy generation behind human activities, carbon from past living organisms, extracted from the atmosphere tens of millions of years ago, is returned to the atmosphere through burning of fossil fuels. Once in the atmosphere as carbon dioxide, the hitherto fossil carbon adds to the heat trapping effect of the atmosphere, resulting in a different energy balance and ocean acidity. A standard narrative sees this as a deterministic consequence of discovering the chemical structures behind 'useful-energy-generating' controllable processes, mainly through oxidation[4] of carbon to generate heat. Whilst a lot of further technical innovation was needed to place the oxidation process into a continuous stream of useful mechanical energy, once the available energy per unit mass of fuel of refined fossilised carbon sources was discovered, it was just inevitable we'd burn it on a large scale and bind the world-ecology into the present paradoxical twist (cf. ROSTON 2009).

But of course, discoveries seldom happen totally accidentally, and even when they do, they still must struggle to find an application. Especially as explosive an application as burning of fossil fuels has been from the geological perspective. 300 years ago most fossil fuels were just geological solid or liquid sediments, an inert part of the non-living Nature 300 million years old. Today 80% of what Humans do is powered by the transformation of fossilised carbon into atmospheric carbon dioxide. Levels of atmospheric carbon dioxide have increased by 40% as a result. A more refined deterministic account sees the Anthropocene as a consequence of nascent British industry seeking energy sources to mass produce objects that the growing population was in short supply of. They had the machines and the materials, but no energy to drive the machines. Fossilised carbon supposedly offered this energy. As Malm (2016) elucidates, this is another simplification hidden in the Anthropocene narrative. The nascent British industry was well provided with abundant energy to move machines from harnessing the flow of water and human labour. The river-water energy, energy of the water's flow under gravity, was to begin with cheaper and more available, according to Malm, than the subsurface carbon deposits. According to Malm, it

4 More properly, redox reactions of reduction and oxidation. But that need not concern us here. Combining oxygen from the atmosphere with carbon from fossilised or contemporary biomass, provides an energy transformation which humans can utilise for novel purposes in the world-ecology.

wasn't the energy 'quality' of fossil carbon deposits that pushed the British industrialists to develop exploitation and distribution infrastructure for fossil fuels, but the "incongruity between [the geographical fixedness of the water energy] and certain social relations" (MALM 2016, p. 256).

Malm shows that the characteristics of capitalist organisation of the economy, a particular arrangement of the energy distribution structure and the governance institutions to manage the energy transformation and distribution, were the dominant driver of shift from water to coal in the early industrial period. The reliance on water energy and its specific spatial distribution required the implementation of governance institutions and distribution structures inimical to capitalist profit acceleration, i.e. the institutions of workers' collective bargaining power and strong political representation. Cooperation between different factories was also a necessary component of the use of water energy, but one that was inimical to capitalism's essential drive for competition. That is not to say that all of the Anthropocene expansion of Humanity against Nature could have been replaced by the water energy, had only the owners of capital been a bit more accommodating, but that the Anthropocene expansion may not have happened the way it did, had we organised our production around different energy transformations and their associated distribution and governance aspects. It is also not to claim that overuse of the water energy would not have resulted in its own metabolic rifts. But combined with the appropriate distribution and governance structures, this energy transformation may not have led to a present paradox. Malm claims that the modern fossil economy may not have started as such, even with some discoveries about the energy density of fossil fuels, had there been no other social, distributional and interpersonal factors favouring a push for its development against other readily available 'useful-energy' sources. Mitchell runs a similar critique of the standard narrative of transition from coal to oil (MITCHELL 2011). These social factors, not the energy-density of the fuels, have then played a crucial role in the Anthropocene paradox.

The sudden jump in fossil fuel utilisation through the 19th and 20th centuries was not driven by population growth, demanding more and more accessible energy transformations, but by the expectation of capitalist production to put out increasing quantities of a competitive product, at combined lower cost of input: energy and labour. This kind of narrative no longer presents the Enlightenment ideals of 'useful knowledge expansion' and associated emancipation, as deterministically connected with a given development-path and eventual Anthropocene paradox, but harps back to the Capitalocene age's necessary expansion of capital through continuous incorporation of cheap nature and cheap humans (labour) presented above (MOORE 2015). We come to the culmination of the alternative Anthropo-

cene narrative: a segregation within humanity of those using the profit from the expansion of useful knowledge and self-realisation was the driver of the sudden imbalance in the world-ecology, the eyeblink transformation that is the Capitalocene (MOORE 2015) or the Thermocene (BONNEUIL and FRESSOZ 2016, Ch. 5). Moreover, according to Bonneuil and Fressoz (2016) renewable and localised energy sources that once dominated the energy transformations humans relied on, were not just defeated by the superiority of fossil fuels, but have a past "rich in neglected technological paths and unrealized potentialities" (ibid. Ch. 5). In their historical (un-developed) form, they have continued to nurture and prepare many human communities for the inclusion in the more centralised and techno-scientifically mediated fossil fuel energy taps.

Alternative renewable sources have either been inherited from the pre-modern era (like the sail ships) or have been experimented with in the same 'useful knowledge' quest that is supposed to spur the self-perpetuating growth of the industrial societies. But too often they have been sidled by the political, psychological, cultural and economic power of the fossil fuel distribution and governance institutions subjugated to it. History of course is not *per se* a simpler explanation than geology and evolution of life and human species. The alternative narratives sketched here are not given as completed and automatically persuasive replacements of the standard road to the Anthropocene paradox. They open up the space to explore the details of such replacements, the very possibility of them. Instead of the narrative in which the dominance of carbon on this planet and within our own living structures necessitated the human path to self-realization (Enlightenment ideals) through the oxidation of fossil carbon landing us in the massive rupture of the natural carbon cycle stabilised over millennia of planetary co-evolution of elements and life[5]; perhaps one in which some aspects of the chosen path of self-realization have spun off into particular hold over governance institutions for energy transformation and distribution offers both an explanation for the appearance of the paradox and a possible intellectual way out of it. The paradox a as a strikingly implausible description that conveys an important truth, because of its implausibility.

In less abstract terms, where the fossil fuel infrastructure has been established it drove the expansion of production and capital, and created instruments for its own further expansion into new territories. In a territorial

5 As Malm (2016, p. 66) puts it: „What about all those generations of *Homo sapiens*, who, up to the nineteenth century, mastered both [fire, and removal and storage of metabolic waste-products] but never voided the carbon deposits of the earth and dumped them into the atmosphere? Were they shitters and burners just waiting to realise their full potentials?"

sense this means that some zones, mainly the Anglo-American (and Dutch) West, have over the centuries benefited more from the dumping of carbon into the atmosphere than those that have been late catching-up. This is one aspect of the contemporary climate injustice, mainly leading to a division between the developed and the developing countries, or between the Global North and Global South. The accumulation of carbon dioxide in the common planetary atmosphere is not a simple consequence of the drive for human self-realization, for literacy, toilets and antibiotics, but a feature of the disproportionate exertion of influence of some humans over the combined energy transformations humans mainly utilise. Heede (2014) shows that institutions that have extracted, refined and sold (thus both provided, but also profited from) the fossil fuels driving the climate change of the Anthropocene, account for nearly 2/3s of carbon dioxide emitted since 1750. These are 90 largest fossil fuel and cement producing companies, most of which still exist today. Some are investor-owned, some state-owned, but they all generate social profit on top of energy and carbon dioxide.

What is more, half of the culpable emissions of these 90 giants of self-realization have been released (and thus monetised) since 1986 – within most of our lifetimes. Some humans of today take a vastly greater benefit from the supposed unwanted side-effect of the self-realization drive than most of the rest of human population. Humanity against Nature, looks more like Them against the World-Ecology. This is why the question of justice is not just one of suffering disproportionate impacts of climate change, but also one of unfair appropriation of the Enlightenment and its technological innovation. A specific form of envisioning of energy transformations and energy distribution structures so that they remain ultimately under narrow control. It is inherently unfair that some humans lack the energy for self-realization and others trade it as surpluses, whilst the available solar energy is sufficient for everyone's nutrition, shelter and education. It would be even more unfair to ask everyone, all humans, the supposed Humanity, to sacrifice some of the available energy for the avoidance of Anthropocene threatened collapse, when such vast differences in outputs of energy transformations exist between humans. As Shue (1999, p. 543) says, if the wealthy feel no general obligation to help the poor in this situation, by our universal and almost naturalised (but also Enlightenment shaped) moral code, "the poor certainly have no general obligation to help the wealthy".

This is to say that through review of historical contingencies that led to the unsustainability of the Anthropocene condition and its negative impacts on humans alive today, who barely contributed to this condition nor enjoyed benefits from its supposed idealistic origins, we gain an understanding of its socio-ecological causes that appear less irreversible and

harmful to the aspiration for self-realization. The alternative narratives of how (some) humans brought on the Anthropocene for all humans, allow for an understanding of the condition, the supposed paradox, that enables the reversal of its damaging processes, without the retracing of actual historical steps and the abandonment of all modernity. A correction of the systemic conditions which bring the paradoxical aspects of Anthropocene as a side-effect, whilst respecting the existence of the changed conditions in which humans and natures find themselves in today. A just, and therefore acceptable to most humans, development path for the global human population and future generations would respect the rational limits of resource extraction and waste-dumping and utilise them in accord with shared commons governance (even if not practiced in actual daily execution among all 7+ billion humans and their 9 billion descendants).

Bali Principles of climate Justice (EJNET 2002) therefore recognise the "unsustainable consumption and production practices" as the root of the problem and locates them in the Global North, "but also among elites within the South". Humanity differs in the extent to which it drives climate change, even today. The Bali Principles call for, among others,

(a) leaving most of the known fossil fuels in the ground, because of their proven harmful effect on the overall commons;
(b) replacing global baseline of per capita energy production with renewable sources;
(c) abandoning wasteful material consumption (and the required production) by the majority in the Global North and the elites in the Global South;
(d) material replacement of the lost commons access (through total shrinkage of the atmospheric commons' waste absorption potential) by the dominant beneficiaries of the industrialisation and development to those expected to bear the burden of climate change impacts in the form of adaptation infrastructure and energy transformation technologies (through re-appropriation of the resources invested in military development, for example);
(e) conservation of the remaining resources in line with the practices of the communities living in long term sustainable balance with them; and
(f) food production and harvesting with maintenance of nutrient cycles (i.e. similar to family farming and fishing).

Whilst some of these principles of justice require greater research in the different options of renewable sources, and exploration of the revival of abandoned renewable technologies; if the baseline is still linked to the continuous growth aspiration further limits of the full world will soon

enough be reached. Not in a very distant future, but just around the corner. So expansion of useful knowledge divorced from the culture of growth is called for. Such expansion of useful knowledge, an intellectual transcendence of 'one's patch of ground and immediate kin' (cf. PAGDEN 2013), is not in contradiction with the principles of justice stated above. A change of the conceptual framework built around energy transformations, (social) distribution structures and collective expectations along the lines of degrowth thinking aims to combine the emancipatory ideals with the structural constrictions of energy-society dynamics.

This requires a "[decolonisation of] an imaginary dominated by a one-way future consisting only of growth. It is the automatic association of growth with better that [...degrowth] wants to dismantle" (KALLIS, DEMARIA and D'ALISA 2015, p.5). Such a conceptual reconstruction deviates from the one which strives to pinpoint which of the well-known (ontologically entrenched) elements of the explanatory construction should be turned up and which should be turned down. Degrowth does not start with a well-defined goal expressed as values that these elements should hold in the future expectations (this many schools, this much oil consumption, this many happy life years), but from the gradual delineation of the path of change of the dominant world-view by change of perspective of paradigm (KALLIS and MARCH 2015). In that it is structurally close to the principle-based explanatory endeavours, which seek to establish self-evident constraining principles within which the dynamics of the ontological elements unfolds. The fresh perspective accomplished by cognitive estrangement from the semiperipheral perspective helps us sketch out a few more details of what is given and what is constructed along the historical emancipatory path. Some of these are the ontological elements of the future path of change of the dominant world-view.

When energy transformation technologies and the social structures of energy distribution set-in and globalize, they are difficult to replace even in the conceptual imaginary. A paradoxical situation of the Anthropocene immediately seems like a logical necessity. To maintain wellbeing and expectations, we can't obtain enough energy in a different way, whilst different distribution channels would supposedly collapse the existing energy transformation technologies. Scarcity of energy becomes viewed as a techno-scientific problem, and legitimizes the status quo of the social structures and cultural expectations (from governance). But a mere scarcity at some instant of time does not warrant a self-propelled growth beyond the immediate satisfaction of the scarcity, unless the demand continuously rises; which Mokyr's invocation of "Cardwell's Law" - the empirical regularity that no society remains at the cutting edge of technological creativity for very long – attests to (MOKYR 1994). A truly subversive conceptual modifica-

tion for diffusing our paradox is to work out the relationship between the desirable expectation and biophysically bearable energy transformation technologies. But, as Malm points out (2016) scarcity does not account for continuous and self-propelled growth, nor does the culture of expansion of useful knowledge (*pace* MOKYR 2017) as it is understood by Enlightenment in a common humanity and ecosystem (PAGDEN 2013).

A particular and historically contingent social structure of distribution and future-oriented governance of 'useful energy', whose energy scarcity is repeatedly renewed through the changes in the universal input of production is human labour. "[Labour's] replacement by fossil-fuelled machinery can [be continuously called for] *if novel contradictions between labour and capital arise and call for such a resolution*" (MALM 2016, p. 264). Technological innovations in energy transformation (converting solar input into embodied energy distributed through society) are called for whenever a bottleneck in available energy for the given distribution is reached. This is then a historically recursive explanation of the growth in the European modernity. Respect for justice among common humanity, and ecological stability that provided the conditions for various forms of civilisation and maintains the aggregated humanity today, call for a different imaginary horizon. One that contains neither economic nor ecological collapse (CIFRIĆ 2014), but an inspiring vision of how to enrich life through transformation and sharing of accessible solar energy.

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CONTRIBUTIONS

Greening the Juggernaut? The modern state and the 'glass ceiling' of environmental transformation

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1. Introduction

In his essay 'The Consequences of Modernity', Anthony Giddens (1990) conjures up the image of modernity as a 'juggernaut' in the sense of 'a runaway engine of enormous power which, collectively as human beings, we can drive to some extent, but which also threatens to rush out of our control and which could rend itself asunder' (1990, p. 139).[1]

The metaphor offers an interesting starting point for a discussion of the environmental state,[2] as it points to some key properties of modern society, which constitute the backdrop of its emergence and might circumscribe its future development. Firstly, the 'autopoietic' character of modern social systems generates problems of purposive command-and-control steering which are typically felt in the field of environmental politics and policy (LUHMANN 1986) and which have led to new forms of 'environmental governance' that aim at influencing the political and economic subsystems (and concrete policy fields therein) through the inclusion of various stakeholders rather than imposing state-centred top-down regulation (WURZEL *et al.* 2013, STEURER 2013). The metaphor of juggernaut hence problematizes the notion of *societal steering*. Secondly, by depicting modernity as a 'runaway engine of enormous power' it points to the material dimension

1 The term comes from the Hindi *Jagannāth*, 'lord of the world', and is a title of Krishna. In Hindu culture, a statue of the deity is taken through the streets in an annual procession on a giant chariot weighing several tons. Once set in motion, the vehicle can barely be stopped. In British colonial times, the term *juggernaut* was incorporated into the English language to take on its figurative meaning as an unstoppable force.

2 Throughout this paper, I follow Rueschemeyer et al. (1992, p. 6) in defining the state as 'the set of organizations involved in making and implementing binding collective decisions, if necessary by force'.

of modernity and, more specifically, to the *energy* that is required to fuel that engine. Thus, modern society must be based on a specific kind of *metabolism* that constitutes its material base of power (FISCHER-KOWALSKI 1998). Thirdly, the metaphor suggests that the two dimensions (systemic autopoiesis and social metabolism) are somehow causally related – that one is the functional prerequisite of the other.

Toward the end of his essay, Giddens asks: 'How far can we [...] harness the juggernaut, or at least direct it in such a way as to minimise the dangers and maximise the opportunities which modernity offers to us?' (1990, p. 151). The emergence, over the past half century, of an 'environmental state', that is, of a type of state for which the management of environmental problems has become a core activity (MEADOWCROFT 2012, p. 67, see also CHRISTOFF 2005), can be interpreted as a systemic attempt to harness the juggernaut, to control and direct its biophysical dimension in a way that allows for its continued survival. Taking the juggernaut metaphor seriously this paper examines the nature and function of the environmental state and enquires into the possibility of its further transformation into a 'green' or 'ecological state' (BARRY and ECKERSLEY 2005), which would minimally aim at aligning all economic activity with some absolute biophysical limits or 'planetary boundaries' (ROCKSTRÖM et al. 2009, MEADOWCROFT 2013). The underlying hypothesis of my investigation is that there is some kind of structural barrier or 'glass ceiling' to environmental transformation which constitutes a boundary between the environmental state and the green state. Whereas the former is geared towards extending the lifespan of the (*per se* unsustainable) juggernaut by managing its most immediate environmental problems, the latter would aim at transforming the juggernaut into a qualitatively new type of society that is based on a sustainable social metabolism. Getting from here to there is the problem and perhaps the greatest challenge of the 21st century.

In dealing with these questions I necessarily need to pay attention to both the institutional and the biophysical dimension of the modern state and therefore choose an interdisciplinary approach. I integrate literature from political science, social ecology and comparative historical analysis into a common framework that aims to provide a better understanding of the conditions of possibility of an ecological transformation of the state.

In the next section, I review the literature on the emergence of the environmental state and identify the point where the efforts to green the juggernaut have so far reached a 'glass ceiling' that hampers ecological transformation beyond a certain point. Section three provides a descriptive account of the material dimension of modernity and the co-emergence of the modern democratic state with the fossil energy regime. Here the question is posed about the nature of the link between the high energy

metabolism of industrial modernity and the modern democratic state. In section four I provide an explanatory account of that link by presenting the analytic model of 'epistemic legitimacy'. The concluding section assesses some of the policy implications of the resulting impasse: I point to likely state responses to a worsening environmental crisis and make some suggestions as to how the 'glass ceiling' of ecological transformation might eventually be broken.

2. The modern state and the 'glass ceiling' of environmental transformation

A growing body of literature in political science is dealing with the question whether and to what extent the modern democratic state can be 'greened'. Scholars ask whether we are witnessing the emergence of an 'environmental', 'green' or 'eco-state' and what the limiting and enabling conditions of such transformations would be (e.g. DRYZEK et al. 2002, ECKERSLEY 2004, BARRY and ECKERSLEY 2005, CHRISTOFF 2005, MEADOWCROFT 2005, 2012). There is some agreement amongst scholars that in advanced industrial democracies environmental management and conservation policy has entered the core of state activity in recent decades and that environmental management today 'is recognised as a fundamental part of what a civilized state should do' (MEADOWCROFT 2012, p.67). Meadowcroft suggests that this recent transformation of the modern state can be seen as the emergence of an 'environmental state' (p.67). Furthermore, scholars tend to make a clear distinction between this real existing 'environmental state' and what they variously call the 'eco state', 'green state' or 'sustainability state' (HEINRICHS and LAWS 2014). While the former is seeking to limit (politically relevant) environmental damage and to improve (local) environmental conditions within the confines of (weak to moderate) 'ecological modernisation' (CHRISTOFF 1996), the latter would make (global) environmental sustainability a prime state imperative with the power to override other imperatives like that of economic growth when necessary. Or, to put it differently, while the environmental state is concerned with *relative* improvements to the status quo, the ecological state 'must be concerned explicitly with *keeping patterns of consumption and production within ecological limits*' (MEADOWCROFT 2005, p.12, emphasis in the original), and thus within some *absolute* (albeit politically defined and therefore socially constructed) standards.

In their analysis of the possible emergence of the green state Dryzek et al. (2002) also rely on the concept of state imperatives, which they derive from the work of Theda Skocpol (1979). 'State imperatives', they write, 'can be defined as the functions that governmental structures have to carry out to ensure their own longevity and stability' (2002, p. 662-3). The three im-

peratives of the early modern state were: 'to keep order internally, compete internationally, and raise the resources to finance these first two tasks' (p. 662). The authors then argue that this basic structure underwent two major transformations, each adding another imperative: With the rise of capitalism and its growing economic base, which enabled 'revenues to increase without any increase in rates of taxation, while simultaneously promoting social order by increasing the size of the economic pie' (p. 663) the *imperative of economic growth* (or accumulation) emerged as a new property of the modern state. In a second transformation as a reaction to the struggles of an organised working class, the welfare state emerged 'to cushion the working class against the dislocations of capitalism'. This new incarnation of the modern state had to adhere to another, fifth, imperative – what post-Marxists (e.g. Offe 1984) call the *legitimation imperative.*

Each transformation was made possible by the incorporation of a social class or movement into the state – the bourgeoisie in the liberal capitalist state and the working class in the welfare state – which could connect its 'defining interest' to the respective new state imperatives. From this analysis the authors derive two core hypotheses: (a) that a social movement can only be successful to the extent that it is able to connect its defining interests to a core imperative (p. 663); and (b) that '[t]he emergence of an environmental conservation imperative would further democratize the state by including environmentalists in the core, creating the green state' (p. 664). From these two hypotheses follows the contention that 'an emerging connection of environmental values to both economic and legitimation imperatives to constitute a green state with a conservation imperative could constitute a development on a par with two prior transformations of the modern state' (p. 679). There are three major problems with this idea of a rupture-less evolution of the contemporary (environmental) state into a green state:

(1) The social classes that triggered the previous transformations of the state did not connect their interests to pre-existing state imperatives but enforced the incorporation of their own 'defining interests' as new state imperatives. Hence, there is no direct route from existing imperatives to the creation of new ones.
(2) It is at least a matter of contention to grant the environmental movement the status of a social class, both in methodological and in historical-empirical terms.
(3) Perhaps most importantly, the logic of state imperative is a *cumulative* one: New state imperatives can only be added to the extent that they do not contradict the already existing ones. The growth imperative does not contradict internal order, external competition and revenue generation, but, quite to the contrary, furthers them; equally, the legiti-

> mation imperative of the welfare state does not contradict any of the pre-existing imperatives, but rather reinforces the growth imperative in that the state is demanding an ever larger economic pie to fulfil its welfare commitments. Consequently, the modern state would only be able to incorporate a 'conservation imperative' on top of the existing five to the extent that it does not collide with them. The consequences for the substantive meaning of such an imperative could be prohibitive and will be further discussed below.

And indeed, the authors' comparative analysis of four liberal democracies (the USA, Norway, Germany and the UK) shows clearly that the 'connection of environmental values to both economic and legitimation imperatives' has in all cases led to the emergence of 'environmental states' to different degrees, i.e. to the incorporation of *environmental management* in the core of state activity, but not to the establishment of an independent state imperative that would enable the emergence of an eco-state. The German state is depicted as having moved furthest in the direction of an eco-state; however, Heinrichs and Laws (2014) show in their recent analysis that Germany is far from turning into anything beyond a conventional environmental state. The difference between these two possibilities is not one of linear development or incremental evolution, as Dryzek *et al.* seem to suggest. Quite to the contrary, I submit, the difference between the environmental state and the eco-state means a qualitative leap which is to date being barred by a 'glass ceiling' that effectively blocks the transformation of one form of state into the other.

The origin of that glass ceiling can be found in what I called the 'cumulative' nature of state imperatives, i.e., the fact that they can only add up as long as they reinforce each other. Under these circumstances any intervention in the name of an environmental imperative 'must not disrupt the ongoing functioning of the economic and political systems' (MEADOWCROFT 2005, p.8) hitherto established. Whereas the environmental state is designed precisely to fulfil this role: to optimise production processes and to solve environmental problems that would otherwise obstruct the accumulation and legitimation processes, the eco-state would be 'likely to risk generating accumulation problems' (BARRY and ECKERSLEY 2005, p. 263) and thus, I would add, also generate legitimation problems (see section 4 on 'epistemic legitimacy'). While the environmental state has focussed on greening the 'supply side' of capitalism by seeking 'more environmentally efficient ways of expanding output' (BARRY and ECKERSLEY 2005, p. 262), the eco-state would need to tackle the 'demand side' and thus interfere with the basic structures of choice, consumer demand and distributive justice. This would require a turn away from the strategy of 'increasing the

size of the pie', and thereby shatter the classic strategy to fulfil the legitimation imperative. As Barry and Eckersley (2005, p. 262) rightly observe, '[a]ddressing the demandside of the causes of unsustainability is a challenge that no state or society has adequately even begun to address, but one that any putative green state will have to tackle'.

Employing the strategy of ecological modernisation, the environmental state to date is occupied with the task of reforming and optimising its own accumulation processes. For Martin Jänicke, ecological modernisation as 'a concept related primarily to economy and technology' constitutes 'a "forward escape" [which] is needed because the employment and welfare arrangements are directly linked to the existing production system [...]' (JÄNICKE 2009, p. 30). Thus, ecological modernisation is the strategy used by the environmental state to protect its core functional imperatives from being disrupted by environmental risks. It deepens the established patterns of modernity rather than overcoming them. That way the environmental state is oriented towards *resilience* in that it takes its motivation for environmental reform from the need to *continue* accumulation and welfare-based legitimation. And 'resilience', as Pearson and Pearson (2012, p. E2030-E2031) point out, 'is, by definition, inward-directed, centripetal, pursuing the maintenance of an existing system's identity, feedbacks, structure and function'. The green or eco-state, by contrast, would need to be oriented towards *transformation*, which 'requires accidental or deliberate outwardness' *(ibid.)* as it would have to align its activities to *absolute* biophysical constraints (where 'absolute' means socially constructed limits like the 'two degree goal' of climate change mitigation, based on biophysical reality). Meeting these constraints would have to have priority over the continuation of previously established patterns of accumulation and welfare provision. This does not mean that a green state would necessarily be in conflict with the welfare state, but that 'all forms of existing welfare state would need to radically transform' (GOUGH and MEADOWCROFT 2011, p. 501), including a move toward 'decommodified production' which would entail a radical transformation if not the end of the accumulation imperative.

We are beginning to see now that there is no smooth continuum between the environmental state and the green or eco-state, but a qualitative leap that would challenge if not shatter established state imperatives. The sustainability imperative is no logical 'add-on' to the accumulation and welfare imperatives of the modern state but its incorporation would require a fundamental redefinition of existing state functions. There seems to be no teleological ladder in the development of the modern state that warrants the rise of the green state out of the capitalist welfare state, but rather we should expect a rupture in the development of statehood inflicted by biophysical constraints of economic expansion. In order to probe more deeply

into this claim I will now sketch the material contours of modernity and deal with the politics of limits more explicitly.

3. The rise of the Juggernaut: the material foundations of modern democracy

In order to understand the material conditions of modernity it is helpful to make use of the concept of *social metabolism* as developed in the field of social and industrial ecology. I will present the concept and its implications in some detail in order to make clear how radically different industrial society is from its agrarian predecessors and what this has to do with the development of statehood and the 'glass ceiling' of environmental transformation. The term social metabolism (first coined by Karl Marx) refers to the entire flow of materials and energy that are required to sustain human activity (HABERL *et al.* 2011). In human history, several characteristic sociometabolic patterns can be distinguished, each forming a dynamic equilibrium of society-nature interaction: these are called *sociometabolic regimes* (SIEFERLE 2001, FISCHER-KOWALSKI and HABERL 2007). Three such regimes can be broadly discerned: the hunter-gatherer, agrarian and industrial regime.

The defining component of a sociometabolic regime is its *energy system.* The metabolism of all pre-industrial societies is based on solar energy systems. That of hunter-gatherer societies has been described as a *passive* solar energy system, as hunter-gatherers only make use of the biomass that grows 'naturally'. The agrarian regime, by contrast, is based on a 'controlled solar energy system' (SIEFERLE 2001) in that it monopolises area for the production of *useful* biomass. This allows for population growth and the emergence of more complex societal structures, which, in turn, require more labour input and the cultivation of ever more land. Once set in motion, this system spirals towards a natural limit of land productivity at which it typically reaches a state of dynamic equilibrium. Thus, the 'typical' picture of agrarian societies is one in which 'the majority of the population, including children, performs demanding physical work on a continuous basis, while still suffering from shortages of essential resources', as Krausmann and Fischer-Kowalski (2013, p. 342) point out. This logic, which has been extensively studied by anthropologist Esther Boserup (1965, 1981), represents a fundamental limitation upon societal development in agrarian regimes: 'as a rule, growth in this regime eventually leads [...] to the stagnation or even diminishing availability of per capita material and energy resources' (KRAUSMANN and FISCHER-KOWALSKI 2013, p. 343).

This energetic lock-in, which characterised and constrained all solar energy-based sociometabolic regimes in human history, could only be broken very recently (in grand historical terms) in what is known as the Industrial

Revolution. The core of this *sociometabolic transition* is constituted by a shift from the use of biomass (with a low energy density) to the use of fossil energy carries (with a high energy density). Although coal had been used to a small extent for heating and small manufacture for centuries, the key to the transition was the invention of the steam engine in the mid-eighteenth century, which allowed – for the first time in human history – for the conversion of thermal into mechanical energy, thereby emancipating society from its dependence on human muscular and animal draught power (KRAUSMANN and FISCHER-KOWALSKI 2013).

Without being able to describe the contours of the industrial transition in any detail here[3], it is perhaps best summed up as 'a biophysical explosion in limited space', as Fischer-Kowalski (2011, p. 155) put it. The transition from an agrarian to an industrial metabolism indeed unleashed a biophysical *juggernaut* in Giddens' sense of 'a runaway engine of enormous power'. Most sociometabolic indicators embarked on an exponential journey upwards that has to date not come to a halt. Environmental historian John McNeill showed that world energy use grew by a factor five between 1800 and 1900 and by another factor 16 between 1900 and 1990. Almost all of this increase came from fossil energy sources (MCNEILL 2000, p. 10 ff.). Global population quadrupled and global economic output grew more than 20-fold in the 20th century (KRAUSMANN et al. 2009), and Steffen (2011) shows that most indicators of human activity have even accelerated their rates of change dramatically since the 1950s.

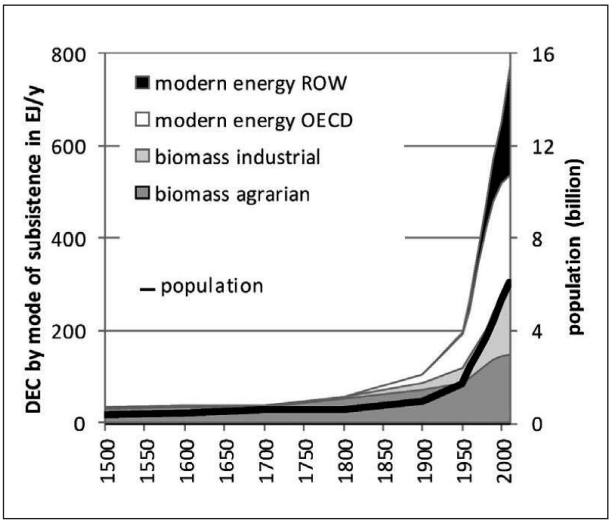
In recent research, Fischer-Kowalski *et al.* (2014a) have explored the human environmental impact on Earth in sociometabolic terms over the past two millennia, using *energy affluence* as an indicator[4]. The analysis reveals the full material extent of the modern juggernaut, as shown in *Figure 1:* in the period from AD 1 to about 1700 (which was dominated by the agrarian regime) we see an almost five-fold increase of human impact, describing the typical pattern of intensification and population growth as analysed by Boserup (1965). In the 18th century, however, the fossil energy system starts to take off, exponentially accelerating its rate of impact into the present: 'From 1700 onwards, human impact doubles every century, from 1900 on

3 A good descriptive and analytical account of this transition is provided in Krausmann *et al.* 2008 and in Krausmann and Fischer-Kowalski 2013.

4 Energy affluence is defined by the indicator DEC (domestic energy consumption), which not only includes 'technical' primary energy such as fuel wood, coal, oil, gas or hydro and nuclear power, but also all types of biomass used as food and feed for domesticated animals or as raw material. It is a good indicator for overall environmental impact as it is tightly coupled to materials and land use. The more energy a metabolism processes, the higher its environmental impact.

it doubles in 50 years, and from 1950 on it triples in 50 years, with no sign of saturation yet' (FISCHER-KOWALSKI *et al.* 2014a, p. 25).

FIGURE 1
Global human environmental pressure expressed as domestic energy consumption (DEC).



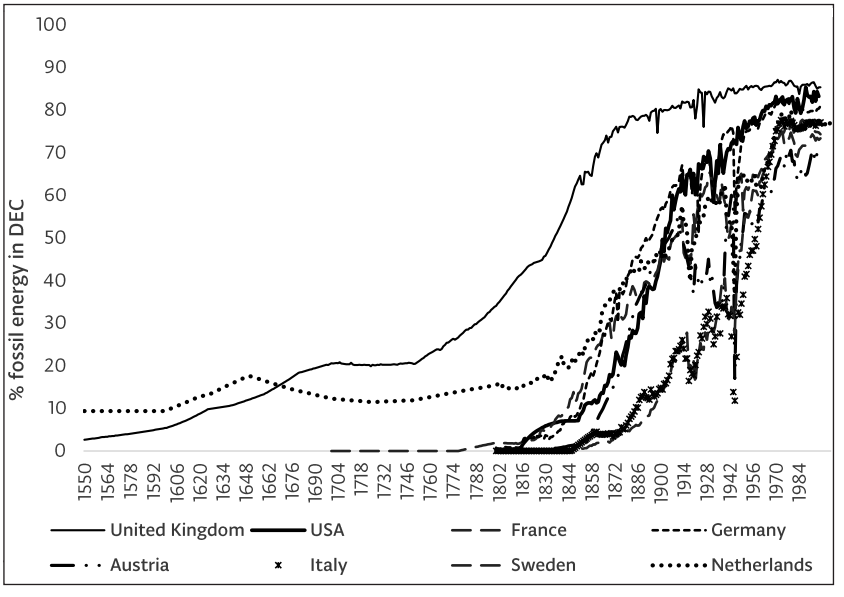
NOTE: *For modern energy use of the global industrial population, we distinguish between modern energy use in OECD countries and in developing emerging countries (rest of the world, ROW).*
SOURCE: *Fischer-Kowalski et al. (2014a).*

A sociometabolic reading of modernity allows for a more realistic view on the critical juncture at which industrial societies find themselves today. It stresses the systemic forces at work in driving metabolic change and points at the structural unsustainability of the current dynamics (HABERL *et al.* 2011). Crucially, a sociometabolic reading enables us to see the extent to which the emergence of the modern state and its various transformations is historically embedded in the development of the industrial metabolic regime. While the defining ideas of political modernity were born deep within the agrarian regime of the Middle Ages (for a discussion see the section on 'epistemic legitimacy' below), their stable institutionalisation in the form of modern democracy succeeded only at a point in history when the 'energy affluence' of modern society started to skyrocket. This, I submit, is not a coincidence and has far-reaching consequences for the capacity of the contemporary environmental state to come to terms with

the unsustainability of its own socioeconomic foundations. It is this relationship of the modern state with the industrial metabolism to which I shall now turn.

The transition of complex systems typically follows an S-shaped curve, involving a *take-off phase*, in which the system leaves its equilibrium, an *acceleration phase*, in which many rapid changes take place and a subsequent *stabilisation phase*, in which a new dynamic equilibrium is reached (ROTMANS *et al.* 2001). *Figure 2* shows the typical s-shaped curves of the sociometabolic transition of selected countries into the age of fossil energy. Using the scheme presented by Dryzek *et al.* (2002) as a template, I show in what follows that the previous transformations of the modern state were deeply embedded in this industrial metabolic transition: the incorporation of the accumulation imperative took place at a time when the fossil energy system was in its 'take off' phase; and the addition of the legitimation imperative was achieved in the phase of rapid acceleration of the industrial metabolism.

FIGURE 2
The industrial metabolic transition of selected countries as a percentage of fossil energy of domestic energy consumption (DEC).



SOURCE: *Pallua 2013; Fischer-Kowalski et al. 2014b.*

I arrive at the results shown in *Table 1* by integrating recent quantitative research by Fischer-Kowalski *et al.* (2014b) and work in historical comparative analysis by Rueschemeyer *et al.* (1992) into a framework which I adopted from Dryzek *et al.* (2002). The framework uses the concept of state imperatives and assigns approximate historical dates for their respective emergence in a number of sample states.[5] These dates are then compared with the approximate year in which the social metabolism of each country entered the take-off phase (share of fossil fuels >4% of domestic energy consumption [DEC])[6] and the acceleration phase (statistical acceleration break) of the transition to the industrial metabolic regime, as provided by Fischer-Kowalski *et al.* (2014b). I chose as the dates of emergence of the accumulation imperative those historical events in which the interests of capitalist classes started to be firmly represented within the state structure, either as a result of bourgeois revolutions or similar events of bourgeois incorporation. In order to attach historical dates to the emergence of the legitimation imperative I chose the year in which the respective state became fully democratic according to the definition of Rueschemeyer et al. (1992), which includes *universal suffrage* as a basic condition. Universal suffrage in a parliamentarian democracy qualifies for an indicator of the emergence of the legitimation imperative as it requires the state apparatus to justify its actions to the entire citizenry. The emergence of the welfare state was in most cases closely linked to (or preceded) the extension of suffrage.

5 The case selection was pre-determined by the cases treated in Fischer-Kowaslki (2014b), for which sociometabolic data were available. The historical dates chosen for the emergence of state imperatives are but rough approximations, since these are processes that usually take several years or decades. A detailed sequence analysis (MAHONEY and RUESCHEMEYER 2003) of the historical and socio-metabolic developments in each case is necessary to confirm and refine these preliminary findings.

6 Fischer-Kowalski *et al.* (2014b) pragmatically define the cutting point for fossil energy take-off to be at 4% of DEC 'because shares lower than that are sometimes hard to identify' (p. 18).

TABLE 1
A historical correlation of the functional development of the modern state with the emergence of the industrial sociometabolic regime.

Country	Fossil energy take-off (approx. year)	Accumulation imperative	Fossil energy acceleration	Legitimation imperative	Follows transition sequence
Netherlands	~1500	~1600	1835	1917	yes
United Kingdom	1577	1642/1688	1750	1918	yes
USA	1823	1787	1850	1830/1969	no
France	1825	1789	1832[7]	1877	no
Sweden	1825	1866	1870	1918	yes
Germany	1836	1848	1847	1919	(yes)
Austria[8]	1837	1848	1854	1919	yes
Italy	1872	1882	1880	1919	(yes)

SOURCES: *Fischer-Kowalski et al. (2014b), Rueschemeyer et al. (1992).*

The preliminary result of this investigation shows that six of the eight sample countries follow the expected sequence: fossil energy take off → accumulation imperative → fossil energy acceleration → legitimation imperative. In all but the two early-industrialising cases the fossil energy acceleration followed immediately after or coincided with (Germany, Italy) the establishment of the accumulation imperative, which confirms the causal link between economic growth and fossil energy use. Since the industrial metabolism could globally accelerate only after the invention of the steam engine and the ensuing rise of the steel-railway-complex (PEREZ 1983, KRAUSMANN and FISCHER-KOWALSKI 2013), both Britain and the Netherlands 'lingered' for quite a while on a relatively high level of fossil energy (between 10 and 20% of DEC) before their metabolisms accelerated

7 A first statistical acceleration break for fossil energy in France occurs in 1816 (FISCHER-KOWALSKI et al 2014b), but a more pronounced break is noticeable around 1832, at a higher level (cf. PALLUA 2013). I chose the later point, as it is more in line with transition theory.

8 Territorial boundaries post-1945.

in the Industrial Revolution. The two deviant cases from the transition sequence are France and the USA. In France, the bourgeois revolution of 1789 preceded the fossil fuel take off (1825), while full democratisation (1877) clearly falls within the acceleration phase. In the USA, the accumulation imperative can be said to be established in the constitution of 1787 (or earlier), whereas the fossil fuel take-off occurred only in 1823. This picture is distorted, however, by the fact that both industrialisation and democratisation in the USA are marked by a sharp north/south-division: while northern states generally industrialised much earlier and universal suffrage there was established already around 1830, the south lagged behind in industrialisation and was fully democratised only in 1965 (RUESCHEMEYER *et al.* 1992, p. 122 ff.). The deviation of these two cases from the expected pattern can be brought in line within the more systemic model of state legitimation, which I will present in the next section.

When we move from the descriptive to the explanatory level of analysis, we may ask: what kind of causal link is there between the successive emergence of state imperatives and the transition from an agrarian to an industrial sociometabolic regime? The statistical pattern established thus far shows the existence of a sequence of events in several cases, but it lacks a causal mechanism of explanation. The explanatory element provided in the literature from which this framework is drawn is built around the notion of class power. Both Dryzek *et al.* (2002) and the comparative historical literature on capitalist development and democracy (RUESCHEMEYER et al. 1992, MAHONEY and RUESCHEMEYER 2003) stress the importance of shifts in power relations between collective actors due to changes in the socio-economic structure. This enables new classes to enter the state by attaching their 'defining interests' to existing state imperatives (DRYZEK et al. 2002) or to impose their own imperatives onto the state (RUESCHEMEYER et al. 1992). The socio-ecological literature adds another explanatory element to the chain of causation in arguing that '[f]rom controlling the supply of energy, collective actors derive economic and political power and cultural influence' (FISCHER-KOWALSKI *et al.* 2014b: 15). According to this view, the increased use of coal and peat for heating and small manufacture in early modern times led to rapid urbanisation and the rise of a class of urban capitalists and artisans which undermined the power of the landed aristocracy. The liberal, bourgeois revolutions and reforms which mark the emergence of a growth-oriented, capitalist state are a *consequence* of this shift in energy sources (cf. FISCHER-KOWALSKI et al. 2014b, p. 17). And they led to the emergence of another powerful social class that was almost entirely related to (and in control of) the use of fossil energy: the class of wage labourers. For the emergence of the legitimation imperative, the causal mechanism repeats itself under different circumstances: in its acceleration phase, the

fossil energy system starts to dominate society, with the consequence that those classes that are most immediately involved in supplying and burning fossil energy gain in structural power. As Timothy Mitchell in his book *Carbon Democracy* (2011) points out, this power derived 'from the extraordinary quantities of carbon energy that could be used to assemble political agency, by employing the ability to slow, disrupt or cut off its supply' (2011, p. 19).

Thus, the causal sequence can be summed up as thus: changes in the energy base of a society effect shifts in the relative power distribution between collective actors which enable tidal changes in the class structure of society and ultimately the transformation of the state. New state functions (imperatives) feed back on the metabolic profile of society, at which point the cycle is closed. As the sequence is cyclical, it is not possible to determine an original cause that sets it in motion. For example, changes in the energy system are often preceded by institutional and technological changes (SIEFERLE *et al.* 2006, p. 106f, NORTH 1998, MOKYR 1990). Perhaps the most important insight from this analysis for the purpose of the present investigation is the fact that within this cycle of causation, the energy intensity has continuously been *spiralling upwards*: every new stage of social complexity meant a considerably higher level of energy and materials use (FISCHER-KOWALSKI *et al.* 2014a, TAINTER 2006). This cycle needs to be broken on a structural level if a serious 'sustainability transition' (WBGU 2011) is to be achieved. However, never before in history has humankind deliberately reduced its energy throughput – technological development and increased social complexity have always led to an overall increase in energy and materials use, even as energy and material productivity continuously increased (KRAUSMANN *et al.* 2009). The 'efficiency revolution' (VON WEIZSÄCKER 2009) and the 'green growth' (OECD 2011) strategy of the *environmental state* will therefore not lead to a new development trajectory but increase the *resilience* of the old one.

This reading of modernity casts serious doubt on the viability of the implementation of a sustainability imperative without radical institutional change. The logic of 'class interests' as a driver of modern state development has led to an ever higher sociometabolic profile, which begs the question what kind of collective actor could emerge whose 'defining interest' were a low-energy, dematerialised economy. At this critical juncture the logic of cumulative extension of state imperatives will have to be suspended and replaced by a logic of purposive institutional design. Previously established imperatives will need to be transformed (legitimation) or abolished (growth) if a new sustainability imperative is to be successfully established. The old pattern of state development does not provide a blueprint for that operation. The analytical framework established thus far helps understand the history of the modern state and the emergence of the environmental

state, but does not offer an analytical instrument for a better understanding of its future. The concept of 'epistemic legitimacy' will extend the analytic reach of our framework and allow predictions of state behaviour and the identification of points of intervention.

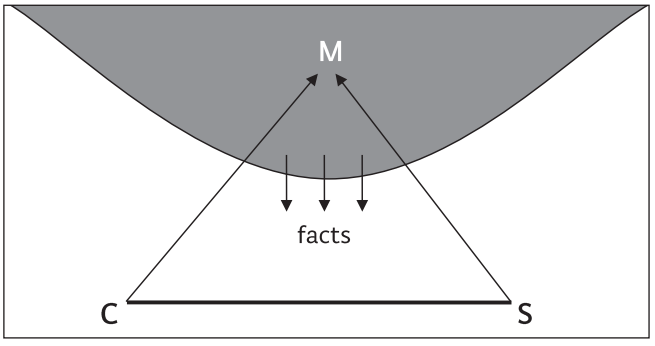
4. Riding the Juggernaut: the 'epistemic legitimacy' of modern democracy

The concept of 'epistemic legitimacy' denotes a strategy that allows democratic societies to come to terms with an irresolvable paradox at the core of their political ontology.[9] The paradox, which resides in the constitutive idea of popular sovereignty, is perhaps best defined as 'the people's relation to itself as both ruler and ruled' (HONIG 2007, p.9). It means that the subject of sovereignty (the people) is at the same time its object, thereby splitting the people into two instances between which a hierarchical relationship (rule) is established. In political practice this leads to an infinite regress in the search of legitimate rule, which in history has often turned violent and frustrated any attempt to establish a stable democratic order. The problem of course is how to determine and express the will of the sovereign people and, secondly, how to execute it also against the will of those who feel misrepresented or even betrayed by it. Apart from the well-researched instance of the French Revolution, where this paradox played out in its purest form (FURET 1981, FONTANA 1992, COWANS 2001) other, more recent events spring to mind as well, where the democratic paradox forestalls stable democratic rule, like the series of regime changes summarised as the 'Arab Spring' (see, for example, HAMED 2014). Given the logical irresolvability of the paradox, it seems miraculous that democracy could establish itself as the 'dominant state form' in the contemporary world (DRYZEK and DUNLEAVY 2009, p. 24). So what happened?

As is often the case, the paradox can only be resolved by thinking 'out of the box'. Thus, the stalemate between the 'people ruling' (i.e. *the state*) and the 'people ruled' (i.e. *the citizenry*) can be broken only be introducing *a third term*, in response to which their relationship can be stabilised. This third term needs to be of a *dominant* character, it needs to attract the *attention* of both state and citizenry and it needs to be perceived by both as an *objective and indisputable reality*. It needs to provide the solid ground on which the 'chicken-and-egg circle' (HONIG 2007, p.2) in the search for legitimate rule can be interrupted and a stable *modus vivendi* between state and citizenry established (HORTON 2010).

9 For a more comprehensive elaboration of the concept see Hausknost 2012a, 2012b.

FIGURE 3
The epistemic legitimacy of modern democracy. The relationship between the citizenry (C) and the state (S) can only be stabilised in response to a dominant and 'objectified' source of reality: the expanding capitalist market (M).



This third term only emerged during the acceleration phase of the fossil energy system in the form of a *dynamic and expansive capitalist market economy*. Under conditions of pure sovereignty, the relationship between state and citizenry is vertical and thus irremediably instable and violent. In the face of the capitalist market as a dominant and objectified source of social reality this relationship could be brought into a *horizontal* line, from which both could engage in the ever more intricate and complex processes of *managing, calculating* and *responding* to the facts the market created (Figure 3). The range of potential discord between state and citizenry (which is in principle open to the most fundamental questions about *what* kind of society to establish) could be effectively limited to questions of *how* to properly manage a market-based society. Ideological differences can be contained and 'broken down' to concrete issues of how best to stimulate growth, distribute the resulting prosperity and manage questions of material inequality and 'externalities' like environmental degradation. All this can be dealt with in a pluralistic party system within a parliamentary regime, where the 'locus of power', as Claude Lefort (1988, p. 17) famously put it, becomes 'an empty place', which is ever only temporarily filled by those who win elections.

The kind of legitimacy the emergence of the fossil-fuelled market economy enabled has little to do with normative justification on the basis of liberal values and rationalism; rather, it has to do with a particular way of instituting a regime of perception and knowledge that makes the paradox of sovereignty disappear from the surface of political life. Since the paradox cannot be resolved, it can only be suspended by creating a gravitational centre of attention that serves as a *common matrix of reference* for both

the governors and the governed. The market is established as an *object of knowledge*, as the object of calculations, statistical interrogations, projections and rational planning. The market as an object of knowledge that can be penetrated by statistical and econometrical enquiry and which provides the abstract raw data of the social on the basis of which 'politics' as a rule-bound game can be set up, is possible only because it is an essentially *opaque* sphere. This opacity is due to the price system which 'operates as a veil' (PENNINGTON 2003: 724; cf. HAYEK 1945) in that it cancels out relations of causality and emergence and transforms them into a slick surface of numerical information. The more opaque and at the same time dynamic this independent source of social reality, the better it can serve as the 'third term' to stabilise the otherwise self-destructive relationship between the ruling and the ruled instances of the people.

The legitimation function of an *independent source of reality* can be usefully expressed in terms of 'causal stories', as developed by Deborah Stone (1989). As Stone points out, 'causal argument is at the heart of political problem definition. Problem definition is centrally concerned with attributing bad conditions to human behaviour instead of to accident, fate, or nature' (1989, p. 299). It is typically in the interest of opposition to portray bad conditions as the intentional (malevolence) or unintended (incompetence) consequences of governmental action. Conversely, it is in the interest of government to portray bad conditions as originating either from some external sphere of causation devoid of purpose (nature, the market) or from purposive actions of external enemies or oppositional forces. Epistemic legitimacy (the legitimacy originating from the construction of an independent sphere of causation), then, systematically works in favour of incumbents and to the disadvantage of opposition in that it helps incumbents push the interpretation of bad conditions into the independent sphere of causation where 'causal stories' do not stick. Epistemic legitimacy effectively shields governments from the causal stories of the opposition and thus helps stabilise the regime. The angle of oppositional attack is narrowed to 'management errors' of a reality that cannot itself be attributed to the powers of government.

When, for example, the market price of oil reached 148 USD in 2008, it was perceived as an 'objective fact' to be reacted to by relevant authorities and consumers alike; had that price been established *transparently* in a decision of a government, the authorship of government for that 'fact' would have invoked the open juxtaposition between government and consumer-citizens. Thus governments tend to take on authorship for facts of social reality only when they are 'positive' (for example by subsidizing the market price of oil, as do many Middle Eastern states), but leave painful prize rises (or other negative developments) to the opaque machinations of the mar-

ket, whenever possible. Consequently, governments that cannot rely on the opacity of the market and thus take on more direct authorship for social reality, are extremely vulnerable to negative economic outcomes and therefore forced to 'create' positive economic performance literally at all costs, for example by subsidising outdated and inefficient modes of production (WHITE 1986). Liberal democracies with markets at their core, conversely, employ and foster the opacity of market mechanisms as a means to create some kind of social objectivity which shields them from causal liability for contingent economic outcomes and allows governments to take on a managerial and 'reactive' position in public perception. Markets are therefore 'constantly intervened in and maintained' (ÇALIŞKAN 2009) by democratic governments not so much to generate growth (which can also be done in planned economies), but to generate a source of social *objectivity*. For these reasons, the legitimacy of modern democracy is primarily *epistemic legitimacy*.

There is an impressive body of literature examining the processes of objectification, naturalisation and quantification at the heart of modernity. For Roland Barthes, the *naturalisation* of reality is the task of bourgeois ideology, which creates an a-historical, de-politicised version of reality in which 'things lose the memory that they once were made' (BARTHES 1972, p. 142). This process, which he calls the production of 'myth', is closely related to the opacity of the market as the prime instrument of bourgeois power, which cancels relations of emergence and presents reality as a slick surface of facts. Foucault's notion of *governmentality* (FOUCAULT 1991a) elaborates on this theme, however with a more sober view on the ideological status of reality. Foucault meticulously traces the emergence of the modern state and its subjects as a process of quantifications, objectifications and the statistical penetration of life as a result of industrialisation and the concomitant requirements to discipline, count, train and govern the population according to the needs of the market. At the end of the eighteenth century, according to Foucault, government 'has to deal with a complex and *independent reality* that has its own laws and mechanisms of reaction, its regulations as well as its possibilities of disturbance. This new reality is society' (1991b, p. 242, emphasis added). 'Society' here emerges as the totality of market-mediated relations at the onset of the age of coal[10].

10 As shown in section 3, it is the unprecedented density of the energy captured in fossil energy carriers like coal and later oil and gas, which allows for the emergence of industrialism and thus of "society" as a dynamic, market-mediated, "independent" reality. Unlike in the biomass-based agrarian regime, energy can now be transported over long distances and transformed into physical work more or less in any required quantity. This transition is described very lucidly in Rolf-Peter Sieferle's (2001) *The Subterranean Forest.*

In the wake of Barthes and Foucault, a large body of work emerged in the fields of cultural economy and the sociology of the market, *inter alia*, which investigates the performative role of the market in modern governance (e.g. CALLON 1998, BUTLER 2010) and the intricate relationship between state, society and economy (e.g. ROSE 1996, MITCHELL 1999, DEAN 2008, MILLER 2008). The concept of epistemic legitimacy draws on these strands of research and introduces the novel argument that a basal form of legitimacy and institutional stability is achieved by employing the epistemic properties of the market (its division of social reality in realms of opacity and transparency, knowledge and ignorance by virtue of the price mechanism) in the institutional architecture of democratic governance. Without epistemic legitimacy, the normative basis of liberal-democratic legitimation, namely the 'uneasy alliance' (PITKIN 2004) of popular sovereignty and representation as its constitutive ideas, would easily break apart. This alliance could only be forged successfully in the social blast furnace of the industrial age, once the epistemic legitimacy of the industrial age had taken effect.

It is important to note at this point that the first transformation of the state (the emergence of the growth imperative) was associated with the institutionalised *representation* of capital interests, that is, it made use of practices of representation established in the feudal state and adapted them to the new socio-economic reality of an emerging class of propertied citizens. Only the second transformation (legitimation imperative) allowed for the implementation of substantive forms of popular sovereignty. This may explain the deviation of the French case from the typical transition sequence: the French Revolution was the attempt to institutionalise popular sovereignty *ex nihilo*, without first having in place a well-rehearsed practice of political representation (FONTANA 1992, p. 114). This attempt failed violently, and only after a century of turmoil which led to the establishment of a bourgeois order on the basis of a market economy and representative government could eventually suffrage be extended and a substantive form of popular sovereignty be granted (cf. ROSANVALLON 2006, Ch. 4). This explanatory scheme suggests a kind of structural necessity in following the sequence dictated by the socio-metabolic transition of industrialised societies: first representation of capital interests, then industrial expansion, then epistemic legitimacy as the basis on which democratisation can take place. But if this is the case, the prospects for a stable model of democracy that is not based on an expansive market economy look dim. The epistemic legitimacy of modern democracy might turn out to be the Gordian knot any future green society needs to slash: without it, democracy can't be institutionally stable; with it, it can't be environmentally sustainable. All depends, then, on the question whether there is a form of epistemic legitimacy that does not rely on a growth-based economy.

5. Greening the Juggernaut? Environmental policy beyond the 'glass ceiling'

What are the chances, then, of 'greening' this juggernaut of modernity in the strong sense of aligning it with some fundamental biophysical boundaries of the Earth system? The argument I developed in this paper is based on two interrelated claims: Firstly, the 'cumulative' nature of modern state imperatives, which would allow for an additional 'green' imperative only to the extent that it does not conflict with previously established ones. From this claim I derived the notion of a 'glass ceiling' for environmental transformation, which consists precisely in the structural necessity of environmental reform to conform with the imperatives of economic growth and legitimation. Secondly, the 'epistemic legitimacy' of modern democracy means that the democratic state is relying on the market as a dynamic and naturalised 'independent source of reality' to maintain its stability. This second claim contains an explanatory mechanism to substantiate and elaborate on the first one in that it exposes some kind of 'inner logic' of democratic regime stability. This inner logic allows us to make some predictions about the future behaviour (in terms of systemic responses) of the environmental state:

The strategy of epistemic legitimation requires the state to take on a fairly *reactive* role (JÄNICKE 2009, p. 32): the state must never *appear* as the author of social reality, but only as its diligent manager. Authorship for social reality can only be accepted as long as the facts are overwhelmingly positive, as in phases of reconstruction and economic boom after a deep crisis (for example, after the Second World War). Here, the state may openly intervene into basic structures of reality (for example, welfare provision) without running into big legitimation problems. Once growth subsides and the 'objective facts' emanating out of the economy are less positive, the state will – according to this logic – retreat to a more *reactive* position and relegate authorship for reality to 'the market' and its quasi-objective laws. This logic allows the state to advance and retreat its position within the triangle (*Figure* 3) to some extent, depending on external circumstances. The environmental crisis is but one of those circumstances.

In face of environmental deterioration as a decidedly negative development, the state tends to relegate all transformative pressure that might impede growth or impose economic burdens to the 'independent' sphere of the market and thus to 'consumer choice' (BARNETT *et al.* 2011, ANONYMISED 2014) or to complex mechanisms of 'environmental governance' (WURZEL *et al.* 2013) with limited decision-making authority with the result that change emanates out of 'society' in the form of social and technical innovations as well as changed behaviour and consumption patterns. All substan-

tial forms of change must emerge from without the state so that the state can maintain its role as a *reactive agent dealing with the objective facts* that constitute the basis of democratic politics.

Two important implications can be drawn from this logic: firstly, the more radical and disruptive the changes required to halt global environmental degradation, the more limited is the state's capacity to live up to the challenge. Previous transformations always led to a higher level of economic activity, the one we are facing now might have to go the other direction: this is an outlook for which no democratic state can take on 'authorship'. The second and potentially even more fundamental implication is that the modern democratic state (in its current institutional architecture) is better suited to 'manage' the effects of the ensuing environmental and economic crises than to avert them. The state does not lose any of its epistemic legitimacy when responding to a crisis – as could be seen in the recent financial and economic crises, which actually strengthened the role of states. But it jeopardises its entire existence if it takes on responsibility for a reality that is turning grim. As a consequence, the environmental state is more likely to *manage socio-ecological collapse* as long as possible, than to take appropriate pre-emptive measures that would transform the entire architecture of modernity. An environmental or resource crisis that seriously affects economic output might then qualify as a new 'independent source of reality', mediated not by the price mechanism as in markets, but by *science* as a source of 'objectivity' (the Intergovernmental Panel on Climate Change, IPCC, perhaps being a precursor to this new architecture). This might then justify 'emergency measures' to maintain socio-economic stability (including forms of authoritarian rule), but still in a *reactive* rather than *transformative* mode. The state would continue to *manage* rather than to *create*. And once that stage is reached, *resilience*, that is, the prevention of economic and political collapse, will become the only priority. The theory of transitions of complex systems suggests that an opportunity for deliberate, transformative change would emerge only at a point when the opportunities to sustain the incumbent system are 'structurally exhausted' (FISCHER-KOWALSKI 2011, p. 155). That is, once the architecture that sustained the market-based, high energy metabolism of modern democracy collapses due to either the exhaustion of the metabolism or of epistemic legitimacy, the opportunity for renewal will open up. This, however, means nothing less than waiting for collapse to make room for change. This trajectory is, I argue, structurally inscribed into the architecture of the modern state.

As a consequence, the implications of my argument are on the level of democratic reform as well as on the level of policy-making. On the policy level, my argument emphasises the importance of such policies that help loosening the systemic adhesion between existing state imperatives in

order to make room for alternative conceptions early enough to prevent the system from spiralling down in the quest for 'resilience'. An example would be policies that weaken the systemic importance of the accumulation imperative while at the same time being in line with legitimation, such as policies that reduce working time (SCHOR 1991, HAYDEN 1999, KALLIS *et al.* 2013) and policies that increase human wellbeing while reducing economic throughput (e.g. JACKSON 2009). However, within the architecture of the modern democratic state I suspect there is an inbuilt limit to the implementation of such policies beyond which the state would start losing its epistemic legitimacy (for example, there will be parts of the population that continue to prefer monetary income to time and material wealth to leisure and social interaction, which would create problems of legitimation). These limits need to be investigated in empirical research and political experimentation.

The more important level on which the implications of my argument come to bear is that of the architecture of modern democracy itself. Looking at that architecture as presented in *Figure 3*, the only plausible solution is to reform the respective roles of the state and the citizenry in democratic decision making. Since the state cannot 'make decisions' that undermine its own functional imperatives, these *transformative decisions* will have to be made outside the state institutions, namely by the citizenry in an anonymous fashion in the form of direct legislation. New institutions need to be set up that allow for deliberative will formation and collective (direct) decision-making outside the representative structures of the state, and within the public sphere (for a detailed proposal of such an institutional innovation, see ANONYMISED 2012a). Decisions thus made can be treated by government as 'objective facts' just like market data. A decision to reduce working hours or to foster decommodified forms of production (GOUGH and MEADOWCROFT 2011, p. 501) made in a popular vote, for example, would not instil the problems of legitimation the same decision made in parliament would create. The glass ceiling of environmental transformation can only be broken with decisions made in institutions that are assigned to the citizenry *directly* (as direct democratic extensions of the state), but there can – of course – be no guarantee for sustainable outcomes of decisions thus made. Politics will have to be played out as a game according to new rules that allow for binding interventions of the public that are not bound by the functional imperatives of the state. That way the chances might rise that the juggernaut of modernity will be transformed into a new kind of vehicle – just what kind we cannot know for sure.

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The principle of common but differentiated responsibilities and its transformation in the Paris Agreement*

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1. Introduction

If one had to pick a very recent date which has already made climate change history, one would surely have to choose 12th December 2015, the date which marked an end to the troublesome process of negotiating a comprehensive and legally binding post 2020 climate change deal. As observed by Rajamani (2016, p.494), the Paris Agreement is a "finely balanced and highly ambitious agreement", and despite its bottom-up structure and conduct-oriented obligations of the parties, represents a major breakthrough in lengthy and stalling negotiations which at certain points seemed far from promising. One of the fundamental causes of this roadblock encountered in the international climate change negotiations under the United Nations Framework Convention on Climate Change (hereinafter the "UNFCCC" or the "Convention") at the same time enabled the final compromise to be reached in Paris - viewed in a new light, the principle of common but differentiated responsibilities transformed from the problem-maker into a problem-solver.

The aim of this paper is to analyse the transformation that the principle of common but differentiated responsibilities went through from the early 1990's and the foundation of a global climate change regime under the UNFCCC, until the 21st Conference of the Parties to the UNFCCC, which took place in December 2015, and resulted in the adoption of the Paris Agreement. Forged in order to address the collective action problem between members of the UNFCCC having significantly differing historic responsibilities for greenhouse gas emissions, as well as differing economic capabilities to engage with climate change mitigation and adaptation, the principle of common but differentiated responsibilities became unsuit-

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able in a world of changed circumstances in which some of the emerging economies became the biggest greenhouse gas emitters. A new balance of the principle of common but differentiated responsibilities had to be struck and, as pointed out by Rajamani (2016, p. 506), it was reflected in the Paris Agreement in a "nuanced form of differentiation in favour of developing countries". It remains to be seen how successful this new form of differentiation will be in practice, but it cannot be denied that the Paris Agreement represents strong progress towards increased fairness in climate change law, which is also indicated by the fact that by 24th June 2016 there were 178 signatories to the Agreement, including all the major greenhouse gas emitters (United Nations Treaty Collection, Depositary).[1]

2. Origins of and rationale for the principle of common but differentiated responsibilities

The principle of common but differentiated responsibilities within the global climate change regime was established by Article 3 paragraph 1 of the UNFCCC, and is worded as follows:

> "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof."

The principle of common but differentiated responsibilities is anchored in two notions, the first one being that the climate system represents a "common concern of humankind", which is expressly acknowledged at the very outset of the UNFCCC, in its Recital 1. As noted by Rajamani (2000, p. 121), the notions of "common concern" and "common heritage of mankind" are "as old as environmental law itself". As explained by Stone (2004, p. 276), this notion reflects the fact that "certain risks affect and are affected by every nation on earth". In all likelihood being the most extreme form of transboundary environmental problems, global climate change impacts all nations, regardless of how much they contributed to it. It can therefore only be effectively addressed if action is taken by all nations and thus represents a common responsibility of them all.

The second founding notion of the principle is the idea of differentiation between the responsibilities of different nations in respect of climate

1 More importantly, one can only hope that this successful trend will continue with the Agreement's ratification and implementation.

change mitigation and adaptation. As will be explained in detail in section III., that differentiation can manifest itself in several aspects, such as different substantive obligations or different obligations at the implementation level (MAGUIRE, 2013, p. 261; CULLET, 1999, p. 169)[2]. The underlying rationale for the described differentiation lies within the principle of equity, which requires that like cases be treated alike, and unlike cases treated differently. In the context of climate change mitigation and adaptation, nations are indeed very different one from another, which can be seen on two main grounds.

The first ground for differentiation between nations can be found in their differing historic responsibilities for greenhouse gas emissions. According to the data provided by the World Resources Institute (2014), the USA is responsible for 27% of all greenhouse gas emissions which took place from 1850 until 2011, followed closely by the 28 current EU member states with a 25% share, while the historically third most responsible country, China, lags far behind with only 11%. The Russian Federation occupies the fourth place with 8%, while the fifth is taken by Japan which is responsible for 4%, and the sixth by India bearing 3% of the historic responsibility. At the time of the adoption of the UNFCCC, this picture was even more polarised in favour of developed countries, which, according to Grübler and Fujii (1991, p.1406), contributed to the 85.9% of "the increases in atmospheric concentration" of carbon emissions from 1800 until 1987.[3] This fact has been recognised in Recital 3 to the UNFCCC, which states:

> "Noting that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs."

It is therefore understandable that at the time of drafting of the UNFCCC, the developing countries did not find it acceptable to undertake the same mitigation and adaptation commitments as the developed countries and that some form of differentiation had to be put in place in order for the agreement to be reached.

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2 Rajamani (2013, p. 154) distinguishes a third form of differentiation which consists in „provisions that grant assistance to developing countries, *inter alia*, financial and technological".

3 Different data has been provided by Banuri et al. in 1995 (RAJAMANI, 2000, p. 123), which reveals that "the industrialized countries account[ed] for two thirds of cumulative carbon emissions".

The second ground for differentiation can be found in the nations' different capabilities to engage in climate change mitigation. Due to their different levels of economic development, not all nations can afford to employ their scarce financial and technical resources for climate change mitigation, or even adaptation. As stated by Cullet (1999, p. 169), in those circumstances differential treatment "seeks to foster a form of substantive equality which cannot be achieved through reliance on sovereign equality in a world where states are unequal in many respects".

In the light of the aforementioned differences and as stated above, the need for differentiation between nations' common responsibilities is based on the principle of equity. Even though differential treatment has received a lot of attention specifically in the context of climate change law, Stone (2004, p. 276-278) lists well-established examples of its use in other areas of international environmental law, such as the protection of ozone layer and biological diversity, and dates the principle of common but differentiated responsibilities back to 1919 and the Treaty of Versailles. All of these instruments of international law recognised the fact that differentiation is necessary to establish equality between *de facto* different nations.

The requirement that "developed country Parties should take the lead in combating climate change and the adverse effects thereof", prescribed in Article 3 paragraph 1 of the UNFCCC, is therefore based on higher levels of those parties' responsibilities for historic greenhouse gas emissions and their higher capacity to tackle the causes and consequences of climate change. As pointed out by Rajamani (2000, p. 122) and Cullet (1999, p. 169), the abovementioned requirement is an expression of the well-established polluter-pays principle which requires that those who caused certain environmental damage bear the burden of its reparation. However, it should be noted that developed country parties are only required to take the lead in climate change mitigation and adaptation, but that the overall responsibility for taking action remains common, that is, shared by other parties as well. In other words, that developed country parties are not the only ones that are required to act.

The underlying idea of the principle of common but differentiated responsibilities is that common responsibilities should be differentiated on the basis of each party's overall contribution to greenhouse gas emissions, but also on the basis of its capabilities to engage in climate change mitigation and adaptation. This reflects the fact that due to their increased greenhouse gas emissions, developed country parties reached higher economic standards and are therefore in a better position to take necessary action. On the other hand, developing countries often suffer higher climate change vulnerability and do not dispose with sufficient resources to

take adequate action in order to protect themselves from climate change consequences caused by developed countries. Apart from the polluter-pays principle, Cullet therefore (1999, p. 169) identifies another aspect of equity which requires developed country parties to act, and that is the principle of solidarity contained in Article 55 of the UN Charter, which recognises "the need for cooperation among nations to achieve the goals of economic and social development". As furthermore emphasised by Cullet (1999, p. 169-170), "equity in international environmental law cannot be dissociated from sustainable development" and implies that "environmental and development goals must be pursued at the same time". Within this context, Cullet (1999, p. 170) points out several problematic issues, such as the fact that mitigation action in developed countries is likely to entail cutting down on certain luxuries, such asdriving a car, while at the same time in developing countries might be closely linked to the "fulfilment of basic needs, such as energy for cooking or heating".

Since the principle of common but differentiated responsibilities concerns the conflict over the distribution of the remaining greenhouse gas emission quotas which are not to be surpassed if the most severe consequences of climate change are to be avoided, it goes without saying that it has strong repercussions for the economies of both the developed and developing countries. While developing countries invoke their "right to development" (MAGUIRE, 2013, p. 260), developed countries are unwilling to concede to reducing their greenhouse gas emissions in direct proportion to their historic emissions, since that would allow them only a small share of future emissions. While certain authors, such as Neumayer (2000), favour historic accountability of greenhouse gas emissions, claiming, *inter alia*, that the developed countries enjoy higher life standards due to their past emissions, others, such as Posner and Sunstein (2008, p. 1594) consider that the technological advantages that the developed countries produced have also benefited the rest of the world and that an argument on the duty of developed countries to act cannot be based on the principle of corrective justice.[4] Rajamani (2000, p. 122), on another hand, citing Smith[5], puts forward a different argument for holding present generations responsible for past emissions, and that is the fact that

4 Posner and Sunstein's work provides a thorough analysis of the argument that developed countries should take the lead in climate change mitigation from the perspective of distributive and corrective justice and concludes that neither of the two principles can serve as an adequate basis for that claim (POSNER & SUNSTEIN, 2008, p. 1611).

5 K.R. Smith, `The Natural Debt: North and South', in T.W. Giambelluca and A. Henderson-Sellers (eds), Climate Change: Developing Southern Hemisphere Perspectives (CHICHESTER, WILEY, 1996), 430±1.

responsibility for past emissions makes present generations responsible for their current emissions.

In summary, all of the aforementioned arguments illustrate the complexity of equity considerations within the climate change context. Due to that complexity and the vital nature of conflicting interests it involves, the principle of common but differentiated responsibilities has played, and continues to play, the central role in the structure of the global climate regime. The story of its development shall be told in the following sections, starting with the UNFCCC.

3. Development of the principle – the UNFCCC

As stated above, the first legally binding instrument which established the principle of common but differentiated responsibility in the context of climate change law was the UNFCCC, which was signed in 1992 at the Rio Earth Summit and which entered into force on 21st March 1994. It was also recognised in the 1992 Rio Declaration on Environment and Development, whose Principle 7 states the following:

> "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."

According to Bodansky (1993, p. 475-478), the UNFCCC negotiation process faced several difficulties which influenced the Convention's final text. The first difficulty pointed out by Bodansky is the fact that the negotiations concerned the use of fossil fuels, which formed the backbone of the world economy. Secondly, at the time the negotiations took place, high levels of uncertainty were present as regards the scope of the climate change problem, its risks and mitigation. Thirdly, the negotiating parties had "widely diverging interests" due to the differences in their dependence on fossil fuels, contributions to the climate change problem and their climate change vulnerability. Fourthly, the negotiations included all nations in the world, which, besides its many advantages, also made the final deal harder to reach. Fifthly, the time-frame the negotiators had at their disposal to reach the deal was very limited given the complexity of its subject-matter. Finally, the negotiations were marked with strong disagreements, which

were not limited just to the developed and developing countries, but included diverging views between developed and developing countries themselves (Bodansky 1993, p. 475-478).

Despite the aforementioned difficulties, the UNFCCC was the first international agreement that acknowledged the fact that it was necessary to act towards the reduction of greenhouse gas emissions in order to prevent human influence on climate change. However, in 1992 the parties to the UNFCC were not yet ready to commit to any enforceable greenhouse gas emission reduction targets. Instead, the Convention only set out general obligations which did not require specific emission reductions. In doing so, its Article 4 distinguished between general obligations applicable to all parties, such as the development of national greenhouse gas emission inventories, formulation and implementation of climate change mitigation programmes, cooperation in the development and transfer of technologies, promotion of sustainable development, cooperation in climate change adaptation, etc.,[6] and other obligations applicable to specific parties. In that respect, Article 4(2) lists obligations applicable to developed country parties and parties that are undergoing transition to a market economy[7], listed in Annex I, the most important of which is the limitation of greenhouse gas emissions and the protection of greenhouse gas sinks and reservoirs. Finally, Article 4(3-5) prescribes that parties listed in Annex II, which are in essence developed country parties, are, *inter alia*, to provide financial support for developing countries for meeting their obligations under the Convention and for climate change adaptation.

The parties' unwillingness to accept any binding emission reduction obligations in the UNFCCC also reflected on the formulation of the principle of common but differentiated responsibilities. As pointed out by Soltau (2011, p.191), Article 3(1) which defines the principle, states that the parties "should" protect the climate system and that the developed country parties "should" take the lead in combating climate change, which does not set an obligation for them to do so. This language was as far as developed countries were prepared to concede, and the least that the developing countries

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6 Article 4(1) of the United Nations Framework Convention on Climate Change. At its very start, Article 4(1) makes it clear that the obligations it sets for all parties are to be regarded in the light of those parties' "common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances."

7 Batruch (2000, p. 58-59), citing Henry Shue, After You May action by the rich be contingent on action by the poor? 1 IND. J. GLOBAL LEGAL STUD. 343, 365 (1994), differs between parties undergoing transition to a market economy and developing country parties on the basis of historic emissions, which are significantly higher for the former.

were prepared to agree to. Furthermore, as noted by Deleuil (2012, p. 272), unlike the Rio Declaration, the final wording of Article 3(1) does not contain a reference to parties' historic emissions, which are only mentioned in Recital 3. Bodansky (1993, p. 503) explains that both the developed and developing countries shared the view that developed countries should take the lead in combating climate change, but disagreed as to the reason why. While developing countries considered that the main reason lies in developed countries' historic emissions, that is their responsibility, the developed countries, led by the USA, insisted that it was due to their higher financial and technical capabilities to do so. The same opinion was expressed by Deleuil (2012, p. 272), who notes that developed countries insisted on putting parties' "responsibilities and capabilities on an equal footing".

Ever since its adoption in 1992, the Convention has formed the framework for further development of the international climate change regime. The aforementioned differences between the parties persisted in the years to come and repeatedly came down to the issue of which parties should act first, and to which extent. The UNFCCC provided a clear answer that the developed country parties should lead the way, and as pointed out by Soltau (2011, p.192), even conditioned the fulfilment of developing country parties' obligations upon the financial and technical support of developing countries.[8] However, as demonstrated soon after, not all developed country parties were prepared to fully adhere to the Convention's provisions.

4. Deepening the divisions – the Kyoto Protocol

The Kyoto Protocol was the first instrument of international law that set legally binding targets for the reduction of greenhouse gas emissions. Within the legal framework of the UNFCCC, 192 parties agreed on the use of several innovative flexible mechanisms in order to achieve the necessary emission reductions, based on the principle of "common but differentiated responsibilities", which was expressly reaffirmed in Article 10. In line with the principle of common but differentiated responsibilities, the Kyoto Protocol determined specific binding obligations for developed countries listed in Annex B to reduce greenhouse gas emissions, listed in Annex A, by a certain percentage in relation to the 1990 levels, while developing country parties did not undertake any similar obligations.[9]

The Kyoto Protocol's reaffirmation of the principle of common but differentiated responsibilities is not surprising, given the fact it was adopted

8 Article 4(7) of the UNFCCC.

9 Article 3(1) of the Kyoto Protocol. Exceptionally, parties to the Protocol could also choose a different base year, as prescribed in Article 3(5).

under the framework of the Convention. However, the definition of the principle contained in Article 10 of the Protocol differs from the one contained in Article 3(1) of the Convention, and is essentially the same as its expression contained in Article 4(1) of the Convention. Pursuant to Article 10 of the Kyoto Protocol, account is to be taken of the parties' "common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances". This language reflects additional concessions made towards developing countries. Furthermore, Article 10 makes it abundantly clear that no new commitments are to be introduced for developing countries.

As noted by Maguire (2013, p. 265), the Kyoto Protocol introduced further differentiation between its parties. Apart from differentiating between developed and developing countries on the basis of their mitigation obligations, the Protocol also differentiates between obligations of individual developed countries, since all Annex B parties were at liberty to set their own emission reduction targets. This resulted in some parties, such as the EU, pledging an 8% reduction in greenhouse gas emissions from the 1990 levels in the Protocol's first commitment period running from 2008 until 2012, while at the same time other parties, such as New Zealand undertook to keep their emissions at 1990 levels, and others, such as Australia, committed to keep the increase of their emissions at 8% from the 1990 levels.[10]

The Kyoto Protocol's differentiation in favour of developing countries represents "a unique model of developed country leadership, yet to be seen elsewhere in international law", but at the same time proved to be "deeply contentious" (RAJAMANI, 2013, p. 155). The price to be paid was at the expense of universal participation and in 2001 the USA, one of the key developed parties, refused to ratify the Protocol and accept its 7% emission reduction target. The USA's rejection of the Protocol was due to the described differentiation in obligations of developed and developing countries, which prompted concerns that the USA would suffer an unfair competitive disadvantage from developing countries who undertook no emission reduction commitments and that the implementation of the Protocol would be "ineffective without developing country participation" (Harris, 1999, p. 37-38). An analysis of the US Senate's position performed by Harris (1999, p. 37-42) shows that the Senate did not oppose the principle of common but differentiated responsibilities *per se* and that a number of senators showed support for developing countries' development needs, but that they required some level of meaningful participation of those countries. However, as pointed out by Harris (1999, p. 34), during the negotiations of the Protocol, the developing countries strongly opposed the language that

10 Annex B to the Kyoto Protocol.

would "call on them to make even voluntary commitments to limit their emissions of greenhouse gases."

The Kyoto Protocol suffered further casualties of its aforementioned strong differentiation during its second commitment period, which was agreed upon in Doha and runs from 2013 until 2020. During that period, the Protocol has been renounced by Japan, Russia, Canada and New Zealand, leaving only 12% of current global greenhouse gas emissions under the Protocol's scope (WORLD BANK GROUP CLIMATE CHANGE and ECOFYS, 2014). The lesson thus learned was that, despite being complimentary from the moral perspective, radical differentiation in respect of binding obligations between developed and developing parties would not ensure the universal participation necessary for the majority of global greenhouse gas emissions to be covered.

5. In search of a new solution – from Bali to Paris

As the need for a new approach towards the division of obligations between developed and developing country parties to the Convention was becoming undeniable, the 13th Conference of the Parties took place in Bali in 2007, where it was agreed that further negotiations would be divided into two separate tracks – while one working group was entrusted with negotiating the second commitment period under the Kyoto Protocol, the second and more broader one was in charge of leading the negotiations on the long-term cooperative action under the UNFCCC (UNFCCC, Now, up to and beyond 2012: The Bali Road Map). As noticed by Rajamani (2013, p. 156), the Bali Action Plan turned the negotiations towards increased symmetry of parties' obligations, by suggesting that all parties be subject to "voluntary, nationally determined and tailored" "nationally appropriate mitigation actions". This development was supported by the USA, which had long sought to differentiate between developing countries, but was opposed by developing countries themselves (RAJAMANI 2013, p. 157-159).

The idea of increasing the parallelism of commitments of developed and developing countries was further considered in 2009 at the 15th Conference of the Parties in Copenhagen and was reflected in the Copenhagen Accord, which was, however, not formally adopted by the Conference of the Parties. The increased need for new lines to be drawn as regards developing country participation has been summarised in the submission of the Republic of Croatia given during the preparatory phase for the Conference: "A division into Annex I countries and non-Annex I countries was established almost two decades ago and does not reflect the current status with regard to economic potential for action and to emissions" (UNFCCC, FCCC/KP/AWG/2009/MISC.1). The Copenhagen Accord addressed this issue by

requiring Annex I parties to "implement individually or jointly the quantified economy wide emissions targets for 2020", and non-Annex I parties to "implement mitigation actions".[11] According to Rajamani (2013, p. 160), the Accord thereby "effectively substitutes a regime of differentiation in favor of developing countries with a regime of differentiation for all countries, providing flexibility for all". In doing so, in its point 1, the Accord expressly relies on the principle of common but differentiated responsibilities and respective capabilities.

The Copenhagen Accord was brought within the UNFCCC process through the Cancún Agreements, adopted at the following Conference of the Parties held in 2010. The Cancún Agreements made a step towards "parallelism" between required actions of developed and developing countries, but did not contain a fixed timetable of reduction targets, like the ones contained in the Kyoto Protocol, for developed countries (Rajamani, 2011, p. 512). They thus represented a further compromise towards universal participation, at the expense of environmental stringency.

Despite the fact that both the Bali Action Plan, the Copenhagen Accord and the Cancún Agreements continued to make reference to the principle of common but differentiated responsibilities, its interpretation and application became the centre of conflict between developed and developing countries and thus blocked further progress in the negotiations. The Durban Platform for Enhanced Action, adopted by the 17th Conference of the Parties which took place in 2011, and was created with the aim to "develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties", contained no express reference to the principle, but only a tacit one, since it was implied that the new deal would be in line with principles of the Convention. Such an outcome represents a hard fought compromise between developed countries, which insisted on further differentiation between developing countries on the basis of "contemporary economic realities", which developing countries considered to be an amendment to the UNFCCC (RAJAMANI, 2013, p. 164). Rajamani (2012, p. 509) considers that this final wording was indicative of the fact that the Durban Platform would lead to more symmetry in parties' obligations.

2012 marked the expiry of the Kyoto Protocol's first commitment period, and the launching of the second commitment period which was agreed the previous year in Durban, but which could only become operational after reduction targets and timetables were set at the Conference of the Parties which took place in Doha. The EU remained the Protocol's main sponsor, which by now made it clear that the new climate change agreement

11 Points 4 and 5 of the Copenhagen Accord.

would not follow its structure. In Doha, the developed countries confirmed their commitment to provide financial and technical support to developing countries (UNFCCC, The Doha Climate Gateway). Furthermore, express mention of the principle of common but differentiated responsibilities was made in Decisions 1/CP.18 on the Agreed outcome of the Bali Action Plan and 3/CP.18 on loss and damage, which indicated that the concept had not been abandoned by the parties.

The following Conference of the Parties was held in Warsaw in 2013, and marked a halfway point from the setting of the Durban Platform for Enhanced Action and the deadline for the fulfilment of its target - a development of the new global climate regime under the Convention (RAJAMANI, 2014, p. 722). Parties were invited to submit their "intended nationally determined contributions" in time for the Paris climate summit. No major agreement was reached on the legal nature of domestic "contributions" of the parties, the differentiation between their obligations or the legal architecture of the future climate regime. However, Rajamani (2014, p. 726) notes that the Warsaw negotiations announced the possibility that it might entail a hybrid of the "bottom-up" and "top-down" approaches. The "bottom-up" aspect would consist in the parties' liberty to make their own choices on their national "contributions", while the "top-down approach" might be present should national "contributions" be subject to certain informational requirements, in order to ensure their transparency.

The need for the redefinition of the principle of common but differentiated responsibilities, which had strong potential to block the Paris Agreement if it were addressed at the last moment, finally surfaced at the final Conference of the Parties before the 2015 deadline, which took place in Lima in 2014. In Lima, the Parties agreed to a new, dynamic approach to the principle of common but differentiated responsibilities. The Lima Call for Climate Action stated that the new agreement would reflect the principle of "common but differentiated responsibilities and respective capabilities, in light of the different national circumstances" (Decision 1/CP.20, Lima Call for Climate Action, point 3). This opened the door for commitments from major emitters such as India and China, which had until then been considered as developing countries with no reduction commitments (THE GUARDIAN, 2014). Rajamani (2015, p. 838-839) considers, and it can hardly be denied, that the qualification "in light of different national circumstances" which was added to the principle "introduces a dynamic or evolutionary element to the principle's interpretation. As national circumstances evolve, so too will the common but differentiated responsibilities of states."

6. A new balance found in Paris

The Paris Agreement, adopted at the 21st Conference of the Parties in December 2015, is based on the principle of common but differentiated responsibilities, in light of different national circumstances, as coined in Lima. The Agreement contains several references to the principle, the first of which can be found in its Recital 3, where it is stated that the Agreement is guided by the principles of the Convention, "including the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of different national circumstances." Article 2, which sets the goals of limiting the increase of temperatures to well below 2°C and increasing climate change adaptation and finance, in paragraph 2 prescribes that the Agreement "will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances". Further references to the principle can be found in Article 4(3), which requires progression of parties' nationally determined contributions and Article 4(19), which calls upon parties to "formulate and communicate long-term low greenhouse gas emission development strategies."

The described references to the principle in some of the main provision of the Agreement reveal its central role in the Agreement's structure. The formula found in Paris addresses the issue of equity in climate change action by providing further differentiation between the parties, in an attempt to ensure that like situations be treated alike, and unlike situations differently. The Paris Agreement requires action of all parties, but does not require them to undertake substantively equal action. As noted by Rajamani (2016, 509), the differentiation in the Agreement is closely linked to "each of the Durban pillars – mitigation, adaptation, finance, technology, capacity-building and transparency. In effect, this has resulted in different forms of differentiation in different areas" and in "transitioning differentiation from an ideological to a pragmatic basis". The Paris approach to differentiation is much better suited to respond to the contemporary division of greenhouse gas emission emitters, which has changed tremendously since the adoption of the UNFCCC in 1992. According to the most recent data (PBL Netherlands Environmental Assessment Agency, p. 12), "the six largest emitting countries/regions in 2014 were: China (with 30%), the United States (15%), the European Union (EU-28) (9.6%), India (6.6%), the Russian Federation (5.0%) and Japan (3.6%). Given the high levels of certainty regarding climate change risks, provided by the IPCCC, and given the current levels of China's and India's emission levels, maintaining the UNFCCC division between Annex I and non-Annex I parties could hardly have resulted in any meaningful mitigation action.

The Paris Agreement, with its "bottom-up" structure which consists in parties' obligations to communicate their nationally determined contributions[12], subject to "top-down" requirements for the clarity, transparency and understanding of information thus provided[13], does not contain a control mechanism which could ensure that its long-term temperature goals will be achieved. Nevertheless, the multi-level differentiation between its parties which the Agreement establishes provides a good basis for substantive progress in greenhouse gas emission reductions to be made after 2020.

7. Conclusion

As recent studies have confirmed (ALTHOR at al, 2015), it is expected that the present inequalities in climate change vulnerability will deepen by 2030, making the countries the least responsible for climate change most vulnerable to its consequences. Having this in mind, and in the light of a radical shift in the global distribution of greenhouse gas emissions which occurred since the adoption of the UNFCCC in 1992, the principle of common but differentiated responsibilities in its original form represented more of a negation of the principle of equity than its expression. A radical shift in the principle's interpretation had to be made in order for its just application in the light of changed circumstances to be assured. The new formulation of the principle adopted at the Conference of the Parties to the UNFCCC in Lima, which further qualifies the principle "in the light of different national circumstances", became an integral part of the Paris Agreement and enabled further differentiation between the parties in respect of mitigation, adaptation, finance, technology, capacity-building and transparency. This has so far significantly facilitated long-awaited universal participation in the Agreement and, along with the Agreement's "bottom-up" structure, ensured developing country action.

The principle's status in the context of international climate change law remains unclear, but as pointed put by Honkonen (2009, p. 259), given the well-illustrated disagreements over its scope and interpretation, it can be concluded that it does not represent customary international law. Despite the aforementioned legal uncertainties, the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances will surely play an important role in the implementation of the Paris Agreements and related rule-making, especially given its central part in the Agreement's structure.

12 Article 3 of the Paris Agreement.

13 Article 4(8) of the Paris Agreement.

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Climate change concern, anthropocentric worldview and the technoscientific context of young researchers

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> *"The important point... is... to note that scientific facts bearing on the global environment never take root in neutral interpretive field; they are dropped into contexts that have already been conditioned to produce distinctive cultural responses to scientific claims"* (JASANOFF, 2010: 240)

1. Introduction

In 2014 a group of authors have published an in depth study on climate change concern and sustainability orientations among the general population that compared the western European democracies and the Eastern European post-socialist societies (DOMAZET and MARINOVIĆ JEROLIMOV, 2014). From those analyses based on ISSP module Environment 2010 dataset, many insightful results emerged, including the one to be used as a starting point of this discussion. Specifically, I am referring to the difference in acceptance of so called *dominant social paradigm* between citizens (representative samples of citizens) of EU countries and its observed connection with lower perception of environmental risks and lower intended pro-environmental behaviour (BRAJDIĆ VUKOVIĆ 2014). In this paper, other dimensions of *dominant social paradigm* (MILBRATH 1984; KILLBOURNE et al. 2002) will be used and, at this point, on a different sample. Those are scientists, in our research – next generation academics, youngest cohort of thinkers, but an aim of presented research is to explore *dominant social paradigm* in the context of their disciplines, and their attitudes related to more specific topic: the climate change.

It has become commonplace in academic parlance, even in social sciences and humanities, to note that the globally dominant structure of social metabolism is positioning most of the world population on an unsustainable

path within this century (cf. GROSS and TELEŠIENE, 2017 for illustration). Whilst in itself insensitive to the vast inequalities of environmental impact between different groups of human population, presently and historically, as well as the socio-historic mechanisms driving these, the concept of Anthropocene, a new geological era that humans have brought about in the life of the planet (ZALASIEWICZ, CRUTZEN, and STEFFEN, 2012), illustrates the severity of the intellectual challenge. In Anthropocene the human population, its societies and cultures combined (but with unequal contributions), act with the power of a geophysical force (ARCHER 2010; SAGER 2011). Using such resounding imagery contributes to the public interest for a seemingly techno-scientific problem, but also calls for a dialogue between natural and social 'camps' of scientific thinking about the role of Humans in co-creating different versions of Environment and understanding of the formal and final causes (in an Aristotelian sense) of the environmental crisis (MOORE, 2016).

Climate change has over the last few decades increasingly become the paradigmatic case of such a complex and global environmental crisis, as well as one of the greatest material threats to the planetary existence as we know it. Although effectively an environmental phenomenon, causes of climate change lie in the modern social organisation, in economic, epistemic and political system spreading from the most developed countries throughout the world. Globally, it was the scientific elites that drove climate change to be perceived as a global political issue, and in most contemporary societies the scientific community mediates the understanding of the extent and severity of the challenge, as well as specifications of its local and regional aspects.

The global and regional strategic responses conceptually divide into roughly two camps: a rapid and radical transition to a "green economy" or a diversion of focus away from the economic growth as a necessary instrument of life-improvement. The former aims to significantly decouple the economic activity from material use and carbon emissions in energy production (UNEP 2011a; UNEP 2011b; CREECH et al. 2014), with a strong focus on technological change (in energy production and distribution, for example), whilst mostly ignoring its social consequences under the pressure of a planetary peril (cf. POLANY 1968; POMERANZ 2009 for a historical narrative disputing such decoupling in principle). But it becomes a highly contentious issue whether global economic growth, however green, can lead to limiting the planetary average temperature at politically agreed bearable limit of 2°C above pre-industrial levels. For if it cannot, and there are serious doubts to this effect, then the whole project is a mirage set out to deceive the population about the ability of the political power structures to tackle the most pressing aspect of the environmental crisis (TIENHAARA 2009; STEINBERGER et al. 2013; HOFFMAN, 2016).

The alternative, the strategy of turning away from economic growth as the necessary instrument of life-improvement, the approach broadly labelled as 'degrowth', seeks to establish goals of sustainability through social and cultural change driving the technological solutions rather than the other way round (JACKSON 2009; KALLIS 2011; KALLIS, KERSCHNER and MARTINEZ-ALIER 2012; DIETZ and O'NEILL 2013). Whilst it also requires a technological change to abandon the current materially unsustainable path (SCHAFFARTZIK et al. 2014), it predominantly invites an understanding, and therefore a scientific interpretation thereof, of a a conceptual decoupling of the social and personal development and improvement aspirations from increase in economic production and consumption (material or 'dematerialized'). This is a sustainability orientation wary of economy environment trade-offs, anthropogenic drivers of the global climate change and global justice elements of the mitigation and adaptation strategies. In simpler terms, it asks of the developed populations of Europe and the Global North to be prepared to do with less in terms of energy and material products, and lead the way in reconceptualising humanity's role on the planet.

Previous research partly overlapping with some of the dataset reported on here has shown that Croatian population (among the global nations of very high human development, but below average GDP *per capita* within Europe; cf. DOMAZET and MARINOVIĆ JEROLIMOV, 2014) on the whole is both aware of the scale of the climate change threat and is highly concerned about its consequences locally and globally (ANČIĆ et al. 2016). It is also surprisingly well positioned on international comparison of epistemic mapping of the environmental crisis, as well as calls for more education and legal-political protection (GUERRA et al, 2017). Nonetheless, economic insecurity and increasing inequality of access to benefits of environmental exploitation erode the political support for addressing the pressing environmental issues, including climate change (ANČIĆ and DOMAZET, 2013). This in itself might be considered a clarion call for the scientific community, especially that of young researchers, to play its social role in interpreting the material threats and their connection to social structures. I will begin to explore some preconditions of this issue in this paper, reporting on research into climate change perception and the extent of anthropocentric orientation among an important social group in Croatia, researchers aged 26-45 employed in the Croatian public academic system.

In the context of this paper, it is important to explain Milbrath's (1984) concept of dominant social paradigm (DSP) defined as '... the values, metaphysical beliefs, institutions, habits, etc. that collectively provide social lenses through which individuals and groups interpret their social world' (p. 7). As Cotgrove (1982) explains, a paradigm is not made dominant by virtue of being held by the majority of people in society, but only by virtue

of being held by the dominant groups who use it to justify the prevailing institutions, A paradigm, thus, becomes a justification for social and political action by the group, and as such functions as ideology (KILBOURNE 2002, p. 194). Following Ulrich Beck's and his view that state, business and science in powerful interplay shape modern societies (1995), Kilbourne et al. (2002) argued that the relevant dimensions of DSP for the environmental context are political, economic, and technological. They proposed and tested batteries related to those three (as they call them) socioeconomic dimensions of the DSP, linking these to environmental attitudes. They have observed those socio-economic dimensions in the context of modern capitalist democracies, and found that the significant dimensions of a paradigm are faith in science, technology and economic growth, as well as support for laissez-faire government[1]. Their empirical study found that environmental attitudes of individuals are directly influenced by their attitudes towards the DSP. Their analysis showed that the combination of citizens' support for liberal democracy and self-interest expressed through economic rationality and technological optimism is inversely related to the measure of their environmental concern and to their willingness to engage in pro-environmental behaviour (KILBOURNE et al., 2002: 202-203). Following approach on socioeconomic dimensions of DSP explored by Kilbourne and associates, our analyses on ISSP 2010 dataset for 17 EU countries (16 members and Croatia as a candidate) have shown that nation-states whose citizens are *less* supportive of liberal democracy and self-interest expressed through economic rationality and scientific optimism, are *more likely* to express environmentally sustainable orientations (BRAJDIĆ VUKOVIĆ, 2014). This is because such societies (nation-states) are more likely to perceive environmental risks and are more in favour of pro-environmental behaviour (ibid.)[2].

1 Killbourne et al. (2002) have defined the dimensions as a) political: the normative framework of liberal democracy, with the focus on freedom of the individual, private property and limited government; b) economic dimension: defined also from the liberal democracy perspective, with self-interest expressed through economic rationality as generally considered as being the sole motivator of behaviour, it is also defined through the belief that economic growth will solve short-term inefficiencies of free markets; c) technological dimension: defined as general character of technological optimism and technological politics, a belief that technology can and will solve problems when they become severe.

2 It this research, environmental risks were measured as perception of environmental risks such as air pollution caused by cars, or industry, pollution of rivers etc. Pro-environmental behavior was measured as intention to sort glasses for recycling, cut back on driving car, save or re-use water etc. (see BRAJDIĆ VUKOVIĆ, 2014).

In this paper, I propose to also examine perceptions of climate change risks, but instead of using the socioeconomic domain of the DSP, the paper will focus on the 'cosmological' domain, which represents the highest level of DSP values and which relates to the so-called 'anthropocentric-ecocentric dualism' (KILBOURNE et al., 1997). Using the causal model of environmental concern proposed by Stern, Dietz and Guagnano (1995), research by Kilbourne et al. (1997) has pointed out that values (as the basic conceptions about life that underlie an individual's behaviour) form a point of intersection between the individual and society. Values include external social-centred aspects of an individual and they are effective as guiding principles established by a social environment. Through their values, individuals orient themselves in their environment and adapt to it (ibid.). The essential feature of the anthropocentric dimension of the cosmological domain is the belief that humans are separate from, and ethically superior to, the rest of nature. As a result, humans consider themselves to rightfully be the masters of nature and to be entitled to subdue it for their own instrumental purposes. Through such a demystification of nature, as well as through scientific and technological development, the manipulation and exploitation of nature by humans are assured and result in 'the death of nature' (MERCHANT, 1980 in BECKMAN, 1997). The opposite position to anthropocentrism is ecocentrism which considers nature to have inherent value regardless of its usefulness to humans (SHRIVASTAVA, 1995; PURSER, PARK and MONTUORI, 1995; THOMPSON and BARTON 1994). As research has shown, countries whose citizens exhibit the lowest levels of anthropocentric values express higher levels of environmental concern (BECKMAN et al. 1997), proving that the cosmological (together with the socioeconomic) value-domains of the DSP are important when researching pro-environmental concern and behaviour.

The explanation of why we will use cosmological domain of DSP in presented analyses lies in the fact that this research has had as primary respondents the very actors that are, in the view of Milbrath and its successors, together with politicians responsible for the social lenses that are used in interpreting the social world by ordinary citizens. Those are scientists, and in our research – next generation academics, youngest cohort of thinkers and lens providers. Here, because they are (as hypothesised by Milbrath and successors) creators in a way, together with the politicians, of the DSP expressed by ordinary citizens, we are concerned about their values linked directly to climate change, but also their cosmological position. However, can we talk about scientist and groups of scientists, objective and rational, as having special type of values that influence their worldview? Certainly so. Social studies of science and technology have long pointed out that leaving out 'the social' from examinations of science and technology as professions and as systems of knowledge generation and application, has

been detrimental to science and technology as well as the society as a whole (SHAPIN, 2009). Karin Knorr Cetina's (1999) work on the epistemic culture of scientists has shown that cultures in different disciplines structure their knowledge-work by defining what is relevant and what is tangential or irrelevant. Cultures structure what it means to think like a scientist in a particular discipline; and what it means to behave, write and speak like a scientist (KNORR CETINA, 1999, 2007, 2009). Much research has shown that the cultural characteristics of scientific disciplines shape the social relations and cognitive preoccupations of scientists working in a given field, meaning that cultural differences are one of the most important factors of disciplinary differences and boundaries. For this reason, when scientists from different disciplines approach a particular issue (for example, the problem of climate change), their approach is likely to reflect their specific disciplinary culture and worldview. In analyses presented in this paper, we place values of young researchers that relate to climate change concern, and anthropocentric dimension of the cosmological domain, in the spotlight. By using the so-called 'cosmological' domain to understand the underlying values of the dominant social paradigm, we intend to question indirectly the values of disciplinary cultures into which young scientists are socialized. Also, in science and technology studies, the coin "technoscientific" represents the conflation of science and technology in everyday life objects and the difficulty of contemporary society to distinguish science from technology (LATOUR, 1987; ARONOWITZ and DIFAZIO, 1994; HARAWAY, 1997). Technoscience exceeds science and technology – it is bigger than the sum of parts (HARRAWAY, 1997) and the term also "designates the state of affairs, (time and place – in this case Western industrial societies in the early 21st century) in which intellectual problems of the day become increasingly dominated by technical and mechanical considerations and often, solutions" (ERICKSON, 2005: 10). It also represents context in which technoscience is also a language and a grammar that we are using to describe the world around us and ourselves within the world (HARRAWAY, 1997: 3). Therefore, we also propose that the values of young researchers represent not only the culture of their discipline, but also the place of their discipline in the wider technoscientific (and therefore also socio-political) context.

2. Method

This paper deals with the role of science and technology in society by analysing the attitudes and values of scientists regarding a phenomenon that is both a global societal issue and a significant threat to the survival of living beings on Earth: climate change. In order to answer the research question, data from two surveys conducted in Croatia are used. The pri-

mary source of data relates to an online survey carried out in 2014 on a representative sample of 215 young researchers employed in the Croatian academic system (aged 26 to 45, with a median age of 33), from all scientific disciplines. At the time the survey was carried out, around 37% of respondents were research/teaching assistants (doctoral candidates), around 43% were postdoctoral researchers and around 20% had permanent/tenured positions. The secondary source of data used is an *International Social Survey Program* (ISSP) (module: Environment) carried out in 2010 on a representative sample of 1000 respondents through face-to-face interviews. This survey was used as a supplementary data source to analyse the attitudes and values of the general population in Croatia. For the purpose of our analyses, the answers of those respondents belonging to the same age group as the young researchers in the first survey were extracted, which resulted in a sub-sample of 362 respondents aged from 26 to 45.

INSTRUMENTS AND PROCEDURES

Discipline is a variable based on the question of the scientific discipline, field and subfield within which the respondents mostly carry out their research. The responses were recoded into four main discipline combinations: (1) social sciences and humanities; (2) natural sciences; (3) biomedical sciences and health; and (4) technical and biotechnical sciences.

The *climate change concern scale* is constructed based on the following questions and statements:

- 'Do you think that a rise in the world's temperature caused by climate change is [...] for the environment?' (with responses ranging from 1 ['not dangerous at all'] to 5 ['extremely dangerous']);
- 'The impact of climate change on Croatia by 2050 will be ...' (with responses ranging from 1 ['extremely positive'] to 5 ['extremely negative']);
- 'Climate change in this century is primarily caused by humans' (with responses ranging from 1 ['completely disagree'] to 5 ['completely agree']).

These three variables are highly saturated on one factor (65% of variance explained, .81 average factor loading). Cronbach's alpha for those three items is .73 and ranges from .58 in biomedical and health sciences to .79 in the natural sciences, with the mean inter-item correlation being on average .47. An additive scale is constructed, according to which a higher result means a greater climate change concern.

The *climate change mitigation variable* is left out of the climate concern scale but is nonetheless indicative, and it is based on the question 'Is Croatia doing enough to fight climate change?', (with responses ranging from 1 ['more than enough'] to 3 ['not enough at all']). This political dimension is important contribution to assessment of the attitudes among researchers as important actors in shaping of social lenses employed by general population (MILBRATH, 1984; and 1. Introduction above).

The *anthropocentric worldview composite* is constructed based on the responses to the following statements:

- 'We worry too much about the future of the environment and not enough about prices and jobs today ' (with responses ranging from 1 ['completely disagree'] to 5 ['completely agree']);
- 'Other living beings on the planet (plants and animals) exist mainly for the benefit of human race' (with responses ranging from 1 ['completely disagree'] to 5 ['completely agree']).

Those two variables are highly saturated on one factor (66% of variance explained, .81 average factor loading). Cronbach's alpha ranges from .65 in the biotechnical and technical sciences to .59 in the natural sciences, with the mean inter-item correlation being on average .45. An additive scale is constructed, according to which a greater result means a more anthropocentric worldview.

3. Results and discussion

3.1. CLIMATE CHANGE CONCERN

As can be seen from Figure 1, young researchers from our sample can easily be said to be mostly very concerned about climate change, for sure. They are concerned about rising temperatures (mostly perceiving it as being very dangerous), they anticipate that the impact of climate change on Croatia by 2050 will be mostly negative, and they mostly agree that climate change in this century is primarily caused by humans. They also tend to hold the opinion that Croatia is not doing enough to fight climate change. Therefore, young scientists from all disciplines score very high on climate change concern scale (in average 12, out of highest concern being in 15).

However, we can also describe young researchers as a heterogeneous group regarding their attitudes towards different aspects of climate change concern, when attention is turned to differences between disciplines. As can be seen from Figure 2, young researchers in the biotechnical and technical sciences are significantly more sceptical (or less concerned) about the impact and consequences of climate change, especially com-

pared to natural scientists, who are the most concerned sub-group in the sample. The research results show that natural scientists are much more concerned and more critical regarding climate change and societal/governmental engagement in fighting the problem, when compared to engineering scientists. Biotechnical and technical scientists are not only far less concerned than natural and biomedical scientists, but they are also less concerned than social scientists and humanities scholars, groups that are expectedly less equipped to fully engage with climate change numerical models and their expectations. Biotechnical and technical scientists are least convinced that climate change in this century is caused by humans, least convinced that the impact of climate change on Croatia by 2050 will be negative, they least perceive that Croatia is not doing enough to fight climate change, and as a result score lowest on the overall climate concern scale.

FIGURE 1
Attitudes of young researchers related to climate change (attitudes and scale)

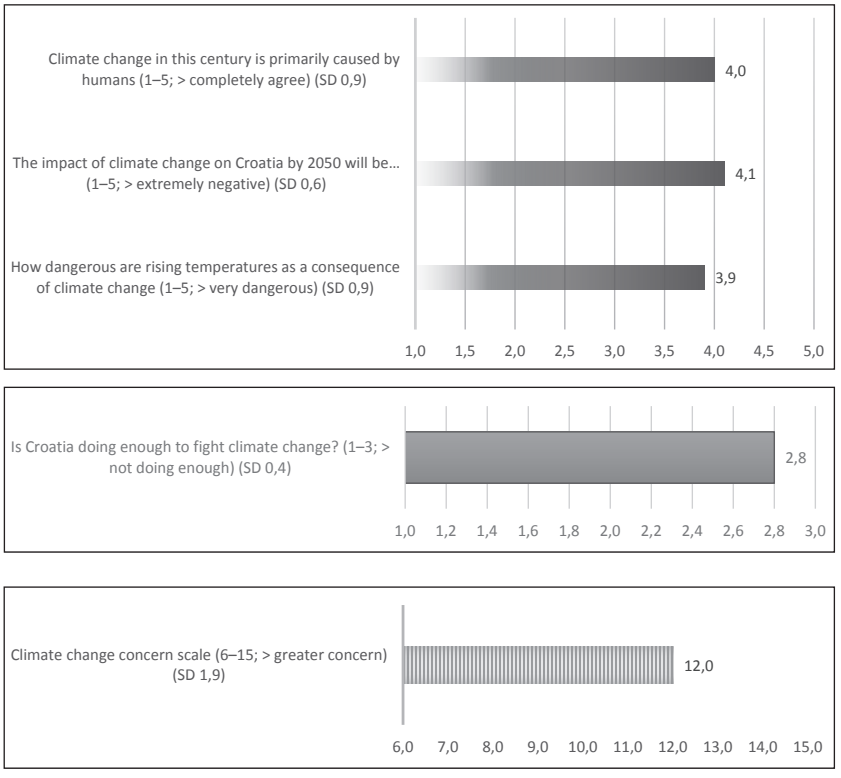
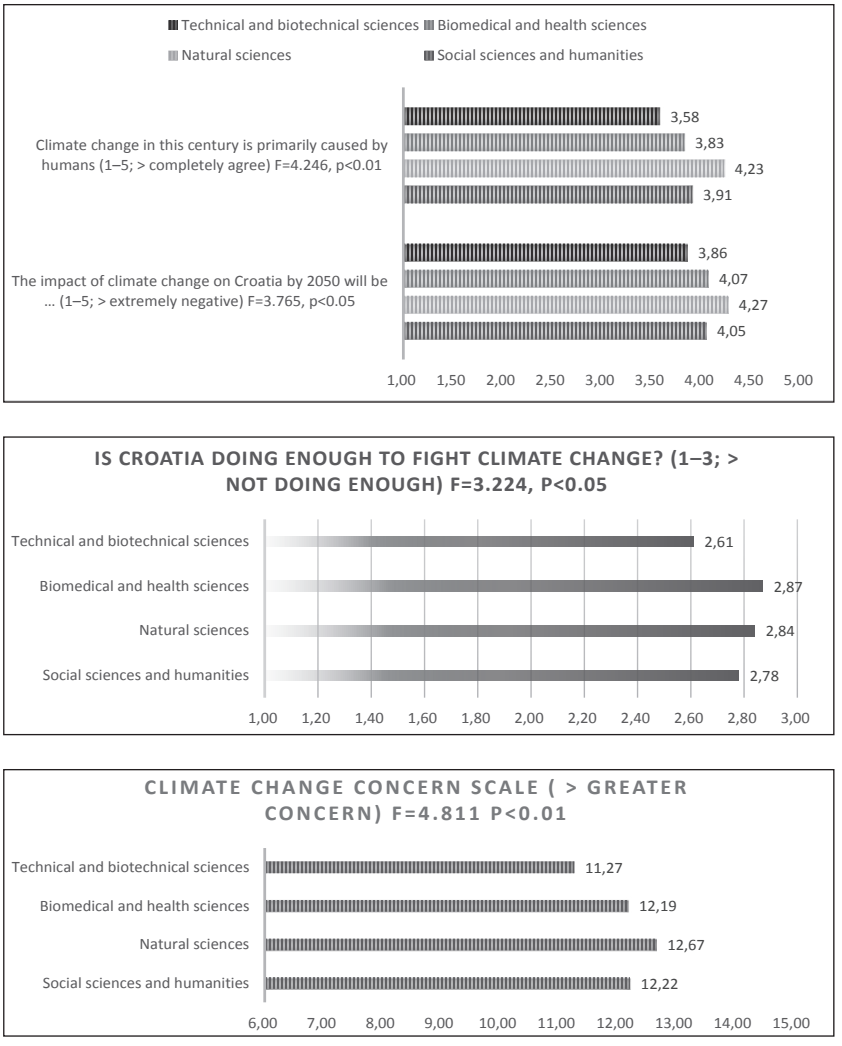


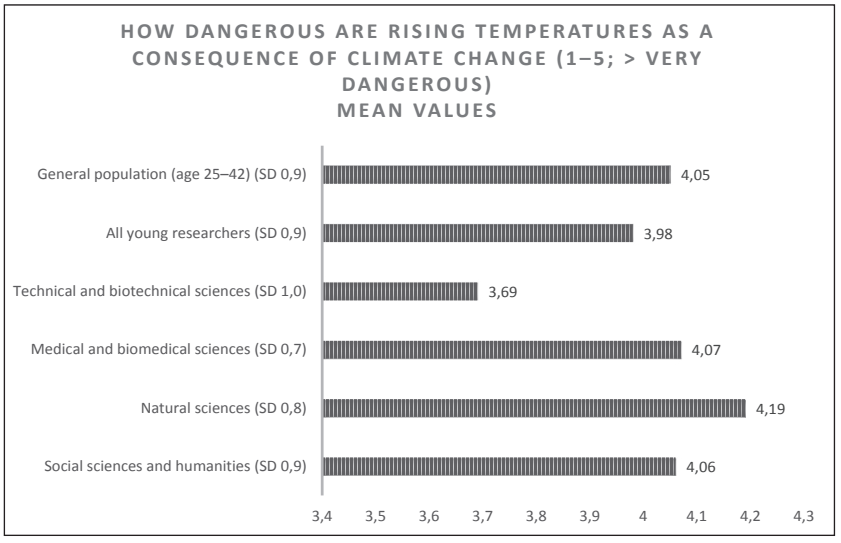
FIGURE 2
Disciplinary differences related to climate change concern (attitudes and scale)



Comparison of attitudes between general population and young researchers regarding the threat of climate change measured as perceived dangerousness of rising temperatures gave us another interesting insight. While there is no statistically significant difference between young researchers as a group and the general population (age group 25-42), there is a statistically significant difference between researchers from the biotechnical and technical sciences and the general population of their age group (F=3.679,

p<0.01). That is, for biotechnical and technical scientists, rising temperatures are perceived as far less dangerous than for the general population (that is, they are far less concerned about them).

FIGURE 3
Difference between researchers and the general population in levels of concern related to rising temperatures due to climate change



Ehrlich et al. (1995 in Bandura, 2007) have argued that:

> 'Environmental degradation of human origin stems from three major sources: population size, the level of consumption; and the damage to the ecosystem caused by technologies used to supply consumable products and to support a given lifestyle' (p. 9).

Technical and biotechnical sciences are directly linked to the supply chain. They solve many problems in everyday modern life, but also support a modern lifestyle that is mostly oriented towards consumption. This path is described as being a part of globally dominant structure of social metabolism that is seen as thoroughly unsustainable (GROSS and TELESIENE, 2017). Therefore it is immensely important to understand difference between disciplines in climate change concern but also attitudes of technical and biotechnical sciences in the context of their 'lay public' age group. Because of that, our further analyses aimed at unmasking of factors that are behind the instrumental value and the perceived role of sciences in modern socie-

ties, to reveal personal values and attitudes, beliefs that are always hidden under the cloak of the supposedly value neutral science.

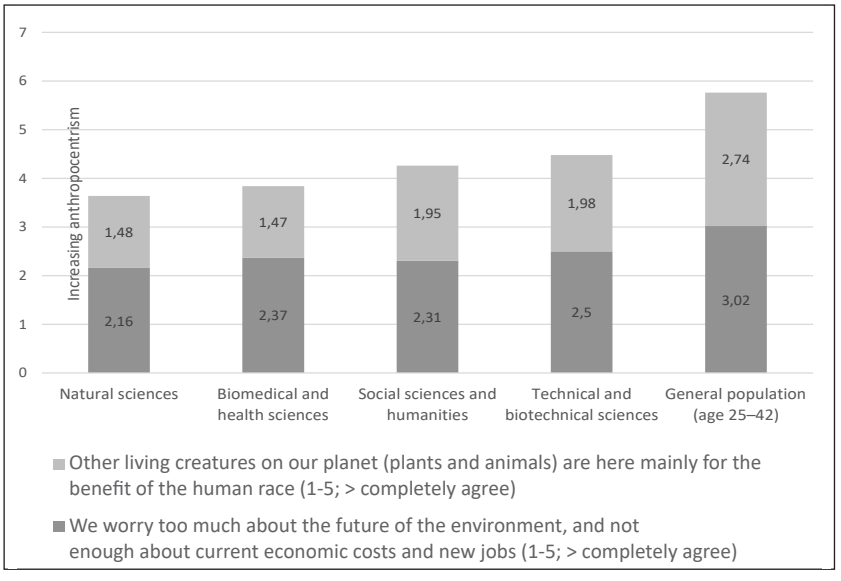
3.2. ANTHROPOCENTRIC WORLDVIEW

In our next presented analyses, we were interested in values of the cosmological domain of DSP as measured by our anthropocentric composite (see Instruments and procedures in 2. Method). As Figure 4 shows, young researchers differ significantly to the general population in their age group concerning both attitudes related to the anthropocentric orientation. Although young researchers in general are significantly less anthropocentric than the general population ($t=10.735$, $df=575$, $p>0.000$), this attitude is not equally spread among young researchers' academic disciplines, especially when they express their attitude related to the role of other living creatures on the planet. Once again, the results show significantly different attitudes between young researchers in the natural sciences, on the one hand, and in the biotechnical and technical scientists, on the other ($F=4.199$, $df=3$, $p>0.010$), the latter being much more likely to perceive other living creatures as existing mainly for the benefit of the human race. Although there is no significant difference between researchers from different disciplines regarding the trade-off between economy and environment ($F=.920$, $df=3$, $p>0.423$), Figure 4 shows that young researchers from the biotechnical and technical sciences are most likely to hold the opinion that there is too much concern about the environment and insufficient concern about the economy and jobs. Therefore, when combined in the composite (see Instruments and procedures in 2. Method for more info), it is no surprise that there are significant differences regarding the prevalence of the anthropocentric worldview between researchers in the natural and (bio)technical sciences ($F=2.763$, $df=3$, $p>0.050$), with the latter being most anthropocentric of all researchers (although in this case they are less so than the general population in their age group).

Spangenberg's (2005) research on the different normative framings of the knowledge society can provide a useful framework for analysing the ideological positions of different disciplines. Spangenberg (ibid.) argues that there are two forms of normative framing of the knowledge society. The first is the (neo)liberal framing, which suggests that public funding should be decreased in all areas and that the free market (along with the free expression of individual preferences) should define the further trajectories for technology and its societal applications. In the second framing, although the market is perceived as a powerful and indispensable institution for optimisation, the institutional framework for defining the orientation of technology is society itself, expressing its preferences through the politi-

cal mechanism of the state (ibid.: 87). Based on these normative framing differences, it is not unexpected that those disciplines that are more oriented towards market and economic ties at large in a way through analysed trends least oppose the dominant (neo)liberal mode of science and the dominant technology supply framework. And it that sense; in terms of sciences being one of most important lens providers regarding dominant social paradigm (DSP) expressed by general population (KILBOURNE 2002) and having in mind economic and political power of bio-technical and technical sciences in modern western democracies; it is not surprising that those sciences are most in favour of the attitude when comparing to the sample of their 'lay' age group. Similar interesting finding is, of course, how close to those views are researchers from social sciences and humanities.

Figure 4
Anthropocentric worldview, comparison between disciplines and with the general population sample

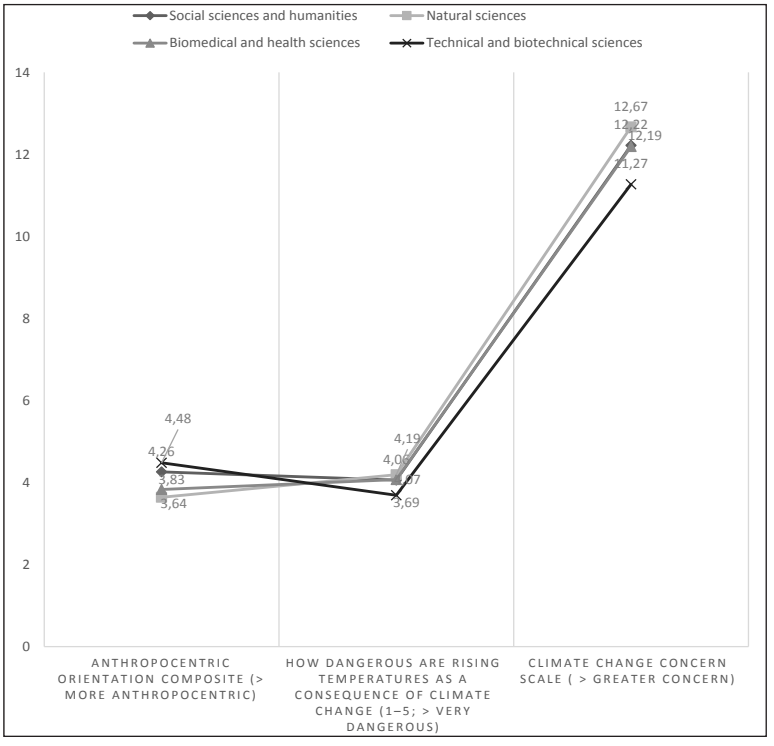


3.3. RELATIONSHIP BETWEEN THE CLIMATE CHANGE CONCERN AND ANTHROPOCENTRIC WORLDVIEW

Last but not least, we explored the relationship between anthropocentric cosmological domain of DSP and climate change concern. The relationship between anthropocentric composite and climate change concern is statistically significant and negative, that is, when respondents are more in favour

of anthropocentric worldview, they express less climate change concern. Also, they are much less inclined to perceive temperature rise because of climate change as dangerous. As can be seen from Figure 5, this relationship between climate change concern scale and anthropocentric worldview is obvious on the level of different disciplines.

FIGURE 5
Disciplinary differences related to climate change concern and anthropocentric worldview



Pattern of relationship can be easily discerned from the Figure, biotechnical and technical sciences score highest on anthropocentric worldview and lowest on climate change concern and perceived dangerousness of temperature rise, while natural sciences exhibit somewhat different trend.

As already mentioned, many authors have pointed out that technical (and biotechnical) sciences, along with their technological outreach, have a special place in the political framework and everyday functioning of Western democracies (and beyond). The engineering profession is an important locus of power relations in modern states. As Cech (2014) points out:

> 'The complexity of large technological systems has long since moved beyond the ability for them to be fully regulated by the democratic process ... the domination of large, centralized, hierarchical institutions has coincided with the growing importance of large-scale technical systems, systems far too complex to be governable by ordinary citizens.' (p. 65)

The influence of engineers in society is therefore unprecedented, but so is their societal responsibility — a point that is too often overlooked. This is especially the case for engineering scientists, in the socializing and political terms, the influential career within the disciplinary culture of engineering. Beck (1992) strongly emphasised this point in his work on risk society, by underlining role of engineers in society as the complexity of large sociotechnical systems continues to expand, the lay public in such context is increasingly reliant on engineers to be public welfare watchdogs. The question, however, is whether engineers are indeed public welfare watchdogs. In her recent and influential work, Cech (2013, 2014) has found that engineers at US universities are socialised through their higher education in what she describes as a 'culture of disengagement'. According to Cech the culture of disengagement has three underlying ideological pillars: depoliticisation; a technical/social dualism; and meritocracy. The ideology of depoliticisation, according to Cech (2013), is the belief that engineering can and should be disconnected from social and political concerns because such considerations may bias the otherwise 'pure' engineering practice. Furthermore, according to Faulkner (2007), by applying a dualistic 'technical/social' ideology, engineers make a cognitive separation of technical and social competencies (such as those related to public welfare) in a way that devalues the latter. In this way, the most valued regimes of engineering work are therefore those that allow engineers to bracket social considerations most extensively. Last, but not least, the third pillar of the culture of disengagement in engineering is the ideology of meritocracy, which is the belief that social advancement structures are fair and just. It refers to:

> 'the assumption that those who succeed do so because of their hard work and dedication while those who do not succeed lack such hard work and dedication and thus deserve their disadvantaged status' (Young 1994; McCall 2013, cited in CECH 2014, p. 49).

All these elements inform the disciplinary culture of engineers, shape the way they practice their discipline and influence their way of thinking, by demonstrating what it means to be an engineer and how engineers are expected to think and act. Because they display an anthropocentric world-

view and a lack of concern about climate change, and those can be viewed as as a proxy of societal concern, we can say that we find elements of a culture of disengagement in the values and preferences expressed by the young engineering scientists analysed in this paper — which is a worrying finding.

4. Conclusion: epistemic cultures and disciplinary viewpoints: a 'culture of disengagement' or 'how to matter and not just want to matter'[3]

Let us start with the brief review of limitations of our study. There is no reason for us to assume that young researchers in Croatia would differ substantially or be more parochial in terms of their disciplinary values when compared in an international context. This is especially the case since our sample consists of young researchers that are significantly more oriented towards the international community then researchers from the same age group were 10 years ago, irrespective of scientific discipline: the number of international publications and projects are significantly higher today in all disciplines (as further results in the research project show[4]).

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3 The citation is from Dona Haraway's piece „Tentacular Thinking: Anthropocene, Capitalocene, Chthulucene" available here http://www.e-flux.com/journal/75/67125/tentacular-thinking-anthropocene-capitalocene-chthulucene/ (15.09.2016.). It is from the part of the text that says: „A complex systems engineer named Brad Werner addressed a session at the meetings of the American Geophysical Union in San Francisco in 2012. His point was quite simple: scientifically speaking, global capitalism "has made the depletion of resources so rapid, convenient and barrier-free that 'earth-human systems' are becoming dangerously unstable in response." Therefore, he argued, the only scientific thing to do is revolt! Movements, not just individuals, are critical. What is required is action and thinking that do not fit within the dominant capitalist culture; and, said Werner, this is a matter not of opinion, but of geophysical dynamics. The reporter who covered this session summed up Werner's address: "He is saying that his research shows that our entire economic paradigm is a threat to ecological stability." Werner is not the first or the last researcher and maker of matters of concern to argue this point, but his clarity at a scientific meeting is bracing. Revolt! Think we must; we must think. Actually think, not like Eichmann the Thoughtless. Of course, the devil is in the details — how to revolt? How to matter and not just want to matter? "

4 In the forthcoming article Brajdić Vuković, M. „Career rewarding networks of young researchers: gendered strategies and outcomes", results that are presented for example show that comparing to publication record in 2004 for the same age-group, young natural scientists have in average 18 international publications while then they were having 9 publications in average. Case is the same when we talk about international projects, while in 2004 average was about 1 project per young natural scientist, today average is 4 international projects per scientist.

For the small size samples, such is the one used in our study, one should be most concerned about biases in terms of representation of the population of the study, and therefore because of the proposed low variability, that it will be difficult to find significant relationships from the data (PRICE and MURNAN 2004). Although the groups of respondents are indeed rather small in our study, we do have a representative sample of young Croatian researchers from different disciplines, which reduces bias and improves statistical power of such small sized study. It is also shown in the very fact that although the sample was limited in size we have still found statistically significant variability, which leads to conclude that our research shows important trends in values and orientations of young scholars of different disciplines. Therefore, with the presentations of important trends our study calls for repetitions on larger sample sizes and, especially, calls for research with the help of different methodologies in order to untangle these observed phenomena in more in-depth and perhaps triangulating way.

Our most interesting findings are related to the fact that researchers in the technical and biotechnical sciences are significantly less concerned about rising temperatures due to climate change (even when compared to the general public). Our findings also show significant value differences related to cosmological domain of DSP, researchers form biotechnical and technical sciences also hold a more anthropocentric worldview compared to other scientists – especially researchers from natural science disciplines. It also seems that as a more anthropocentric worldview is expressed by an individual, his/hers climate change concern is lower, and he/she perceives the rise of temperatures because of climate change as less dangerous.

This paper's intention was not to criticise engineers and their values. Its intention was to highlight climate change and publicly supported action on mitigation and adaptation, as a key problem in creating societies whose development should be founded on sustainable uses of science and technology and on the promotion cohesion and equality within society. The results direct us towards one question: what does it mean in a practical sense if engineering scientists are the least concerned regarding climate change, and rising temperatures as its consequence, compared to other scientists and (as some trends show) even compared to the general public?

As Jasanoff (2003) has pointed out, environmental degradation caused by the use of science and technology does not just result in signs of disrepair, but it also results in increased vulnerability closely tied to socioeconomic circumstances. Namely, inequalities persist in the ability of different social groups and individuals to defend themselves against the risks posed by such disrepairs. The results of this research have shed light on the fact that scientists, both as individuals and as a group with a vital function in society, are under the influence of and share the cultural norms and values

of society as a whole, and in particular those of the disciplinary background, culture and community they belong to. This disciplinary belonging effectively acts as a proxy for accepting and perpetuating those values. However, what researchers do in their everyday profession (in the cognitive and practical subject of their research) and in their epistemic communities influences not only their cognitive approach related to science and technology, but also their general worldview. If this were not the case, we would not be witnessing such a sharp contrast between the values expressed by engineers and natural scientists about climate change concerns.

At the same time, however, the worldview of scientists and engineers influences their behaviour. The way in which they understand their public responsibility probably informs their future approach to the production of their techno-scientific artefacts and, in this way, they are directly involved in creating a sustainable or unsustainable knowledge society. This is especially the case for engineers, in a very practical and direct sense. Namely, as Verbeek has argued, 'technologies profoundly influence the behaviour and experience of users' (2006: 361), while Latour (1992) and Akrich (1992) have described technologies as virtually possessing a 'script' in the sense that they can prescribe the actions of actors involved. This unprecedented power and influence of technology can have positive outcomes for sustainability. For example, Spangenberg et al. (2005) talk about supply-focused science and technology, a system in which societal issues and concerns would lead to producing 'scripts' that would be most beneficial for society at large. The problem that needs to be tackled, though, in order for this to happen, according to the work of Cech, is changing of values of technical and biotechnical sciences by gradually making their culture more socially engaged. Cech has suggested that this problem can be tackled, if there would be enough of political consensus in the science and education sector, through education and bottom-up initiatives. Those initiatives should in concordance or, even better, a part of broader aim to establish goals through social and cultural change driving the (bio) technological sustainable solutions (JACKSON, 2009; KALLIS, 2011, etc.) Because of the urgency of the problem at the heart of this paper — climate change and its consequences — the proposed approach may not be sufficient to tackle the issue of social disengagement of engineers, but it should definitely be considered as a valuable starting point.

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‘Punished for a crime you did not commit’: climate (in)justice as understood by Kenyan civil society representatives

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1. Introduction

Wainwright’s (2011) review of books which offer sociological insights on climate change, published in 2009 and 2010, has a telling title: ‘Is Sociology Warming to Climate Change?’. The phrase ‘warm to’ has a clever double function: it suggests that although climate change has not been sufficiently addressed by sociology there are positive steps in that direction; and it reminds us that global temperatures on our planet are dangerously rising[1]. In an article with a less ‘catchy’ title, ‘The sociology of global climate change’, Zehr (2015) classifies existing sociological work on climate change into four areas: the social causes of climate change, sociological studies of the construction of climate change as an environmental problem, studies connecting climate change to social inequality and sociological studies of mitigation and adaptation. Our own contribution to this volume explores the relationship between social injustice and climate change.

As Zehr (2015) has pointed out, sociological research on social inequality and climate change has focussed on the unequal sources and distribution of environmental ‘bads’ and ‘goods’ between the Global North and Global South and across divisions of social class, race, ethnicity, age and gender.

1 According to the latest report by the Intergovernmental panel on climate change (2014), the period from 1983 to 2012 was ‘very likely’ the warmest 30-year period of the last 800 years in the Northern Hemisphere (2014, 40).

The term 'environmental justice' has been used to encapsulate similar concerns since the 1970s and 1980s, when scholars noticed that marginalised communities were disproportionally affected by environmental disasters. For Ascelrad (2010), the concept of 'environmental justice' expresses a re-signification of environmental issues by connecting them to socio-political dynamics traditionally associated with social justice debates[2]. According to Pellow and Nyseth Brehm (2013), environmental justice studies have tended to document how the poor, women, older people or indigenous communities, for example, are affected by environmental threats such as landfills, mines, incinerators and polluting factories. The term 'climate justice' has been used more recently to emphasise how climate change more specifically enhances global and local inequality[3]. Our interest has been to explore how people understand climate (in)justice. In particular, we have been curious about how climate (in)justice is understood by people living in a Global South country.

Our contribution opens with a section briefly sketching the dominant theoretical approaches to social justice and the ways in which these have been translated into climate change concerns. This is followed by an outline of our research study. The central question that we ask - 'How do people working on climate change issues in Kenyan civil society organisations understand climate justice?' - is answered in subsequent findings sections. Our central question reveals two important aspects of our research endeavour. First, our normative justice lens goes against what Gewirtz (1998) identifies as three problematic approaches in social research: 'a sceptical postmodernist denial of the tenability and desirability of universalistic principles'; 'an uncritical, problem-solving orientation'; and 'a commitment to value-free research' (1998, 469). We are both committed to a climate justice agenda and, in the tradition of many critical scholars such as Bourdieu (1988), suspicious of sociologists who claim that their research is politically disinterested. Secondly, by exploring how people in a Global South country understand climate (in)justice, we wish to emphasise the value we attach to 'the ethic of otherness' and the im-

2 For Ascelrad (2010), in the case of Brazil the struggle for environmental justice involves the defence of culturally specific environmental rights (traditional communities located at the frontier of expanding market activities), the defence of rights to equitable environmental protection from socio-territorial segregation, the defence of rights to equal access to environmental resources, and opposition to the concentration of fertile land, water and safe grounds in the hands of powerful economic interests (2010, 114).

3 For a discussion of the relationship between environmental and climate justice see Schlosberg and Collins (2014).

portance of listening to the concerns of those most affected by climate injustice in global terms.

2. Theorising climate (in)justice

To 'do justice' to the vast literature on theorising social justice, with an emphasis on how this literature has been translated into discussions of climate change, requires an elaborate undertaking. The debates in the literature are manifold, ranging from the ways in which social and climate justice are conceived (as uni- or multi- dimensional for example) to the level at which they are conceived (global, national or local). Although such an undertaking goes beyond the ambitions of this chapter, in order to theoretically situate our research we briefly sketch some of the approaches to social and climate justice, concluding with our own approach.

The fair distribution of goods in society has been a central social justice concern. Underlying it is a recognition that goods are unevenly distributed between, for example, the rich and the poor or the Global North and Global South. For authors such as Walker (2012) and Gewirtz (1998), this 'distributional' concern is the 'conventional' understanding of social justice, often taken as synonymous with it. Similarly, Fraser (1996, 3) has observed that egalitarian redistributive claims 'have supplied the paradigm case for most theorizing about social justice for the past 150 years'. Authors such as Gewirtz and Fraser endorse a broader understanding of social justice. Gewirtz (1998) endorses what she refers to as the 'relational' dimension of social justice, which encapsulates the ways in which relations of power - economic and cultural - are distributed in society. For Fraser (1996) the socio-economic axis of (in)justice, exemplified by economic exploitation, marginalization and deprivation, needs to be theoretically expanded with a cultural axis which incorporates the recognition and respect of cultural identities such as gender, ethnicity or sexuality[4]. In her later work, Fraser (2009) elaborates another dimension in her conception of justice: the political dimension. This dimension brings into focus political representation and questions 'whose voice is being heard' at the national and global level.

'Distribution', 'recognition' and 'representation', addressed rather abstractly in the previous paragraph, have concrete adaptations in discussions on climate change. Popke, Curtis and Gamble (2014) summarize these as

4 For Fraser (1996), cultural injustice is manifested in examples of cultural domination (being subjected to patterns of interpretation and communication associated with a culture that is alien and/or hostile to one's own), nonrecognition (being rendered invisible by the authoritative representational practices of one's culture) or disrespect (disparagement in stereotypical public cultural representations).

follows: distributional justice refers to the extent to which environmental assets or risks are equitably distributed with the observation that the world's poorest people in the most disadvantaged regions are more likely to bear a disproportionate share of climate change impacts, although they have contributed much less than others to 'increased greenhouse gas emissions that are driving human-induced climate change' (2014, 2); recognition, on the other hand, refers to the extent to which vulnerable communities affected by environmental hazards are acknowledged and have the status, legitimacy and respect to be able to represent their interests and positions; and finally, procedural justice requires the openness and inclusivity of policy and legal processes that shape environmental outcomes. In terms of the latter, as Preston et al. (2014, 14) put it: 'Procedural justice is largely concerned with the fairness and transparency of the processes used to make decisions about societal goals, i.e. 'who decides' and 'who participates' in decision-making processes'. This 'trivalent' approach to climate justice has been theoretically elaborated by Schlosberg (2012) who advocates for a capabilities approach to justice as a way of addressing 'a range of concerns brought by climate change – from distribution of vulnerability; to recognition of people, places, and their relationships; to a number of threatened basic rights' (2012, 452).

Preston et al. (2014, 3) have defined climate justice as being about ensuring 'both collectively and individually, that we have the ability to prepare for, respond to and recover from climate change impacts and the policies to mitigate or adapt to them by taking account of existing and projected vulnerabilities, resources and capabilities'. 'Distribution', 'recognition' and 'representation' are all integral to this. Authors writing on climate justice differ with regard to which of these they focus on. Barker, Scrieciu and Taylor (2008), for example, focus on distributional justice, emphasising that affluent individuals and groups 'may avoid much of the consequent harm by relocation and by other means of private protection' (2008, 318). They single out poor rural communities as having comparatively no responsibility for greenhouse gas concentrations and yet being at risk of suffering most from climate change because of floods and droughts. Parks and Roberts (2010), on the other hand, highlight procedural justice challenges by seeking to answer why North-South climate negotiations have not produced substantial results. Whereas these authors discuss the global dimension of climate justice, Bulkeley, Edwards and Fuller (2014) situate climate justice concerns in the city, arguing that 'despite the parallel expansion in scholarship which has examined questions of climate justice at the international scale, to date there has been relatively little scholarship that has considered questions of climate justice at the scale of the city' (2014, 31). Drawing on Fraser's work, they advocate a 'multivalent' concep-

tualization of climate justice that includes issues of 'cultural recognition' alongside distribution and representation, criticising scholarship with a 'predominantly distributive mindset, albeit one engaged with procedural justice' (2014, 32).

Barrett (2013) has made the point that theoretical debates over climate justice are far more frequent than empirical analyses. As already mentioned, our research ambition was to explore how people working on climate change issues in Kenya understood climate justice. We wanted this to be a grounded process, so it was only during our analyses of interview data that we engaged with how their responses fitted with existing social and climate justice theory. We found that for our study participants climate justice was both a global and local matter. It is also a question of distribution, recognition and representation, and the work of Fraser (1995, 1996, 2009) and climate justice researchers working with her analytical framework (e.g. Schlosberg 2012) helped us notice these dimensions in their responses. Interestingly, however, their answers at times resisted the analytical separation of these categories, an issue which has theoretically been recognised by Fraser (1996, 2009). We acknowledge that Fraser's work has not been without its critics (see OLSEN 2008); however, we have found her discussion of social justice and its translations into climate justice literature a useful lens through which to interpret our findings.

3. The research study

The research reported in this paper was carried out as part of the *EcoFair Trade Project* funded by the European Commission. It involved a month-long stay in Nairobi, Kenya, in August 2014, during which time eight representatives of civil society organisations (CSOs), whose work engages with climate change issues, and one representative of an inter-governmental organisation, which was formerly a CSO dealing with climate change related work, were interviewed. The broader question guiding the study was how the causes and consequences of climate change were being understood in a Global South context. A particular focus was on the consequences of climate change for food security and how questions of justice were understood in relation to climate change.

The semi-structured interviews were conducted with three women and six men working at the following organisations: Kenya Climate Justice Women Champions, African Centre for Technology Studies, Heinrich Böll Stiftung – East & Horn of Africa, Hivos (Humanist Institute for Cooperation), Green Africa Foundation, Kenya National Farmer's Association, Consumer Unity & Trust Society – Africa Resource Centre, Kenya Climate Change Working Group and Kenya Young Greens. Eight interviews were

conducted in Nairobi and one in Kikuyu. The interviews, which on average lasted for one hour, followed a protocol consisting of six sections. In the first part of the interview participants were asked to introduce their organisation. This was followed by sections exploring how well study participants felt climate change issues were represented in the Kenyan political sphere and the media, how they understood the causes of climate change, its consequences and their distribution, what they thought of existing mitigation and adaptation strategies and interventions and how they saw the future of Kenya in a context of climate change risks. Beyond these sections, which contained specific questions, participants were also asked questions which were prompted by their responses. All of the interviews were audio recorded, transcribed and then coded inductively. Initial codes were grouped into thematic categories which were then, where possible, further grouped into distributional, cultural and political dimensions of justice.

Aside from such technical details, our study has been inspired by a qualitative research tradition that includes 'voiced' research, an approach which seeks to reinsert 'opportunities of expression that have been expunged because dominant visions hold sway' (SMYTH and HATTAM 2001, 407). As Smyth and Hattam (2001) have highlighted, who gets listened to is an artefact of power. Since the Global North represents the 'dominant vision' with regard to climate change, our project of talking to people in a Global South country has been to provide 'an opportunity of expression' to voices that are often globally marginalised. However, we recognise that within a Kenyan context listening to marginalised voices would have required us to talk to women on small farms or the homeless of urban centres, for example. Unfortunately, because of language barriers this was not feasible.

We provide many interview excerpts in the paper in order to give the reader a sense of the material we base our conclusions on. Pseudonyms have been used throughout in order to protect the anonymity of our interviewees. The ethics of research has been observed in other ways too: informed consent was obtained from all of our study participants; they were told about the study, their permission to audio record the interviews was obtained, they were given the option not to answer questions they did not want to and to withdraw from the interview at any point.

We have organised our findings in three main sections, which are preceded by a section briefly outlining the manifestations and consequences of climate change in Kenya as the broader context of our study.

4. Climate change in the Kenyan context

In 2013, the Government of the Republic of Kenya released its first climate change policy: the 2013-2017 National Climate Change Action Plan, which lays out adaptation and mitigation actions aimed at supporting Kenya's development along a low-carbon climate-resilient pathway. According to the document, 'the evidence of climate change in Kenya is unmistakeable' (2013, 2): prolonged droughts, frost in some of the productive agricultural areas, receding lake levels, drying of rivers and other wetlands. Whereas some regions are described as experiencing frequent droughts, others experience severe floods. The document makes the point that 'extreme and harsh weather is now the norm' (2013, 2) and that there is 'scientific evidence that the frequency of droughts, floods, and other extreme climate events has increased in recent years' (2013, 4).

Such observations correspond to what our study participants had to say about what they understand to be the local effects of climate change. Importantly, our study participants use a climate change discourse in order to frame their experience of changing weather patterns. As an experiential response to climate change deniers, Eugene makes the following interesting point:

> 'Africa has never questioned the science on climate change; that is actually one of the most interesting things…because its effects I think have been felt here earlier.'

These effects, according to our interviewees, include distorted seasons, the unpredictability of dry and rainy periods, droughts and floods. Two of our participants, Melanie and Oliver, describe the changes as follows:

> 'the weather you are seeing is not what used to happen in Kenya. In August you would have sunshine that is strong. Early August, even September, and the rains would come in October. But now the rain actually starts in August. So, the weather patterns have actually changed. The other thing is the droughts. They never used to be as frequent as they are at the moment. And also the issue of floods'. (Melanie)

> 'When it rains, it really rains a lot until we have floods'. (Oliver)

The consequences of such weather conditions are manifold. In particular our interviewees emphasized food insecurity. Traditional crops seem to be suffering from unpredictable rain patterns: 'you plant maize it fails, you plant maize again, it fails again' (Ken). Food production is identified as a major problem, but so is food distribution. The health of humans and ani-

mals was identified as negatively affected; a higher occurrence of malaria was mentioned. Our study participants also spoke of climate migrations, from one rural area to another and from rural areas to urban slums, which were described as creating conflicts over natural resources. The impact of climate change on the country's economy was also highlighted; according to Eugene, climate change is costing Kenya around 2% of its GDP[5].

Such consequences have also been mentioned in Kenya's Climate Change Action Plan (GOVERNMENT OF KENYA 2013). The document makes reference to adverse impacts on food security, particularly since the country depends on rain-fed agriculture for food production; displacement of communities and migrations resulting in conflicts; and widespread disease epidemics. The negative effects on Kenya's nature-based tourism industry and hydro-power-dependent energy sector were also pointed out. Finally, along the lines of Eugene's comment noted earlier, the document states that the 'continued annual burden of the extreme climatic events could cost the economy as much as US$500 million a year, which is equivalent to approximately 2.6% of the country's GDP' (2013, 5).

It is against this dramatic background that the following sections address climate (in)justice.

5. Distributional injustices: the Global North-Global South divide

According to Preston et al. (2014), theoretical literature on climate justice has tended to focus on the unequal distribution of responsibility for carbon emissions between nations, particularly in terms of the Global North-Global South divide. This 'spatial' aspect of climate injustice[6] also dominated in the responses of our participants who interchangeably used terms such as 'Global North', 'Western', 'developed', 'industrialised' and 'Annex I' countries in order to signal different historical responsibilities for causing climate change. The USA was particularly singled out in their responses, as was the contribution of 'emerging economies'. Our participants also recognised the responsibility of their own country, albeit minimal.

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5 Since the interviews were conducted with representatives of civil society organisations working on climate change related issues, we assumed that they had knowledge of data related to climate change both in Kenya and beyond, and therefore this issue was not probed specifically in the interviews. Eugene's mentioning of the cost of climate change to Kenya is an example of a more specific reference to data, although our participants mostly talked about general trends.

6 For an informative and interesting discussion of the concept of 'spatial justice' see Soja (2009).

> 'Africa does not contribute that much to climate change. We do contribute and we need to do our part, but basically climate change emissions are from the North'. (Oliver)

> 'We know that they are major polluters, because of their industrialization. Because of them there is global warming, the weather patterns changing…even in developing countries there is also pollution, but it is negligible compared to what is coming from the industrialized countries'. (Christine)

> 'In terms of historical responsibility, the West has the bigger burden of responsibility…and Africa has responsibility, but minimal responsibility' (Eugene)

Eugene expands on the contribution Global North countries make to climate change by noting that their emissions do not only happen within their own borders. He cites examples of multinational companies who operate in Africa and makes the argument that Africa's contribution to climate change is even smaller if one takes into account the polluting operations of such multinationals[7]. The contribution of transnational corporations to climate change has also been recognised in the Bali Principles of Climate Justice (2002): 'climate change is being caused primarily by industrialized nations and transnational corporations' (2002, 1).

Curtis and Gamble (2014) have made the point that the world's poorest people are more likely to bear a disproportionate share of climate change impacts, although they have contributed much less than others. Similarly, Yamada and Galat (2014) open their article on Typhoon Haiyan in the Philippines with the assertion that 'Those who suffer from climate change are not responsible for producing it' (2014, 1). These assertions are poignantly captured in Mike's remark:

> 'And paradoxically also the greater effect is on the Global South. So it is kind of being punished for a crime you did not commit or you are less responsible for'.

According to our study participants, the hesitance of Global North countries to address the consequences of climate change and work on preventing its effects is a further dimension of injustice. The following interview excerpts illustrate this:

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7 It is worth noting that the profits made by multinational companies are also extracted from countries such as Kenya, although this was not discussed in the interview.

> 'The biggest contributors to the problem should bear a greater portion of responsibility for addressing the problem. That is just a matter of moral principle…It is also that they have a greater capability to do something about it, they have the capacity to do something about it. So, Africa doesn't just have a minimum contribution to the problem, it actually has a minimum capacity to actually address the problem. That doesn't take Africa off the hook completely, there are lots of things Africa can and should do.' (Eugene)

> 'Those countries need to do something, they need to recognize the fact that Africans are poor, they are not there yet, we are still developing. They need to support us. They are the polluters. (Oliver)

In scholarly work, Barker, Scrieciu and Taylor (2008) draw on a vocabulary of 'ethics', 'morality' and 'justice' to suggest that those who have been historically more responsible for the emission and accumulation of greenhouse gases in the atmosphere, i.e. developed economies, should bear the brunt of climate change mitigation action. Clearly, our informants would agree.

6. Recognising differences in vulnerability

Whereas the previous section focussed on inter-nation distributional concerns, this section explores intra-nation vulnerabilities, drawing attention to climate justice 'as an ideal that has multiple sites' (FISHER 2015). Intra-nation vulnerabilities are captured in the Bali Principles of Climate Justice (2002, 1) as follows: 'the impacts will be most devastating to the vast majority of the people in the South, as well as the "South" within the North'. For Curtis and Gamble (2014), recognition, as a dimension of climate justice, refers to the extent to which vulnerable communities affected by environmental hazards are acknowledged and have the status, legitimacy and respect to be able to represent their interests and positions. Bullard's (2007, 1983) work on environmental justice has, in particular, been crucial in highlighting how people of colour in America have been disproportionately affected by weather-related disasters. Our study participants singled out rural communities, the urban poor and women as especially vulnerable to climate change. In particular, our interviewees' discussion of women living in rural areas brings out the 'intersectional' nature of vulnerability. The Kenyan National Climate Change Action Plan (2013) also singles out as particularly vulnerable the urban poor living in flood-prone slums and the rural poor who rely on ground water for water supply and rainfall for

food production, as well as women and children. The vulnerability of these groups is of course a matter of distribution, but it is intertwined with their lower social status and marginalised cultural identities.

With regard to the rural poor, changes in weather conditions have negatively impacted crops and related food security. Differences in economic capital are sharpened in such circumstances: according to one of our interviewees, irrigation expenses due to droughts are far more difficult to bear for the owners of small farms in comparison to agricultural corporations. Our study participants also noted that droughts have led to cattle dying, which has in turn led to communities stealing cattle and subsequent conflicts. Just as for the rural poor, food security is a major challenge for the urban poor. According to Melanie, weather conditions negatively impacting food production in rural areas causes food prices to go up. As a result: 'For the urban people, and especially the poor urban people they are not able to access that food, and especially when the prices are very high' (Melanie).

The cultural dimension of climate injustice is most prominent when it comes to gender. According to Oliver and Christine:

> 'Climate change affects us both but the way it affects men is not the way it affects women. We find that the man's role is maybe to go to the office…but the lady wakes up very early in the morning, let's say five, milks, goes to the farm, goes to fetch firewood, to fetch water. But with climate change we find that resources are become very scarce. The distance at which they are going to collect firewood has increased. The distance that they are going to collect water has increased. The food, they are the ones who are looking for food…it has now become more difficult for them to access food and to look for food…for the family. They have been affected more compared to men' (Oliver).

> 'The other reason is that wherever there is food insecurity it is the women and children who suffer. Because men, they go to the market place…and you can find there their friends are eating, whatever meat or anything…and then they share a bit of that…but the poor woman left in the house…has no one to turn to. So, when there is no food, there is no food for the woman, there is no food for the children. And ironically women are producers of food. Like…80% of food that is consumed in families in Kenya is produced by small scale women[8]. So, when the weather fails it means they suffer unequally' (Christine).

8 Women involved in small-scale farming.

Such gendered consequences of climate change have been recognized in academic work. Alston (2011), for example, who has written about the gendered impacts of declining water availability in a region of Australia, cites literature indicating that women are more likely to die in catastrophic climate events and that they are more susceptible to malnourishment and poverty when food and water security are threatened. Terry (2009) makes the point that although women's greater vulnerability compared to men is partly due to their more limited access to resources, which is a distributional concern, it is also connected to social and cultural norms about, for instance, gendered divisions of labour. In other words, their vulnerability is also a question of identity. The Kenyan National Change Action Plan (2013) acknowledges that pre-existing socio-cultural roles expose women to higher rates of climate insecurity.

7. Whose voice is being heard?

The focus of this section is on the inclusivity of policy processes relating to climate change. Fisher (2015), citing Barrett (2013), makes the point that the distributional and recognition dimensions of climate justice are overlooked unless the most vulnerable communities are involved in these processes. On a global level, according to the Bali Principles of Climate Justice (2002), local communities, affected people and indigenous peoples have been kept out of the global processes to address climate change; the document demands that 'communities, particularly affected communities play a leading role in national and international processes to address climate change' (2002, 1).

Our interviewees focussed on opportunities for participation in policy processes relating to climate change on a national rather than global level. They addressed two aspects of such participation: opportunities for their own involvement in these processes and opportunities for members of vulnerable communities to have their voices heard. With regard to opportunities for their own involvement, several of our study participants indicated that their organisations had had the opportunity to influence policies related to climate change. In particular, several had contributed to the development of the National Climate Change Action Plan which is described in its introduction as 'the result of a year-long, participatory process involving the public sector, the private sector, academia and civil society' (2013, 1). According to Ken, there is a strong civil society in Kenya: 'We have a very strong civil society, with a government that has given some space for civil society to…speak and intervene, and cooperate with government'.

On the other hand, our respondents were less positive about the involvement of women in climate change policies. The following interview excerpts illustrate this:

> 'Women particularly…they have no platform where they can… have their voices heard and their actions recognized…the people who are making decisions on how to respond to climate change are actually men…when men do the talking for women, more often than not, they make decisions that are not favorable to women'. (Christine)

> 'What needs to be done is that women need to be given the voice, a platform, to be able to air their views, to be able to come up with suggestions which can be implemented to…improve food security. Because they are the ones who are directly involved in the agriculture, in the looking for food' (Oliver).

Whereas in the previous section a discussion of the consequences of climate change for rural women brought out the inter-connectedness between distributional and cultural dimensions of justice, the above quotes illustrate how cultural and procedural dimensions intersect. Importantly, however, the marginality of women's voices in policy processes relating to climate change is not specific to Kenya. Alston (2011), writing about the Australian context, notes a 'dominance of decision-making by men' (2011, 67) and calls for 'the incorporation of women into decision-making about climate change' (2011, 68), citing the Bali conference feminist slogan 'No climate justice without gender justice'.

8. Conclusion

The central question guiding this paper is how do people working on climate change issues in Kenyan civil society organisations understand climate justice? On a more abstract level, we found that for our study participants climate justice encapsulates intersecting matters of distribution, cultural recognition and political representation and that it occupies multiple sites.

In general, our participants used the term 'climate change' as the common denominator for their experiences of distorted seasons, droughts and floods, which they identified as impacting the well-being of humans and animals in many direct and indirect adverse ways. They were unanimous in attributing the historical responsibility for climate change to the Global North and spoke fervently about the injustice of having to suffer its consequences. Although they acknowledged that Africa should have a role in mit-

igating climate change effects, the general consensus was that developed countries should take a leading role in these processes. Furthermore, their attitude was that developed countries should financially and otherwise support developing countries in their adaptation struggles. This is briefly and powerfully captured by one of our interviewees in her statement 'You polluted, you pay for it.'

Our interviewees recognise that vulnerability to climate change cannot just be reduced to the Global North-Global South dichotomy, but rather that there are vulnerable communities within each. In the Kenyan context, rural communities, the urban poor and women were singled out as particularly vulnerable to climate change effects. In the case of rural women, social and cultural norms about the gendered division of labour were identified as enhancing their vulnerability. Gender was also identified as a key category with regard to the procedural dimension of climate justice: according to our interviewees, women are often excluded from climate-change-related decision-making. The position of women vis-à-vis climate change effects illustrates the difficulty of analytically separating distribution, recognition and representation as facets of climate justice. This analytical separation has been a feature of much social and climate justice theorising which Fraser (1995) has sought to overcome with the notion of 'bivalent collectivities'. The term captures social groups suffering both socioeconomic maldistribution and cultural misrecognition. For Fraser, gender is a paradigmatic bivalent collectivity in that women's disadvantage is rooted in both the political-economic and the cultural-valuational structure of society.

By way of a final conclusion, climate justice is currently, to borrow Rizvi and Lingard's (2010) phrase, 'an alternative social imaginary'[9]. The dramatic and urgent tone of many of our interviewees' responses suggests that for countries of the Global South, and in particular the 'south' within the Global South, survival depends on it becoming a *dominant* social imaginary. Judging by our interviews, people from the Global South have many valuable insights on how this can be achieved. Sadly, they are pessimistic about the Global North's role in this process: 'They have industries, their emissions are immense, and they need to come up with…to honor their promises. You know, they promise something, they want to do this and this and they don't do it'. (Oliver)

9 The authors are hinting at Taylor's (2004, 24) discussion of the 'social imaginary' which encapsulates a community's shared understanding of what is and what should be in their collective social life.

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Environmental Change and Involuntary Migration: Environmental Vulnerability and Displacement Caused by the 2014 Flooding in South-Eastern Europe*

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1. Introduction

In 2015, over a million refugees and other forced migrants came to Europe, mostly by two dangerous sea routes, the so-called Eastern Mediterranean and Balkan routes (UNHCR, 2016). Most of these global flows of displacement, which today amount to more than 65 million persons, have in the past few years surpassed the number of persons displaced all over the world during and after World War II. Current geopolitical processes, which act as the pressing factors of displacement and cause involuntary migration on a global level, are primarily linked to the conditions of instability and the general presence of violence in almost all continents of the world, from West and North Africa through the Middle East all the way to Central and South-East Asia. However, along with the well-known political and economic causes of migration and forced displacement in the world, which include wars and other armed conflicts, terrorism and persecutions, socio-economic deprivation, poverty, and general lack of prospects, it is becoming increasingly evident that environmental change in the broader sense of the word, and climate change more narrowly, can be equally significant causes or macro-drivers of migration and displacement. In the period to come, this acute crisis and its processes will pose before the EU numerous social, economic, humanitarian, and security challenges, as the number, scope, and intensity of displacement flows caused by environmental factors in the 21st century are bound to become even more intense in numbers, size, and

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impact, as various research results quite unambiguously indicate (ADGER et al., 2003; ADAMO, 2010; FORESIGHT, 2011, GEMENNE, 2011).

In the light of these processes, this paper starts from the perspective of previous studies on forced migration in order to discuss the effects and impacts of environmental change on people and their habitats as one of the possible and increasingly important causes or macro-drivers of involuntary displacement in the world. Following a description and analysis of the global numbers indicating the size and degree of involuntary environmental migration, we shall also discuss its preconditions, which necessarily include the issues of environmental risks, environmental vulnerability, threat and resilience, as well as environmental (or climate) and social justice. As a case study, we have analysed the evacuation and temporary environmental displacement during and after a natural disaster, namely flooding in the regions of Croatia, Serbia, and Bosnia and Herzegovina in May 2014, concluding with some guidelines for the future reduction of environmental threat and increase of environmental resilience in these three countries.

2. Environmental Change and the Impact of Environmental Risks on Human Habitats and Societies

Scholars generally agree that modern climate change is different from natural climatic variability, since it results to a considerable extent from human activity, which alters the Earth's climatic system (MASLIN, 2009; HENSON, 2011; IPCC AR5, 2014). **Since the late 18th century as the time of the emergent Industrial Revolution, the impact of man on climate and the environment has increased significantly.** It is with human activity that the chemical composition of the atmosphere has changed, causing a more intense global warming than that which would have ensued naturally, without human influence.

According to the reports of the Intergovernmental Panel on Climate Change (IPCC V, 2014), climate change implies a series of interconnected geophysical, climatic, and meteorological factors and results from both natural and anthropogenic influence. It is manifested by a constant increase in the atmospheric concentration of greenhouse gases, a rise in average global temperature (the so-called "global warming"), a reduction of ice and snow covers, a rise in the global sea level, and an alteration of precipitation patterns. Presently these are manifested in the form of increasingly frequent and intense, even extreme climatic, hydro-meteorological, and geophysical events (IPCC V, 2014). Beside all these, in this text we use "environmental change" predominantly to imply a series of additional interconnected factors, which are partly consequences of the aforementioned climate change

and partly phenomena *sui generis*. In other words, environmental change is a consequence not only of natural climatic variability, but also of ecological imbalance, or rather direct degradation of the environment caused by the human factor, including technological disasters such as various developmental projects. All these transformations differ in their speed, frequency, intensity, duration, as well as the impact they have on human societies and migration patterns.

When describing and analysing the transformations and variability of environment, we use the collective term "environmental change" to denote the totality of transformations in the natural and societal (human) environment on planet Earth (both globally and locally) caused by natural (geophysical, climatic, ecological, biological and/or biochemical) events and processes, or human (anthropogenic) impact on the environment. In that sense, the term "environmental change" is understood as a higher generic term subsuming the term "climate change". Thus, environmental change would imply and include the following: a) extreme weather events and natural disasters (temperature extremes, cold or hot, drought and the related fires, volcano eruptions, earthquakes, tsunamis, floods, landslides, and storms – whirlwinds, hurricanes, typhoons, monsoons, and tornados); b) ecological imbalance and degradation caused by the human factor (deforestation, erosion, soil exhaustion and soil desertification, sinking and submersion of coastal and island land owing to the increase in sea level, and finally - water, soil, and air pollution); c) technological disasters (industrial accidents and contamination, atomic and nuclear catastrophes, environmental pollution resulting from developmental projects). Even though there is an overlap of effects, impacts and outcomes of climate change and environmental change, the former is a subset of the latter. Climate change refers primarily to the changes in atmospheric and hydrologic processes driven by anthropogenic influences, whilst environmental changes in general contains the aspects of category (c) above: the technological disasters and specific high-impact by-products.[1]

1 Hence, following the argumentation in Cifrić (2000), we understand 'environment' as the unity of 'natural environment' and 'societal (human) environment'. The natural environment is a given reality of nature on this planet, including physical (living and non-living) world, ecosystems and the entire biosphere. On the other hand, societal (human) environment is a socially constructed space within which human interventions i.e. anthropogenic impacts on the natural environment are carried out, through social life and societal processes. In this sense, societal environment also includes technical and technological sphere of human activity, while the totality of natural and societal (human) dimensions of the environment, both frame living conditions of human beings and society.

Human interference with the environment is ever more evident, and numerous reports lead to conclusions about the reverse impact (with outcomes which are often irreversible!) of environmental change on the present and future ecological, economic, political, demographic, and other social issues. It is important to note that the nature of these events or processes, as well as their scope, intensity, and duration, determine the type and degree of environmental threat, which becomes a driver for migration and displacement.[2] In the period from 1992-2012, as many as 4.4 billion persons in total were affected by environmental adversity or disaster, mostly by flooding, drought, or storms (UNISDR, 2012). In the period from 2008-2014, the annual average number of persons affected by some type of catastrophe was around 210 million, with variations ranging from 95.3 million in 2013 to 245.7 million in 2012 (IDMC/NRC, 2015:9). Based on the data provided by IPCC, Tacoli (2009) has argued that of all types of environmental change, it is the rising sea level, extreme weather events (such as heatwaves and storms), and fluctuations in the available freshwater (e.g. droughts) that will most likely lead to migration and displacement of populations.

Some areas in the world are more prone to episodic environmental events, others to the processual ones. It has been predicted that environmental change will most significantly affect the societies in the Asian-Pacific region (LACZKÓ and AGHAZARM, 2009; IPCC V, 2014). According to the data provided by Guha-Sapir et al. (2014), Asia and the Pacific are the areas that have suffered most environmental hazards, and it is highly likely that such events will continue to occur in the future. In the thirty-year period (1974-2003), about a half of the environment-related events and disasters occurred there, and these are also the areas where natural disasters have resulted in the highest mortality: thus, as many as 85% of global deaths caused by disasters have happened in this area (EM-DAT/CRED, 2014).

Floods most often occur in the areas of Central, South, and South-East Asia (an especially vulnerable area is the Ganges delta, with a population of 125 million, mostly impoverished, and a density of ca. 200 persons per

2 Our 'definition' of environmental change is to some extent inspired by three types of catastrophes, proposed by Hamm (2011; quoted in CIFRIĆ, 2013: 92). In regard to the proposed classification we point out that some of manifestations of environmental change cannot be defined unambiguously as pertaining exclusively to one of the above categories. In some occasions they might be a result of a series of natural and anthropogenic factors, Fukushima Daiichi disaster being just one example. Therefore, seldom we find a clear-cut, ideal-type distinction of different environmental events and processes in reality. Consequently, we could rarely establish direct and definite causality between one mode of environment change and specific migration response to it.

km2), Africa (the region of the Great Lakes, central and south-eastern Africa), Central America, and the western part of South America. In 2009, more than 80% persons affected by extreme weather events (such as tropical storms) were located in Asia and Oceania, partly Africa (EHRHART et al., 2009:2, FORESIGHT, 2011). The greatest risk of stormy winds has been observed in southern Asia (Bangladesh, the coasts of India, Vietnam), the eastern coast of Africa (particularly Mozambique and Madagascar, Tanzania), Central America, and the Caribbean. The threat of drought is present primarily in the Sub-Saharan Africa, southern Asia (especially Afghanistan, Pakistan, and some parts of India), and in some parts of South-East Asia (especially Myanmar, Vietnam, and Indonesia). This means that the regions of Sub-Saharan Africa, the Horn of Africa, and South and South-East Asia are at risk from all three threats and environmental risks (drought, flooding, and storms) and may therefore be considered, tentatively speaking, as areas of increased or extreme exposure to and threat from environmental change.[3]

Differently put, the populations that are most acutely exposed to environmental risks live in: a) underdeveloped countries; b) dry or semidry areas; c) coastal and fluvial regions (GLOBAL HUMANITARIAN FORUM, 2009; OXFAM, 2009). These populations are most vulnerable because of their overall poverty, as well as exposure to drought and desertification, or the consequences of rising sea level and flooding. There are several variables that the scholars take into account when calculating environmental vulnerability: sex, age, ethnicity, cultural factors, and socio-economic status (class). This last factor can cause further social stratification and additionally increase the vulnerability of populations that are already insecure, especially at the local and regional levels. In that sense, exposure to risks and socio-economic inequality determine and intensify each other. Garcia-Acosta (2007:130) has emphasized that one should use the term "differential (environmental) vulnerability" as it indicates that social groups are not equally exposed to risks and have different means of coping with environmental emergencies, which is why the effectiveness of their response to these risks varies as well.

The negative consequences of environmental change affect the survival chances, wellbeing, and personal safety of people, making them environmentally vulnerable. However, environmental change may also create ad-

3 Environmental vulnerability apparently occurs in the geographic areas marked by the lines of global economic power and inequality, which separate the lands of (Global) South and North. In this way, environmental vulnerability mirrors the socio-economic one, indicating that environmental change is far from democratic, as it affects various social groups differently.

ditional vulnerability in individuals and communities that have been previously affected by various types and degrees of social and economic threat, deprivation and injustice (WILLIAMS, 2011). The character and severity of the impact of environmental change varies depending on the event, and is detrimental to the degree in which the capacity for adaptation in the vulnerable population has been diminished by the adverse impacts of change. Vulnerable groups are often the first and most severely affected segment of the population. The same goes for those who had already become forced migrants and refugees, as they are or will become vulnerable in multiple ways because of the complex factors of stress and threat, political, social, economic, and environmental combined.

As the level of environmental hazard often overlaps with various levels of socio-economic threat it is then convenient to ascertain that issues of environmental justice are closely connected to those of social justice. In their endorsement of "environmental justice", A. Antypas et al. have argued that it refers to a situation in which members of a minority social group find themselves in an unfavourable position, or threatened on the local, regional, or national level by environmental threats or hazards (ANTYPAS et al., 2008). They can also be victims of violation of their basic human rights, if that violation is a result of environmental factors, and systematically deprived of access to information or to the legal system, and/or participation in decision-making on issues referring to the environment.[4] In that sense, marginal social and ethnic groups (especially the indigenous ones) may be "environmentally discriminated" as their living conditions are threatened and degraded through exposure to high environmental risks and hazards.

In her report to the UN, Ksentini (1994) has indicated that the right to environmental protection is closely related to the right to development, and that the poor citizens of underdeveloped countries often suffer from simultaneous violation of their basic human rights, right to development,

4 Antypas et al. (2008:8-10) have argued that the conditions for environmental justice are met when environmental risks and hazards are evenly distributed, without direct or indirect discrimination on all levels of responsibility; when access to natural resources is evenly distributed; and when access to information, participation in decision-making, and access to the legal system regarding environmental issues is granted to all. Thus interconnected, the fields of human and environmental rights are a subject of the so-called political ecology, which, among other things, investigates the basic human and environmental rights (the right to life, health, and environment), environmental justice (the right not to be environmentally discriminated on account of one's group characteristics), and procedural justice (the right to information and access to the legal system regarding environmental issues).

and right to a quality environment. In other words, as V. Shiva (2008) has stated, there is no social justice without environmental justice, and vice versa. Here we understand these overlapping categories of environmental and socio-economic justice as a right of all human beings to adequate means of existence and satisfying quality of life within their natural and societal environment, with assurance of (renewable) resources for sustainable livelihoods not just immediate survival.

The populations of all geographic areas and all societies depend to a greater or lesser extent on the resources of their ecosystems. Based on the data provided by IPCC IV (2007) and IPCC V (2014) it has been emphasized that global warming will create an additional pressure to use the available resources in order to mitigate the consequences of these changes. An aspect that deserves special attention is the impact of environmental change on the availability of fresh water and the consequences this may have on the populations. Access to fresh water or the lack of it is not only a "potential" source of conflict, which may lead to displacement as a consequence. It has already created and keeps creating tensions in some parts of the world, wherever several countries depend on the same sources of water – especially in Africa, the Middle East and South-East Asia. According to the predictions of IPCC V, the availability of fresh water will continue to diminish progressively in many parts of the world (IPCC V, 2014:19).[5]

Rising of the sea level implies an additional reduction of water owing to the salinization of fresh-water resources. If the predicted rise of the global sea level of at least one meter takes place before the end of the century (CULLEN, 2010), that will expose the island and coastal populations to the risk of losing their habitat and land to erosion and intense flooding, which means an increased degree of threat and exposure to environmental risks. Anthoff (quoted in STERN 2007:82) has estimated that 145 million persons will be threatened if the sea level rises for a single meter, most of them living in southern and eastern Asia.

Not everyone is equally affected by ecological imbalance and environmental degradation. The adverse impacts of these changes are not felt equally among the populations of various countries or even within the same population (AHTONEN et al., 2012:13). The already marginalized social groups must bear a disproportional burden of environmental change in both the "underdeveloped" and the "developed" countries, for example, which has become evident in the consequences of Hurricane Katrina in

5 Warren et al. (quoted in BARNETT and WEBER, 2010:12) have suggested that before the end of the century, between 800 million and 1.8 billion persons will be exposed to water-related stress. They have also estimated that up to 600 million persons may be threatened by famine before 2080.

the USA (GEMENNE, 2010).[6] Agnew (2012) has argued that some groups are "more exposed" to the consequence of climate change because they live in the areas of high environmental risk (e.g. risk of flooding). Some are "more sensitive and more vulnerable" with regard to climate change because their means of sustenance are narrowly linked to their ecosystems (e.g. peasants, fishermen, cattle breeders). Some, again, have a limited capacity of "adapting to" and "recovering from" adverse change, i.e. they lack environmental resilience (e.g. the poor).

Environmental risks are also related to demographic factors and the issues of sustainable development. A considerable part of present and future urban growth in Africa and Asia consists in the increased expansion of slums, which are regularly located in very sensitive places. Thus, instead of "developing", rural-urban migration can simply mean translocating the vulnerable and impoverished populations from one place to another, from rural areas to towns and cities (BLACK et al. 2008:23). Thus, being environmentally vulnerable goes hand in hand with socio-economic deprivation and social precariousness, insufficient hygienic conditions, low standard of living, and bad quality of life in general. Owing to these reasons, sociologists and urban planners may consider rural-urban migration not as a motor for development, but on the contrary: as a burden or obstacle to development. Nevertheless, from the perspective of a poor rural family, it remains a positive factor, as it is expected to bring gain to individuals, families, and households (DE HAAS 2007).

Thus, environmental change may, yet need not, generate mobility and migration directly and immediately. In case of natural or technological disasters, it quite directly influences the emergence of migration and displacement. In case of ecological imbalance and environmental degradation, it motivates migration largely indirectly, through threats to food supply and health, as well as through the degradation of land and fresh water resources,

6 However, not all parts of the population in developed countries show equal environmental resilience. In case of Katrina, a hurricane that struck New Orleans in 2005, the system of dykes and flood protection failed (GEMENNE, 2010). The flooded areas mostly affected the lower parts of the delta, inhabited largely by an Afro-American population of a lower socio-economic status. Fussel, Sastry and VanLandingham (2010) have concluded that the consequences of the hurricane and the flooding have disproportionally affected various population strata, since those who suffered most were also those who had been socially vulnerable before the disaster. The wealthier, white population showed greater environmental resilience owing to their better living circumstances, financial means, and social contacts, which made the relevant information more accessible to them and gave them the possibility to leave the affected area, something that not everyone who is environmentally vulnerable will be able to do.

the habitat, and the means of sustenance (VÖRÖSMARTY et al., 2000; IPCC IV, 2007). Environmental change differs in its frequency and intensity of occurrence, as well as its degree and the way it influences migration and displacement, which is the topic of our next chapter.

3. Environmental Change as a Driver of Migration

Environmental change acts as an inducement to and driver of migration, bringing about the emergence of global (in)voluntary migration, which can be called environmentally induced migration. Environmental factors are expected to induce migration flows in the 21st century with an increased frequency. Nevertheless, environmental change is rarely the only factor (e.g. in case of natural disasters) and is mostly only one among many (albeit an increasingly important and frequent one), acting as a motor or motivator in making the decision to move or flee (BLACK et al., 2011; CASTLES, 2011). Adversities and catastrophes as episodic and short-term events, as well as ecological imbalance and degradation as long-term processes, influence the lives of millions of people all over the world. Environmental change varies not only in the frequency and intensity of occurrence, but also in the way it motivates migration and displacement. Competitiveness and antagonism over using natural resources and possessing sources of energy are among the main reasons of (political) conflict in the world. However, from a long-term perspective, "episodic" environmental change (such as natural disasters) today generates an equal or even greater number of victims and displaced persons than political conflicts around ideologies, resources, and territories. A report by IDMC/NRC (2014) estimates that in 2001 the global number of persons displaced for environmental reasons surpassed for the first time the number of those displaced for political reasons.

However, not all geographic areas are equally exposed to the adverse consequences of change, and not all population strata are equally vulnerable to or resilient against environmental stress and environmental risks. Among those affected by change, not all have responded to environmental events or processes with migration or forced displacement. Recent data on the number of displaced persons around the world, as seen in the table, confirm that sometimes the number of those displaced because of environmental change even surpasses the number of those displaced for political reasons. Displacement for environmental reasons (natural disasters) is extremely variable, from 14.9 million in 2011 to 42.3 million in 2012, with an average of ca. 26.4 million displaced persons per year (IDMC/NRC, 2015:9). The data in Table 1 reveal another trend: whereas the extent of environmental displacement varies from year to year (with the largest number by far in 2010), the last few years show an increase of internally displaced persons

owing to armed conflicts and general violence, which primarily refers to the prolonged war in Syria.

TABLE 1
The total number of refugees and internally displaced persons in the world, 2008-2015

	2008	2009	2010	2011	2012	2013	2014	2015
Refugees in total*	16.03	16.05	16.4	16.37	16.34	17.9	19.5	21.3
Internally displaced persons (because of armed conflict or general violence)	26	27.1	27.5	26.4	28.8	33.3	38.2	40.8
Internally displaced persons (because of natural disasters)	36.5	16.7	42.4	15	32.4	22.3	19.3	19.2
TOTAL NUMBER (in millions)	**78.53**	**59.85**	**86.3**	**57.77**	**77.54**	**73.5**	**77**	**81.3**

SOURCE: *Župarić-Iljić (2015:85) – author's adaptation of UNHCR and IDMC/NRC data (*includes Refugees under the mandate of UNHCR-a, and Palestinian refugees under the mandate of UNRWA)*

In global proportions, most persons displaced due to natural disasters in the period 2008-2013 were in China, India, the Philippines, Pakistan, Bangladesh, Nigeria, and the USA, with 81% of all displacement cases located in Asia (IDMC/NRC, 2014a:31). In 2013, the most massive displacements, both absolutely and relatively (with regard to the ratio between the number of displaced person and the total population number) took place in the Philippines (7.2 million), China (5.9), India (2.1), and Bangladesh (1.1). Two super-typhoons (Haiyan and Trami) in the Philippines alone displaced as many as 5.8 million persons, while floods in China and India displaced more than a million persons in each respective country. Of all disasters, storms and floods were most prominent by far, displacing more persons than any other event (20.7 million or 94%) (IDMC/NRC, 2014a:31). In 2014, Asia was still the locality most affected by natural disasters, with as many as 16.7 million displaced persons, which amounts to 87% of all persons displaced due to natural disasters, while environmental displacement in both American continents was in the second place with 1.6 million displaced persons (8.3% of the total number) (IDMC/NRC, 2015:30). In Africa, the

most affected areas were Ethiopia and Sudan with ca. 770.000 displaced persons (4%) and in 2014, Europe had a disproportionally large number of environmentally displaced persons (190.000), primarily due to flooding in the Balkans.

Based on various analyses of the present threat, the scenarios and projections of future environmental displacement range from 10 million to more than a billion persons in this century (GEMENNE, 2011). Such alarming prospects (even though not entirely scientifically based) have drawn the attention of politicians and the public to the increasing and more massive migration of people motivated by environmental and climatic change. Some scholars emphasize that one should not forget that such migrations are rarely caused by environmental reasons alone; instead, they occur in combination with other economic, social, political, demographic, and other factors (BLACK et al., 2011).[7] Even the definition of environmental migrants and the estimates of their present number, as well as projections about this number in the future, are a matter of scholarly debate. The same goes for the classification of (in)voluntary environmental migrants, as well as the issue of responsibility for the protection of the so-called "environmental refugees", as they do not receive adequate protection within the international refugee regime.

Researchers focusing on the estimates about the number of persons displaced for reasons of environmental change (EACH-FOR, 2008; WARNER, 2010; GEMENNE, 2011) particularly emphasize that it is not quite clear how far one can go with the predictions concerning the number of persons who will react to environmental threat by temporarily or permanently leaving their place of residence. If environmental change threatens human habitats, migration can be only one possible strategy in responding to that threat. It is often difficult to predict how many persons will move or be forced to migrate, and in which directions, as pointed out by Black et al. (2011). Scholars have also indicated the relatively high degree of immobility in the human population, which is supported by the statistical data of only 3% international migrants in the world (IOM, 2015). For this reason, the present data do not indicate that people will leave their places of residence or migrate in large proportions motivated exclusively by en-

7 In the light of terrorist attacks, the world climate summit in Paris has warned of numerous global risks and challenges in terms of safety, social (in)equality, and environmental justice as the diversifying factors (co-) acting as the macro-drivers for migration, regardless of which expert projections and predictions on the future flows of displacement will actually come true. Even if the projected numbers and scenarios prove incorrect, the predictions as such might nevertheless have an impact on the future environmental and migration policies.

vironmental change; nevertheless, the trend is present and will probably continue to increase in the future, judging from the relevant reports on the global environmental situation (STERN, 2007; IPCC V, 2014; IDMC/NRC, 2014a).

Norman Myers, one of the most prominent advocates of the so-called alarming/catastrophic predictions on the impact of environmental change on the emergence of forced migration, argues that most migrations in the future will be motivated by natural disasters or environmental imbalance. These migrations would involve between 50 million (estimate for 2010) and more than 200 million persons forced to migrate before 2050, some of those possibly seeking safety in Europe (MYERS, 2002). The latter projection has been generally accepted and is often cited as the number of "environmental refugees" in the 21st century. On the other hand, Black et al., (2013:34) have warned that such large numbers of persons affected by environmental change, as well as predictions of environmental displacement, are methodologically imprecise, since they mostly refer to the displaced persons at the "peak" of the environmental disaster and during emergency actions (evacuation), rather than in a long-term perspective, including the time after the displaced persons' return, which can happen relatively soon. As these authors have argued, environmentally displaced persons are rarely in the situation of "prolonged displacement" that very often characterizes the (classical) refugee experience.

Disasters in terms of water and temperature extremes are usually related to sudden environmental events that require prompt reaction. In such unexpected natural or technological catastrophes, immediate flight of the population rarely includes active or efficient strategies of planning or decision-making (BOANO, ZETTER and MORRIS, 2008). Forced migration takes place as the sole promising option of saving lives, without special preparation and in a state of urgency. Since natural disasters are more conspicuous as the causes of forced migration than slow and gradual environmental degradation, the appropriate response is faster as it appears more urgent. Migration caused by environmental degradation is rarely planned, even if ecological imbalance and environmental degradation were planned and intentional. Links between gradual environmental change and migration are often filtrated through economic circumstances or economic deprivation, far more than it is the case with urgent migration and forced displacement caused by a natural disaster. Bates (2002) has indicated that poor populations are more likely to live in marginal ecosystems and are usually most sensitive to environmental damage, which is why they are frequently forced to migrate. They are also the least likely to be able to return soon to the setting they had to leave.

Furthermore, migration is only one possible answer to environmental risks and stress. However, not everyone exposed to that risk and stress will respond by moving away (BLACK 2001; MCLEMAN and SMIT, 2006; ADAMO 2008). It may seem inaccurate to speculate about the number of people who will probably be forced to migrate owing to environmental change in the future. Brown (2008) has argued that predictions of possible threats and displacement owing to environmental reasons are complicated by three factors. Firstly, the scope and size of forced environmental migration will depend on the growth and distribution of the global population, which will expand significantly in the course of the 21st century. This trend will be especially present in underdeveloped countries, where it will go hand in hand with the high rate of growth in urban population (UNFPA, 2009). Secondly, there is a manifest methodological, particularly statistical flaw related to establishing the actual numbers of migrants in the world, particularly acute when it comes to internal migration, which accounts for most of migration flows. Since most migrations caused by environmental change are actually internal and most forced environmental migrants remain within the territory of their own countries, the problem is even more manifest and complex. Lastly, since the climate system is rather inert, the consequences of present activity will be felt long into this century, as Brown has argued. In his opinion, the impact of climatic and environmental change as a motor of forced migration depends on at least four factors: "the quantity of future greenhouse gas emissions; the rate of future population growth and distribution; the meteorological evolution of climate change; the effectiveness of local and national adaptation strategies" (BROWN, 2008:27).

In other words, the consequences of environmental (climate) change in the next 50 years are largely predetermined. The effects of environmental change will only confirm some of the existing global migration patterns. Geographic areas that are particularly sensitive and vulnerable as to environmental stress will continue to be the sources of migration, especially rural to urban, as it has happened in case of the impact of drought in Sahel. Migration between the neighbouring regions and countries will continue to follow the established migration networks, as in case of migration to the USA during the prolonged drought in rural Mexico (BROWN and MCLEMAN, 2013:3). All that will happen afterwards is a matter of speculation, but if the present trends do not change, it is quite probable that the environmental situation will further deteriorate. The frequency and intensity of natural disasters is thus likely to increase in various regions, including South-Eastern Europe, such as the flood that struck parts of Croatia, Serbia, and Bosnia and Herzegovina in May 2014.

4. Environmental Vulnerability and Displacement as a Result of Flooding in South-Eastern Europe

Floods are among the most frequent natural disasters today, and they are on the increase. Even though earthquakes are the most devastating, and very often the one with highest number of immediate casualties, form of natural disaster, floods have the positively highest impact factor regarding vulnerability and displacement potential. As many as 47% of the total number of 246 million persons affected by all natural disasters (according to the annual average of 2002-2011) were those affected by floods, followed by droughts (29%), storms (16%), earthquakes (4%) and extreme temperatures (4%) (UNISDR and CRED, 2013). Prolonged and abundant precipitation, followed by a sudden rise in the water level of rivers and their overflowing from riverbeds are bound to cause flooding of catastrophic proportions. The areas of South Asia and the Pacific (partly also Central America and the Caribbean) are especially threatened by stormy seasonal monsoons and floods. Most of them occur in India, China, and Bangladesh, which are among the countries with the highest demographic density, as well as relatively high poverty rates, which decreases the adaptive capacity of the population.

In May 2014, such a natural disaster of large proportions happened "in our own backyard." The flood that affected parts of Croatia, Bosnia, and Serbia took human lives and caused huge material damage, which is still being estimated and repaired. The disaster also caused a considerable number of evacuations and short-term (environmental) displacements. Images of evacuations and devastated homes in the media reminded of the displacements and refugees during the 1990s, especially because in Bosnia and Croatia the disaster affected areas that had suffered damage and loss of lives during the war.

The flooding was caused by an increased and huge quantity of precipitation (rain), which started on May 13 and lasted until May 18, 2014. "The cause of increased precipitation was a powerful and lasting cyclone with its centre above South-Eastern Europe. It was preceded by a very moist period, which saturated the soil in the fluvial region of the Sava." (DHMZ, 2014:7). All this resulted in a fast rise of the water level in the Sava and its tributaries – the rivers Una, Vrbas, Bosna, and Drina – in its middle and lower fluvial region. Owing to their confluence, the Sava reached previously unrecorded values and the highest water level since the beginning of systematic records" (HRVATSKA VODOPRIVREDA, 2014).

As evident from Fig. 1, the rivers overflowed the banks, especially in eastern Croatia, northern and north-eastern Bosnia, and western Serbia, flooding numerous settlements in a very short span of time. In Croatia, the most severely affected area was the extreme east of the region of Sla-

vonia, i.e. the Vukovarsko-srijemska County (the area at the triplex border with Bosnia and Serbia). Additional threatened areas were located in other Croatian counties, but there the environmental hazard was not manifested as a devastating risk in the form of a natural disaster. In Croatia, Hrvatske vode (the public water management company) were in charge of organizing defence measures, but they failed to prevent the catastrophe despite the highest level of flood protection measures.

FIGURE 1
"Deadly flooding across Croatia, Bosnia, and Serbia"

SOURCE: *www.digitaljournal.com/news/world/mine-explodes-in-bosnia-as-floods-clear-up-begins/article/384322*

It has been estimated that more than 2.5 million persons were directly or indirectly affected by the consequences of flooding, including mudslides (RELIEFWEB, 2014). This number includes more than half a million children, as well as a certain minor number of internally displaced persons and refugees from the period of warfare in the 1990s (in Bosnia and Herzegovina, and in Serbia).

In Serbia, the flooding affected the largest number of persons, including 23 who drowned. Among the 1.6 million persons affected, around 32000 were evacuated from their homes, whereby most found shelter with their

relatives in unaffected areas. Around 5000 persons were accommodated in reception centres organized as temporary shelters by the Serbian government and the Serbian Red Cross (UN SERBIA, 2014:15). In the area that was most severely affected (the municipalities of Obrenovac and Lazarevac), there is Roma population comprising about 11% of the total population, a particularly vulnerable group that suffered severely; another such group were the asylum seekers in the flooded reception centres in the Obrenovac area.

In Bosnia, more than a million persons in ca. 60 municipalities were affected by flooding. Among these, 25 dead and over 90 000 evacuated and displaced persons have been recorded. Around 43000 homes were flooded, and because of landslides ca. 1900 houses in mountainous areas were damaged, most of them irreparably. As many as 2610 landslides were reported (RELIEFWEB, 2014:2). Severe damage was inflicted to the infrastructural and communal system, which still partly affects the health and the quality of life of people there, especially owing to environmental stress related to the pollution of fresh water and sanitary facilities (IDMC/NRC, 2014c:4).

In Croatia, around 38000 persons were affected by flooding, mostly in the extreme east of the county, in Vukovarsko-srijemska County, although the consequences of flooding could also be felt elsewhere: in the fluvial area at Slavonski Brod, as well as during the overflow of the Orljava River near Požega. However, the area that was most severely affected was that of Županjska Posavina, in three municipalities: Gunja, Drenovci, and Vrbanja. In fact, the flood was not caused directly by the river overtopping the levee along the Sava River due to the high water levels, but by breaks in the levees in localities near Rajevo Selo and Račinovci.[8] Besides Gunja, these villages were completely flooded and their entire population had to be evacuated, as well as the population of other, partially flooded villages.

In Croatia, two persons died in the water torrent when the levee broke. Estimates speak of more than 13000 evacuated persons, with 8321 persons registered as having been accommodated in ca. 150 locations (VUZS, 2014). Accommodation was organized in improvised reception centres in the vicinity, in various institutions such as sports halls of primary schools in nearby villages, or in families. Red Cross took care about the evacuated

8 Models of prevention or structural adaptation to flooding by means of building dams and levees seem to lead to something that Etkin (1999, quoted in BLACK et al., 2013:39) has termed "risk transference", which means that these defence measures are based on a system that would actually result in rarer, yet highly hazardous disasters instead of the more frequent, low-risk ones. In other words, the present-day system of dykes has actually unnaturally limited the periodic overflowing of rivers, which would otherwise self-regulate the water surplus in their riverbeds.

persons by providing food, sanitary equipment, and other humanitarian aid, as well as psychosocial help and assistance (DUZS, 2014:28).

Besides human suffering, the flood caused interruptions in the energy supply network and severely damaged the infrastructure, including the lack of fresh water and the loss of cattle and agricultural assets. More than 8500 acres of arable land were devastated and more than 8000 domestic animals, among them 5500 head of cattle, were dislocated (VUSZ, 2014). More than 1000 animals died, which caused a threat of infectious diseases. The total direct damage has been estimated to almost 300 million Euro. Nevertheless, that is considerably less than the estimated total damage in Serbia, which amounts to 1.5 billion Euro (UN SERBIA, 2014:16), or Bosnia and Herzegovina, where it has been estimated to over 2 billion Euro (RELIEFWEB, 2014).

TABLE 2
Comparative overview of the consequences of flooding in May 2014

	Croatia	**Bosnia and Herzegovina**	**Serbia**
Total number of persons affected by the consequences of flooding	40.000	1 million	1.6 million
Deaths	2	25	23
Number of evacuated persons	8.321 (13.000)	90.000	32.000
Number of long-term displacements (November 2015)	260	670	560
Particularly vulnerable social groups	Children, women; Roma; persons displaced during the wars in the 1990s; paupers; asylum seekers		
Damage estimates	300 million Euro	>2 billion Euro	>1.5 billion Euro
Number of restored homes (November 2015)	2.018/2.279	29.905/43.249	19.780

SOURCE: *DUZS (2014), UN Serbia (2014), Reliefweb (2015), IDMC/NRC (2015), author's adaptation*

The key predictor for the return of environmentally displaced persons has been identified in the type of aid at the disposal of the community threatened by environmental stress and/or affected by an environmental disaster (ADAMO, 2010). Owing to the overall solidarization of Croatian citizens and other countries, the collected financial and humanitarian aid reached the victims of flooding, i.e. evacuated and displaced persons. Among the

2689 flooded houses and 529 buildings that had to be demolished, 1811 houses and some twenty public buildings were listed after the flood for state-financed restoration. According to the governmental report, 969 family houses were restored before mid-December 2014 and 284 buildings were cleared away (OMBUDSMAN, 2014:9). A year after the flood, 1557 houses were completely restored.[9]

After the water receded (before the end of 2014), around 600 families returned to Gunja, which is more than a half of the total number of village households. Some of them moved into their restored or half-restored houses, while others awaited the completion of restoration works in makeshift housing (modified cargo containers or trailers). Such 'trailer camps' for temporary accommodation had been established in Gunja in mid-July 2014 (for ca. 350 persons), Račinovci (for 200), and the village of Padež, part of Rajevo Selo (for 100), while ca. 160 persons were accommodated in social welfare centres. However, voices could be heard that "the quality of accommodation in trailer camps was far from acceptable and especially inadequate for the accommodation of vulnerable groups – large families with children, elderly persons, or persons with health conditions" (OMBUDSMAN, 2014:9). There are likewise indications that the state failed to adequately define priorities in house restoration, as the element of general vulnerability was not taken into account.

The area affected by flooding had been structurally highly vulnerable before in terms of economic, social, and demographic parameters. In this situation, it was struck by a relatively significant natural loss (depopulation), as well as a mechanical outflow of the population (emigration). In the territory of three Croatian municipalities that were most severely affected, there were 12846 resident persons according to the census of 2011, which was a decrease of 27% compared to the situation of 2001, when there were 17631 residents (DZS, 2014). These three municipalities were areas of special public care as significantly underdeveloped according to the economic, structural, and demographic criteria. They also had a significant unemployment rate (the entire county being among those with the highest unemployment rate in Croatia) and a considerable number of persons living on social welfare (OMBUDSMAN, 2014). This was a significant obstacle to the return of labour (e)migrants and this weather event could act as an

9 Black et al. (2013) have demonstrated that the phase of clearing, restoration, and reconstruction can lead to increased economic activity in the area affected by an environmental disaster. In this case, one of the rare positive consequences of flooding was that the local population (a considerable percentage being unemployed) could obtain jobs, at least temporary, through the model of public works on the clearing and restoration of their own or their neighbours' houses as well as the local infrastructure.

additional impetus to make the decision on temporarily or permanently emigrating from the region.

Access to information, and especially participation in decision-making process related to adapting to environmental change (or reacting to natural disasters), are two important factors of environmental justice, as we endorse in Antypas et al. (2008). Both rights had been compromised by the Croatia's state bodies during the preparation, reaction and restoration phase in regards to flooding. This is reflected in the fact that some of local Croatian citizens who are inhabitants of the flooded localities, being disappointed by process of determining liability for a breakage of the dike, had announced they would have sued the Republic of Croatia as the possible culprit for the damage caused, before the European Court of Justice.[10] Hence, as emphasized in Čaldarović (2012:171), there is always a need for effective, prompt and correct information which is conveyed to public about all possible outcomes before, during and after the realization of environmental hazard. These information could add to environmental resilience, mitigation and adaptation potential for communities affected by a disaster.

It is important to stress that parts of Bosnia and Herzegovina affected by flooding had suffered far worse during the war in the 1990s, which had forced many to move away in order to seek shelter and safety. Presently, the situation (especially in Bosnia and Herzegovina) is still burdened by the problem of war-displaced populations, who remain in the state of "prolonged displacement" despite all the efforts to take direct measures of defence against flooding as well as *post ante* mechanisms that would create the conditions for the return of evacuated and displaced persons. Thus, the areas affected by flooding were the very same parts of Croatia and Bosnia and Herzegovina which had been devastated during the war, which means that many houses that had been restored and rebuilt after the war were now demolished again by flooding and landslide. Beside these hazards, there was an additional danger in many areas that the remaining landmines may get activated (RELIEFWEB, 2014:3).

Furthermore, environmentally motivated migration and displacement can occur before, during, or after the natural disaster (in the phase of recovery and restoration). Black at al. (2013) have drawn attention to the fact that the trauma of environmental disaster can lead to the emergence of "post-disaster migrants", who are forcibly immobile during the disaster, but move away later on. As for the flood of 2014, it would be interesting to see how many of those who returned home after short-term displacement actually abandoned the idea of repairing their homes and decided to move

10 Please see: http://www.glas-slavonije.hr/269637/1/DORH-suti-poplavljeni-iz-zupanjske-Posavine-obratili-se-Europskom-sudu

away permanently from the flooded area. These considerations seem all the more important as these are the areas that are otherwise socio-demographically and socio-economically vulnerable, as they are, as mentioned before, characterized by accelerated trends of natural and mechanical depopulation, primarily owing to the unfavourable economic situation, high unemployment rate, and general lack of prospects.

Owing to these reasons, the population of these areas have a reduced resilience against suffering, their vulnerability being enhanced by adverse social, economic, demographic, and occasionally political factors, intensified by insufficient structural revitalization after the war of the 1990s. Whereas in Croatia and in Bosnia and Herzegovina the areas affected by flooding were mostly multi-ethnic areas with post-war returnees, in Serbia it was partly the areas with population that had been displaced before, having been forced to settle here from Croatia or from Bosnia and Herzegovina during the war. Thus, segments of the population affected by flooding had been in the situation of having to leave their homes twenty years before, and the natural disaster may have incurred an even greater damage than during the war. Another vulnerable social group were the asylum seekers from Asian and African countries, who had fled from persecution (and perhaps partly from environmental hazards?) and now had to be evacuated from Serbian reception centres at Obrenovac and Banja Koviljača. All these issues need further research focusing on the links between environmental change and displacement, including the data referring to our case.

5. Concluding Remarks – Environmental Justice and Coping with Environmental Vulnerability and Displacement

In this chapter we discuss diverse natural and societal factors contributing to global environmental change and the way they influence modes of coping with environmental threats. Anthropogenic degradation of the environment in the form of general air, water, and soil pollution has direct consequences for heath and the quality of life. Until recently, it could be claimed that high-degree concentration of industrial pollution in the developed regions of the world implied the contamination of the entire ecosystem and the biosphere. Today, this threat has extended to those underdeveloped countries that seek to reach the level of industrial development characteristic of the so-called "developed countries". The problem is worsened by the fact that these countries do not possess the new, "cleaner" technologies with reduced mechanisms for the emission of detrimental gases and other polluters, but are based on the "old" industries that the developed countries have largely abandoned or made "greener", that is, ecologically more acceptable and environmentally less detrimental. Of-

ten the old, dirty industries have been exported to the underdeveloped countries, along with the waste, which these were willing or even forced to accept in return for financial gain. This poses a particular sort of global environmental injustice related to power issues of international community and presumably environmentally oppressive character of 'richer' countries towards 'less developed' countries of the periphery (in Wallerstein's world-system terms).

Environmental justice does not concern only the issues of responsibility and sharing the burden of environmental change, but also the issues of exposure to the consequences of that change for those living in the regions of high environmental risk (e.g. regions prone to flooding, and the population strata more vulnerable to its impacts). Environmental justice also refers to the right to change these circumstances, be it through an *in situ* adaptation or by regular and supported migration away from such areas, as a sort of *ex situ* adaptation. By using the example of flooding in 2014, we have shown how adaptation measures can be implemented primarily as a response to environmental threat in a moment of crisis, that is, reactively, without an anticipating strategy that would increase environmental resilience and decrease environmental vulnerability. Environmental displacement that took place during that natural disaster was largely forced, resulting from necessity, spontaneously and arbitrarily, only partly facilitated by governmental actions in the evacuation phase. An organized and publicly directed process was initiated only later, after the water receded and in the phase of recovery, reconstruction, temporary accommodation, and the processes of organized return of the population. Thereby it becomes clear that in both phases certain parts of the population (the poor, minorities, previously displaced persons) were more environmentally and socially exposed, as well as more vulnerable, than others, both in the phase of evacuation as in that or return, or while waiting to return.

We showed that some parts of local population had been deprived of access to prompt and valid information about the environmental risk during different phases of the disaster and its aftermath. In the same manner affected citizens were not included in decision-making process in the phase of preparing evacuation, and only participated partially in the process of planning restoration. Often inadequate accommodation for vulnerable groups such as children, elders, persons with disabilities, as well as misplaced priorities in house restoration, are indicative of the insensitivity of state administration concerning different degrees and modes of personal and structural socioeconomic and environmental vulnerability.

For all of these reasons, environmental migration and displacement must be viewed as a heterogeneous phenomenon, which may include different categories of persons migrating for reasons of environmental

change. With regard to the degree of control over the situation and the degree of vulnerability, these categories can include, on the one side, those who are "voluntarily mobile" – individuals and groups resembling regular migrants, with a high degree of control and a low level of vulnerability or sensitivity to real or perceived threat – and, on the other side, those who are "forced to migrate", and who have very little or no control and are in a situation of high vulnerability (ADAMO, 2010). If these two poles represent the extremes of the spectrum, it is very probable that between them there are those who are compelled to move and indeed leave the area, as well as those who are forced to move, but stay, since they have insufficient economic or social resources to organize and carry out their migration.[11]

We are ending this paper with a summary of EACH-FOR (2009:22-23) research on the situation in the Balkan countries regarding their potential to adapt to environmental change and the possible guidelines to increase their adaptation capacity: The degree of adaptability to environmental degradation is relatively low, in a situation where an increasing part of the local population is affected by environmental change, especially flooding. Researchers have not observed any higher degree of interconnectedness between environmental change and long-term displacement, except for the short-term one owing to natural disasters in some regions. A solution would be to invest additional resources in further development of measures for environmental protection and measures that would aim at reducing the impact of environmental stress on certain parts of the environmentally vulnerable population, such as ethnic minorities (especially the Roma), the poor, rural population, and other vulnerable groups. Adaptation strategies should aim at investing more into defence measures against flooding and the related landslides, as well as the prevention of industrial pollution. Regarding the recent war devastation, the need of finding solutions

11 An important observation by Barnett and Weber (2010) concerns the need of "pondering" over various factors that are at work in migration decisions, as equal climatic or environmental circumstances need not have equal consequences in various areas affected by the events or processes. Climatic variability with the natural disaster of prolonged drought, although it may appear almost identical in various areas, does not affect the agricultural regions of northern Ethiopia and central Australia in the same way, be it in terms of migration potential or in terms of life quality. Whereas in Ethiopia it will most probably result in migration, in Australia it will not. Migration because of drought primarily occur in Ethiopia owing to the higher degree of vulnerability in its population owing to poverty and institutional failure to deal with the situation, rather than the extreme climatic event *per se*. Environmental (climate) change may be a trigger of migration, but poverty and famine are its actual causes (BARNETT and WEBER, 2010:6).

for the problem of "pollution" of the ecosystem by remaining landmines is especially acute.

The analysis of floods in Croatia, Serbia, and Bosnia and Herzegovina has clearly shown the necessity of developing measures that would aim at increasing environmental resilience and reducing environmental vulnerability in the local population threatened by sudden environmental change, such as flooding. This ought to be done in order to prevent involuntary environmental migration and efficiently facilitate migration understood either as a short-term evacuation measure or as a more permanent adaptable strategy for coping with the future environmental change and challenges. Thereby it is important to see that working on any form of increasing environmental resilience should imply diminishing environmental injustice and establishing fair models of reduction of both environmental and social vulnerability of the population exposed to environmental hazards and socioeconomic deprivation.

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Political ecology is a research approach that combines the disciplinary tools of ecology as well as political economy to address the relations between humans and nature, and various outcomes of social and cultural norms that determine different human communities' access to nature. Political ecology seeks explanations and interpretations of the phenomena resulting from the human-nature interaction, such as conflicts over resources, which appreciate both the ecological processes and the political power struggles. Aspects of political ecology rooted in commons research, materialism, feminist development critiques, environmental history, post-colonial studies and science and technology studies are reflected in different chapters of this volume. As the average global warming exceeds 1°C, many of the world's most vulnerable people's resilience responses are already overwhelmed. The Anthropocene is upon us, bringing the catastrophic outlook to the present, not some distant future. The catastrophic outlook anchors the idea of progress in the idea of catastrophe, the fact that things just cannot go on as they are.

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