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# EAERE Magazine

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**EAERE**

European Association  
of Environmental and  
Resource Economists

EAERE Magazine serves as an outlet for new research, projects, and other professional news, featuring articles that can contribute to recent policy discussions and developments in the field of environmental and natural resource economics. It is published quarterly in the Winter, Spring, Summer, and Fall. Contributions from the wider EAERE community, especially senior level researchers and practitioners, and EAERE Country Representatives, are included in the magazine.

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Frank J. Convery



**Frank J. Convery** ([frank.convery@envecon.eu](mailto:frank.convery@envecon.eu)) completed forestry degrees at University College Dublin and PhD (forestry economics) at the State University of New York, followed by careers at Duke University, Heritage Trust Professor at University College Dublin, and Chief Economist, Environmental Defense Fund. His professional passions: bringing academic research down to where things are done; finding ways that work to protect our shared climate and environmental commons with a focus on mobilizing markets and (latterly) innovation to these ends; help make Ireland and Europe exemplars thereof.

We use this issue to hear from: two of EAERE's 2021 awardees for Best Doctoral Dissertation, the team that so successfully steered us through our EAERE conferences in 2020 and 2021, and conclude with some personal reflections on my experience at COP 26.

Yuting Yang's (University of New Mexico) award was for her thesis titled "Economic Studies on Energy Transition and Environmental Regulations" in which she examines the expansion of cross-border electricity transmission and its impact on energy transition and carbon emissions and the resiliency of distributed microgrids. A tenet of our profession is that as access to markets expand, other things being equal, the choices for consumers will increase, the prices they face will tend to fall, and overall welfare will increase. Yang accepts this broad premise, but, in her paper, she very elegantly demonstrates that, unless climate policy is consistent across the relevant markets, such expansion, such as grid interconnection, could well result in climate-damaging outcomes. She notes that in the European Union, such outcomes will be mitigated by the fact that there is a single carbon price faced by electricity generators<sup>1</sup>.

Frikk Nesje (University of Copenhagen) is our second awardee. His dissertation aims to strengthen the foundations of intergenerational cost-benefit analysis for assessing climate change. Reading it recalled a wonderful New Yorker cartoon, where a parent is explaining to his children: "Yes, the planet got destroyed, but for a beautiful moment in time, we created a lot of value for shareholders." It is relevant because it puts its finger on how we decide to trade-off present versus future benefits which

is the essence of Nesje's analysis<sup>2</sup>. There are at least two enormous layers of uncertainty arising when assessing climate policy choices, both of which were identified by the late Marty Weitzman. As regards the first, he noted that "The climate science seems to be saying that the probability of a system-wide disastrous collapse is non-negligible". As regards the second, he described the choice of discounting the distant future as "one of the most critical problems of all of economics". His conclusions, which I share, were that managing extreme uncertainty is the only framing that makes sense in assessing climate policy choices, and that great modesty should characterize the definitiveness with which we draw normative conclusions. Nesje addresses the second of these sources of uncertainty, namely the discount rate. He makes the self-evident point that the rate of time preference we decide to apply to decisions to address (in human terms) very long-term impacts will determine the outcome. "For 1000 units of inflation-adjusted (composite) consumption a century from now, a discount rate of, say, 1.4 percent would imply that society should be willing to sacrifice up to 250 units today, while a discount rate of 4.5 percent would imply a willingness to sacrifice 10 units of consumption". He carefully interrogates the literature, ranging in time from Ramsey's pioneering paper in 1928 to his own Working paper on cross-dynastic intergenerational altruism published in 2021, and carefully maintains the distinction between the positive (mostly rooted in considerations of efficiency) and the normative, which gives much more weight to intergenerational well-being.

Monica Eberle suggested that it would be very useful to document the challenges faced by the

<sup>1</sup> Since early May 2021, the carbon price faced by electricity generators and their customers across the EU has exceeded €50 Euro per ton, and on January 6, 2022 it stood at €86.74 - <https://ember-climate.org/carbon-price-viewer>

<sup>2</sup> His article reminded me of my first 'Eureka moment' when I realised, as a young forestry student, that economics could be a powerful and very useful analytical tool. I was introduced to the Faustmann formula, which was published in 1849 by 27 year old Martin Faustmann (1822-1876). His formula allowed one to calculate the net present value of the income stream for a forest rotation or infinite series of such rotations. The key message over 170 years ago was that what you can afford to pay for land to establish a forest depends on many things, but mostly on the discount rate you decide to apply to future net earnings.

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Technische Universität Berlin team that hosted our first remote (pandemic) conferences in 2020 and 2021, and how they responded to them, on the basis that such knowledge would be invaluable as we move forward to what could well be a future where conferences are all remote, or remote-in person hybrids. Georg Meran and his team<sup>3</sup> responded with alacrity and great skill to document their experiences and providing lessons for others in “Dinosaurs Turned Digital – EAERE’s First Online Annual Conferences”. This article will be valuable to all future hosts of EAERE conferences, but it has much wider application than that. A hybrid world is in all our futures and I recommend this paper to you as an important step in smoothing the journey. We owe this group an enormous debt of gratitude.

The final paper in this issue is “(Very) Personal Impressions on COP 26, Scotland” by myself in which I try to make sense of my first ever in person attendance at a COP. My guess is that it will come across as anecdotal and misinformed by seasoned COP goers, but may be of interest to those of you who have yet to cross into the maelstrom called ‘COP’.

### Looking Ahead

I love Peter Medewar’s definition of a virus: “A piece of nucleic acid surrounded by bad news.” But bad news, in the form of Covid-19 adversity, has taught us valuable lessons: humility; the essential role of innovation in finding new and better ways to navigate threats and how best to engender it; and the need to adapt quickly and with skill to ever changing circumstances.

Beginning with issue 16, which will be published in Spring 2022, we will turn our attention to the impacts of climate change, and how to adapt to them. This is the corollary of reducing greenhouse gas emissions and removing carbon,

which we focussed on in Issues 11-14 inclusively; we will, as before, address this impacts-adaptation theme for the Big Four (China, European Union, India, and the US). We will start the coverage in Issue 16 with the European Union, with papers by Francesco Bosello, Professor of Environmental Economics at Ca’ Foscari University of Venice and Affiliate Scientist at the Euro-Mediterranean Centre on Climate Change (CMCC), and Paul Watkiss, Paul Watkiss Associates Ltd. This will be followed in subsequent issues by modules devoted to China, India, the US, and Africa.

From Katie and myself, thanks for your attention and feedback in 2021 and let’s hope that ---2022 is gentle on us all.

Frank J. Convery

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3 Klaus Eisenack, Jens Weizsäcker, Markus Sieglow, Achim Hagen, Christian von Hirschhausen, Elisa Krammer, Lukas Barner, Christina Arndt

# Challenges and Opportunities of Electricity Interconnection with Renewables

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**Yuting Yang** (yutingyang@unm.edu) is an Assistant Professor of Economics at the University of New Mexico, specializing in environmental and energy economics. Her research primarily focuses on energy transition policies in the electricity sector. Her current research looks at the expansion of cross-border electricity transmission and its impact on energy transition and carbon emissions and the resiliency of distributed microgrids. She holds a Ph.D. from the Toulouse School of Economics and was awarded the 2021 EAERE Award for Best Doctoral Dissertation for her thesis titled “Economic Studies on Energy Transition and Environmental Regulations.”

## Renewables at the center stage of energy sector decarbonization

COP26 has once again reminded the world of the urgent need to take rapid and concerted actions toward carbon neutrality to avoid any irreversible damage from climate change. Although each country could take different pathways to mitigate greenhouse gas (GHG) emissions, there is a broad consensus for the *energy sector's* net-zero emission (NZE) pathway. The pathway includes the electrification of heating, transportation, and other end-uses; and generating electricity using zero-carbon technologies, predominately solar PV, wind, hydropower, and nuclear power. According to the International Energy Agency (IEA), to achieve NZE by 2050, the share of renewables in total electricity generation needs to reach 90% in 2050. Specifically, 70% of the generation is projected to come from wind and solar (IEA, 2021).

The biggest challenge associated with wind and solar, albeit abundant and carbon-free, is their intermittency. Intermittency imposes risks on the power system that constantly balances instantaneous supply and demand. Thus, to support renewable integration, the grid demands more demand-side response, storage capacity, and the expansion of electricity transmission.

## Is electricity interconnection the highway to zero-carbon energy transition?

Electricity interconnection allows for electricity trade over long distances and brings several established benefits. First, electricity trade harnesses varying comparative advantages in electricity generation across regions or countries, which can lower prices to consumers through improved

production efficiency. Second, trade can facilitate the penetration of renewables to regions with insufficient renewable resources or technology, thereby enhancing the potential to lower carbon emissions. Thirdly, trade brings more flexibility to the grid by utilizing the asynchronous electricity consumption pattern and renewable generation across geographical locations.

Does investment in electricity interconnection infrastructure then put us on the highway to NZE? To understand this question, I extend on the theoretical work of Ambec and Crampes (2012, 2019) and Joskow and Tirole (2000, 2005) to look at how interconnection affects intermittent renewable adoption and carbon emissions. My research shows that expanded interconnection does not guarantee lowered carbon emissions in a decentralized electricity market unless coupled with sufficiently high carbon prices or other renewable policies (Yang, 2021). Additionally, how much interconnection mitigates or exacerbates carbon emission critically depends on the interconnected regions' existing energy mix and available resources.

## Windville, Solarville, and Fossilville

The above results can be illustrated with an example. Consider Windville, an isolated region with abundant wind power and expensive thermal power. Out of efficiency concerns, Windville decides to connect its grid to its neighboring regions, Solarville or Fossilville. Solarville has a lot of sunshine year-round, and its thermal power has the same cost as Windville. Fossilville is not blessed with renewables but has numerous coal mines, making its thermal power cheap. Suppose Windville forms an agreement with Fossilville to jointly invest in a cross-border

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transmission line. Once the interconnection is built, Windville can import and export electricity depending on the market conditions. Since the thermal power from Fossilville is cheaper, Windville will import until the capacity limit of the transmission and meet the residual demand with local power generation. This would lead to two effects that increase the carbon footprint of Windville: Windvillers consume more electricity as it becomes cheaper, and less wind capacity investment takes place compared to when Windville was isolated. However, the story could be different if Windville and Fossilville have a uniform carbon price or jointly agree to phase-out coal. Then Windville could export its wind power when the wind is blowing and bring down the carbon emission in both regions.

What if Windville interconnects with Solarville instead? The interconnection will not crowd out Windville's wind and thermal capacity investment. However, since sunny days are negatively correlated with windy days, Windville can import solar power on sunny days, decreasing thermal power production when the wind is not blowing. Analogously, Windville can export wind power to Solarville on windy days. Thus, interconnection provides insurance against local renewable intermittency, increases renewable capacity investment, and reduces total carbon emissions.

### **Location and timing of interconnection is key to lowering carbon emissions**

The example above indicates that interconnection ensures efficiency gains in the electricity market; however, it does not guarantee increased renewable penetration and reduced carbon emissions. Therefore, to “kill two birds with one stone,” it is crucial to consider the *location* and *timing* of when the interconnection is put in place.

Location determines what characteristics do the interconnected markets have, i.e., are the markets like Windville, Fossilville, or Solarville? Interconnecting two markets with negatively correlated renewable resources, like Windville

and Solarville, makes the two markets complementary. In this case, more interconnection capacity can lead to higher renewable penetration and more significant carbon reduction. Interconnecting markets with a cleaner energy mix and cheap thermal power, e.g., Windville and Fossilville, makes the two markets substitutes. Expanding interconnection may crowd out renewable investment since renewables are costly when accounting for their intermittency. Thus, carbon emissions may exacerbate with interconnection expansion. Analogies can be made for other market combinations as well, e.g., two Windvilles or Solarville and Fossilville. Therefore, the location of interconnection planning matters, even if the markets are under the same carbon policy.

Timing refers to the carbon policy conditions under which the interconnection is implemented. For example, will the carbon price be around 50 euros or 100 euros during the period when the interconnection is in service?<sup>1</sup> Timing matters because the higher the carbon price, the higher incentive for renewable investment. Especially in the case of Windville and Fossilville, higher carbon prices would incentivize both markets to phase out fossil to minimize cost, and interconnection would thus facilitate renewable penetration. As the world gradually exhausts the carbon budget, carbon prices, either in the form of taxes or prices of tradeable permits, are expected to increase in the following decades. To ensure interconnection always leads to a reduction in carbon emissions, governments need to consider the timing of interconnection planning as well.

### **Interconnection, intermittency, and imperfect carbon policies**

In addition to the location and timing of interconnection planning, it is also important to consider the carbon policies in the interconnected markets. European countries, with the EU-ETS, are under the same carbon pricing systems, which reduces carbon leakage concerns of interconnection. Often, interconnection exists between regions that adopt different carbon

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<sup>1</sup> It is interesting to note that the allowance price per ton of CO<sub>2</sub> in EUETS falls well within this range – <https://ember-climate.org/carbon-price-viewer/>



policies and prices. For example, California implements a stringent carbon market while its neighboring states have much more lax carbon policies; many of the northeastern states in the U.S. are under the Regional Greenhouse Gas Initiative (RGGI) but have interconnections with states that are not part of RGGI. This unilateral or imperfect carbon policy structure between interconnected markets brings another challenge to interconnection with renewable intermittency: potential carbon leakages. In my work with Stefan Ambec, we look at the effect of interconnection on overall emission under unilateral climate policies (Ambec and Yang, 2021).

Our analysis shows that, under the conditions posited, interconnection dampens the policies effectiveness of unilateral climate policies through two channels: lowered renewable investment and increased electricity consumption. Additionally, suppose the policy-adopting jurisdiction further increases the carbon price and incentivizes more renewable investment. In that case, it will create a positive feedback loop that increases investment into interconnection capacities and further reduces the share of renewables. Although a border carbon adjustment mechanism can address the carbon leakage concern, it cannot facilitate the penetration of renewables into the no-carbon-policy jurisdiction to fully resolve the inefficiency of imperfect carbon policies.

#### **Other GHG emissions from network expansion**

Carbon dioxide is not the only GHG impacted by interconnection expansion. It may also lead to the increased emission of Sulfur Hexafluoride ( $SF_6$ ), the most potent GHG with a global warming potential of 23900 (IPCC, 2013).  $SF_6$  is widely used as the insulation gas in gas-insulated switchgear (GIS) equipment in the transmission and distribution network (ENSTO-E, 2021). As increased electrification and renewable penetration demand network expansion,  $SF_6$  use and emission will inevitably rise under the current technology and without policy intervention (Simmonds et al., 2020). Currently, transmission system operators in Europe (ENTSO-E) are researching new GIS technologies that substitute  $SF_6$  with lower GWP gases. However, there is a lack of thorough economic analysis on the fea-

sibility and the scale of policy incentives needed to achieve such transition. Thus, future research is necessary to understand the non- $CO_2$  GHG emissions to paint a complete picture of net-zero pathways.

#### **Interconnection vs. Distributed Generation**

Interconnection and network expansion are at one end of the spectrum to decarbonize the electricity system. This promotes the linking of utility-scale renewable generation across large geographical distances. Distributed feeder microgrids (DFM) are at the other end of the spectrum. DFM can produce electricity where energy is needed, thus reducing significant network investment. Moreover, DFM provides a community-level demand-side response, which increases the reliability and resilience of the grid to demand or supply shocks. Of course, neither interconnection nor DFM can be applied in all contexts. A systematic approach is needed to identify the cost-efficient network planning that puts us on the 1.5 degrees C pathway.

#### **Technology, policies, and the market**

The world has seen a significant reduction in the capacity cost of renewables in the past decades. However, renewable intermittency has hindered the mass adoption of renewables in many countries. Although engineers understand the technical solutions for intermittency well, such solutions usually need coordinated policies to deliver. As economists, we can use our understanding of the market and different policy tools to help bridge the gap between efficient technology and effective and equitable policymaking.



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# Assessing Climate Change

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## Introduction<sup>1</sup>

*The purpose of my thesis was to strengthen the foundations of intergenerational cost-benefit analysis for assessing climate change.*

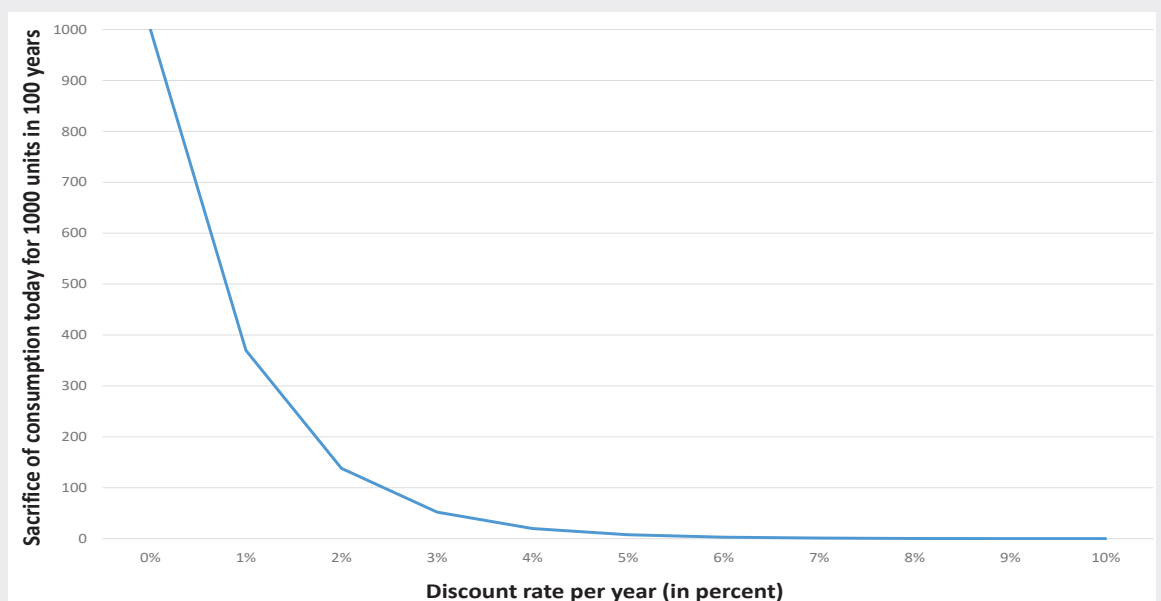
There are two alternative reasons for why the future should be given less weight than the present (Ramsey, 1928):

- One is concerned with the opportunity cost of capital. It says that a project is only worthwhile if it has at least the same return.
- The other is concerned with pure impatience and inequality aversion under growth. This means that a project is only worthwhile if

it has at least the same return.

Both of these rationales for discounting the future can be calibrated by annual discounts rates. In intergenerational cost-benefit analysis, the first reason is often associated with a concern for efficiency, and the second with a concern for distribution. I therefore refer to them as the “positive” (descriptive) and “normative” (prescriptive) approaches to calibrating the discount rate (Arrow et al., 1995).

When the maturity of a project is long-term, its estimated economic value is extremely sensitive to minor alterations to the discount rate. This is because small changes to the annualized rate compound to much more significant differences



**Figure 1.** Worthwhile sacrifice of consumption today for 1000 units of consumption in 100 years, illustrated for different values of the discount rate.

<sup>1</sup> This article is based on a highly shortened and revised version my thesis introduction, and framed in terms of the Stern-Nordhaus debate. Read the thesis for alternative motivations, formal derivations and in-depth discussions of contribution to literature. I am grateful to my supervisors Geir Asheim and Ben Groom, co-authors Christian Azar, Moritz Drupp, Mark Freeman, Martin Hänsel, Daniel Johansson and Thomas Sterner, and committee members Antony Millner, Paolo Piacquadio and Katheline Schubert.

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over these time horizons. To take an example: For 1000 units of inflation-adjusted (composite) consumption a century from now, a discount rate of, say, 1.4 percent would imply that society should be willing to sacrifice up to 250 units today, while a discount rate of 4.5 percent would imply a willingness to sacrifice 10 units of consumption. Figure 1 illustrates the implied worthwhile sacrifices of consumption for different values of the discount rate.

Indeed, it is because of the sensitivity of long-run cost-benefit analysis to the choice of the discount rate that discounting the distant future has been described as “one of the most critical problems of all of economics” (Weitzman, 2001, 260). In recent decades, the disagreement on the discount rate is most obviously seen in the aftermath of the Stern Review (2007), which took a normative stand and advocated for a small discount rate of around 1.4 percent that favored strong and immediate action on climate change mitigation. In a positivist response, Nordhaus (2007, 686), recipient of the 2018 Economics Nobel Prize, noted that the “unambiguous conclusions about the need for extreme immediate action [do] not survive the substitution of assumptions that are consistent with today’s marketplace real interest rates and savings rates”. The larger rate put forward by Nordhaus (2008) is 4.5 percent (later adjusted to 4.25 percent, e.g., Nordhaus (2019)).

This led to a lengthy and still largely unresolved debate in academic circles over the appropriate discount rates in such contexts. Policy guidance on this topic also varies substantially internationally (OECD, 2018). It was in light of this debate that I investigated how the discount rate used to assess intergenerational projects such as climate policy should be determined.

## Thesis summary

I now clarify in more detail the relation between the content of the thesis and the stated purpose.

### Chapter 1

*Cross-Dynastic Intergenerational Altruism* (solo-authored, available as the working paper Nesje (2021)) investigates how the discount rate is

determined when the present generation has concerns for the future that extends beyond the welfare of their own descendants. A key finding is that the discount rate cannot be inferred from the market.

It revisits theoretically the traditional concept of intergenerational altruism used to define the long-term discount rate (in, e.g., Nordhaus (2007) and to some extent Stern (2007)). This concept is dynastic in the sense that the present members of a dynasty (family or tribe) do not care directly about the welfare of descendants of other dynasties. I develop a cross-dynastic counterpart to the traditional concept, acknowledging that present members of a dynasty may care directly about the welfare of descendants of other dynasties (by a concern for sustainability). The present members of a dynasty may thus place some weight on the next generation as such. This in turn leads to a preference externality, since the saving of one dynasty benefits contemporaries in other dynasties (they also care cross-dynastically). I find that intergenerational altruism cannot be inferred from observed behavior, implying that positive calibration of discount rates does not respect preferences for the future. Even small preferences for the next generation as such can reduce the discount rate by 20-40 percent as compared to Nordhaus’ calibration.

I further show that the preference externality decreases with time. This means that a dynasty’s preferred discount rate is smaller for long-term projects such as climate change, leading to a time-inconsistency problem unless the dynasties cooperate. In general, a dynasty’s preferred discount rate converges to the socially efficient one only in the limit, as time goes to infinity. This gives a new justification for declining (private) discount rates in the infinite horizon setting.

### Chapter 2

*Destructive Intergenerational Altruism* (co-authored with Geir Asheim, published in the Journal of the Association of Environmental and Resource Economics as Asheim and Nesje (2016)) investigates theoretically whether increased intergenerational altruism (by decreasing the discount rate) can reduce the threat of climate change, and finds that long-term wellbeing might be serious-

ly undermined.

It argues that stronger intergenerational altruism (though decreasing the discount rate) can undermine future wellbeing if not complemented by collective action. Given the external effects of greenhouse gas emissions, dynasties (families or tribes living in a setting where there is no climate policy at the country-level) taking care of their descendants do not necessarily contribute to solving the efficiency problem that climate change poses, but may add gravity to the problem. Lowering the discounting rate may thus not promote the interests of future generations.

#### Chapter 3

*Discounting Disentangled* (co-authored with Moritz A. Drupp, Mark C. Freeman and Ben Groom, published in the American Economic Journal: Economic Policy as Drupp et al. (2018)) investigates empirically the extent of heterogeneity in expert opinion on the appropriate discount rate, and obtains a surprising degree of consensus. The project under consideration is generic, but application to climate change is discussed.

It undertakes a survey of (publication-based) experts in economics that influence discounting policy, on the discount rate to be used when assessing intergenerational projects including climate change mitigation. The seminal expert survey by Weitzman (2001) was silent on the reasons for this huge variation in opinion, even on whether respondents were using positive or normative principles to inform their response. Methodologically, the survey improves upon some of the key limitations, and is the most detailed survey of expert opinion on the topic. A key finding is that more than three-quarters of experts in economics are comfortable with a discount rate of 2 percent, highlighting that the views of Nordhaus (2008) and Stern (2007) may not be representative.

#### Chapter 4

*Updating the Nobel Prize Climate-Economy Model Provides Support for the UN Climate Targets* (co-authored with Martin C. Hänsel, Moritz A. Drupp, Daniel Johansson, Christian Azar, Mark C.

Freeman, Ben Groom and Thomas Sterner, later published as *Climate Economics Support for the UN Climate Targets* in Nature Climate Change as Hänsel et al. (2020)) investigates numerically whether the UN climate targets can be optimal in Nordhaus' climate-economy model. It does so by using more accurate climate science relationships, together with the latest evidence from economics, including discounting views, and finds that they can.

It puts the findings of Chapter 3 into perspective. The UN climate target to limit global warming to well below 2°C by the end of this century is either economically suboptimal or unattainable according to Nordhaus (2019). We update Nordhaus' DICE model, which recommends warming of 3.5°C, to better reflect the prevailing understanding about the relationship between emissions, concentration and temperature change, the most recently updated damage function, and a large range of expert views on the discount rate (Chapter 3). We also make two additional changes that are in line with recent research, and model adjustment costs and technical feasibility constraints in terms of decarbonization, allowing a more credible study of low-emission scenarios. When jointly considering these updates from the climate and economic sciences we find that around three-quarters (one-third) of expert views on intergenerational welfare translate into climate policy paths that are consistent with the 2°C (1.5°C) target.

#### Conclusion

I started out with the aim to strengthen the foundations of intergenerational cost-benefit analysis for assessing climate change, a long-term problem that is increasingly pressing. Given the previously reported lack of consensus among economists and that guidelines vary considerably between countries, this is imperative.

The thesis establishes some support for smaller discount rates than the one put forward by Nordhaus (2008) for cases without and with collective action. Chapter 1 finds theoretically that large positive (descriptive) discount rates inferred from observed behavior in the market (e.g., Nordhaus, 2008) may not be socially desirable, if there are concerns for the future that

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extends beyond the welfare of own descendants. This is due to the resulting preference externalities when saving for own descendants (unless there is collective action). However, this support for smaller discount rates comes with a caveat underlining the importance of collective climate action. Chapter 2 finds theoretically that small discount rates that people use to make decisions may not be socially desirable, as they could lead to overaccumulation of capital in absence of collective climate action, resulting in increased accumulation of greenhouse gases.

Chapter 3 finds empirically that most publication-based experts in economics would recommend a smaller discount rate than Nordhaus (2008) when evaluating a long-term generic project as a Time Discounted Utilitarian planner. The smaller discount rate of Stern (2007) also has limited support in this context, meaning that there is evidence for a middle ground between the prominent positions of Stern (2007) and Nordhaus (2008). Assuming collective climate action, Chapter 4 quantifies numerically the insights of Chapter 3 in a state-of-the-art climate-economy model.

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## Dinosaurs Turned Digital — EAERE's First Online Annual Conferences

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### EAERE 2020

In April 2018, the EAERE Council had accepted the proposal of TU Berlin to organize the Annual Meeting 2020 in collaboration with Humboldt University Berlin, which took over the tasks of the Program Committee. We immediately started looking for extraordinary venues for the reception and the traditional dinner. The idea was to assemble the crowd of European environmental and resource economists, all members of a fortunately non-yet extinct species who are presumably interested in the fate of other species who might or already have become extinct. We thought this assembly to perfectly fit under the 20m giant dinosaur and

next to the “wall of biodiversity” in the large hall of Berlins’ “Museum für Naturkunde” (museum of natural history).

The preparations progressed according to plan and continued even when first news about the COVID situation in China arrived in the fall of 2019. First, we naively thought this to be tackled by Spring. However, due to the pandemic situation and in a joint decision with the Associations’ Council, we had to change to an online-only conference in April 2020. We gave some thought to skipping it completely or shifting to Autumn, but we already had hundreds of excellent papers submitted and under review. There were only a few months left to convert



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the conference to the new virtual format — at a time where most of the world had just learned to use webinar tools more frequently and servers broke down on a regular basis due to increased data traffic. Contracts with caterers and venues had to be canceled, room reservations had to be suspended, pre-conferences were called off, and an online infrastructure had to be established. Due to the short preparation time, we jointly decided to organize the congress in a decentralized way. Thus, we took care of the (usual) information system, the website, the online program, and provided all the sessions' access links that were set up and administered, however, by the chairs of the respective sessions. This brought co-presenters into more pre-conference contact and required much more collaboration from the community than usual. Only the virtual plenary sessions ran via the Berlin webinar platform. Particularly painful was the cancellation of the contracts with exhibitors and the abandonment of sponsorship contributions for the dinner. Survival was only possible since the EAERE Council agreed to cover part of the expected financial losses from its rainy day funds. Fortunately, it turned out later that we were admitted to convert the funds raised from the German Research Foundation for the in-person conference to cover the costs of the online congress under a special Covid-19 scheme.

Due to the relatively short preparation time, the congress basically consisted of a sequence of parallel sessions spread over ten days. The congress' opening, the plenary session, and the awards ceremony took place on a single, central conference day. It came as no surprise from the post-conference evaluation questionnaire, that the lack of interaction between participants was strongly missed. While we tried our best in scheduling a virtual social event for the central conference day on the interaction platform “Spatial Chat” in the early evening, attendance on this platform was very moderate, which can be attributed to various causes: the “Zoom fatigue”, technical hurdles, low familiarity in the usage of such tools, and the prevalent understanding that an in-person social event cannot be simulated very well by a virtual format.

## EAERE 2021

In parallel to these ad-hoc solutions, we had a set of discussions with the Council on what to do for 2021. We still heard from many association members that they ultimately wanted to have an EAERE in Berlin. In addition, we were still addicted to our dinosaurs. On the other hand, we were not sure whether we had the resources to host the conference again. In the end, at the expense of postponing the conference in Rimini, and possibly driven by an overly optimistic mood that the pandemic would be resolved one year later, we agreed to host the conference again to welcome everyone in Berlin.

Things turned out differently, though. It soon became clear that the pandemic situation would again not allow this format, so we announced in October that the congress might shift to an online conference, but waited until December for the final decision. Now there was enough time to better exploit the possibilities of the online format by taking into account the constructive-critical comments of participants at the 2020 congress, as well as our own experience, which coincided in many respects. To be mentioned are:

- lack of interaction / networking
- no social events
- limited focus (tiresome for eyes and other sources of distraction)
- low engagement / interaction in sessions
- no visual feedback from attendees (cameras off)
- no informal feedback and discussion after sessions
- decentral organization

We therefore tried to make the 2021 Annual Meeting more inclusive. For this purpose, the conference sessions were integrated into a “foyer environment”. The foyer was open and usable for communication and networking activities during the entire conference, even during time slots where sessions ran in parallel (see figure below). As a tool for implementing this foyer, we chose one of the many online event plat-



forms available, simulating the basic structure of an in-person congress. We decided for Remo, a platform with virtual tables and chairs. Users can sit at these tables and interact with everyone. The size of the participants per table was a maximum of eight people, so that the camera tiles on the laptop are clearly visible. The participants are very mobile and can move between the tables. We also used this “foyer” for the plenary sessions where Remo was run in the presentation mode. During the presentation mode, presenters were on stage, while the residual attendees could follow the presentation from their seats and were able to ask questions by using an integrated Q&A tool (but could not chat with their neighbours during the keynote).

very few people. This was particularly true of the exhibitors’ rooms. One exception was the room of the publisher SpringerNature, where a well-attended information program was offered in cooperation with the publisher of the Environmental and Resource Economics journal. The organizers of future online congresses should therefore develop formats that - in addition to setting up virtual exhibition rooms - also offer an integrated program combining congress topics with exhibitor publications.

### “Zoom Fatigue” and Other Challenges

However, it is not easy to develop a suitable format because it makes the conference schedule even tighter and therefore more exhausting.

EAERE 2021 - Conference day	
Familiarizing with the platform 9.00-10.00	
Parallel sessions 10.00-12.00	Virtual foyer 10.00-12.00
Virtual coffee break 12.00-12.30	
Parallel sessions 12.30-14.30	Virtual foyer 12.30-14.30
Sessions with exhibitors	Virtual lunch 14.30-15.30
Keynote lecture 15.30-17.00	
Virtual coffee break 17.00-17.30	
Parallel sessions 17.30-19.30	Virtual foyer 17.30-19.30
Virtual foyer 19.30-20.00	

In addition to the conference foyer, we set up several virtual rooms to allow participants to make a tour in our virtual conference hall. To be mentioned here are the exhibitors’ rooms, the EAERE office room, a room of the German Federal Environmental Foundation (DBU) - our platform sponsor, and a room for the Job Market. With those rooms on an advanced online platform, we had a similar experience like with the ad-hoc solutions one year earlier. While these virtual spaces are well suited for informal meetings, this opportunity was only taken up by

This is certainly one of the main problems in our opinion: an online congress puts far more strains on the participants than an in-person congress. This problem has now also been taken up in the scientific literature<sup>1</sup> under the term “video conferencing fatigue” or in a more compact notion “Zoom fatigue”. The states of exhaustion are partly the result of a so-called “nonverbal overload”<sup>2</sup>, which sets in due to simultaneous direct eye contacts between the participants with the camera turned on. Participants are exposed to more intense eye contacts than

1 Bennett, A. A., et al. (2021). Videoconference Fatigue? Exploring Changes in Fatigue After Videoconference Meetings During COVID-19. *Journal of Applied Psychology*, 106(3), 330–344.

2 Bailenson, J. N. (2021). Nonverbal Overload: A Theoretical Argument for the Causes of Zoom Fatigue. *Technology, Mind, and Behavior*, 2. DOI: 10.1037/tmb0000030

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in an in-person situation with the same number of participants. This probably also explains the desire of many participants to lighten up the conference schedule. However, one should not conclude from these observations that parallel sessions should take place with the camera turned off. Conversely, we have also made the experience - which was confirmed by comments in the evaluation questionnaire - that a virtual congress does not take the participants out of their working environment, which is an important contrast to an in-person congress. The result is that multi-tasking takes place during the sessions. This, of course, diminishes participation during sessions, implying that presenters receive less feedback on their work.

Probably the involvement in daily work routine together with the fatigue syndrome is another reason why the foyer platform was not intensively used for informal meetings. After attending the parallel sessions, a rest was needed, which could still be used for routine tasks at the same time. The formation of new contacts is also hampered by the fact that social mechanisms are less present in a virtual space. In a real foyer at bar tables or at lunch, a brief exchange of words occurring out of politeness alone may lead to a conversation. This is not the case in the virtual space. The participants can observe the foyer without making themselves known (camera switched off).

All these problems increase with the size of a conference. Small congresses or workshops, whose participants often already know each other from different contexts, will certainly be able to benefit from virtual congress platforms. Large congresses, used to make new contacts, particularly for young scholars, will likely encounter the problems described above. It will be debatable whether this would be different for hybrid conferences, where part of the participants is present, and others participate only virtually.

If online formats continue to be used in the future, not only because of the pandemic situation but also because of the much lower CO<sub>2</sub> emissions compared to in-person congresses, it should be considered whether the program should be clustered by topics. So an annual

meeting could be, say, spread over 14 days and structured chronologically by topic. This could lead to social contact being established in the virtual environment because of the smaller, more manageable group sizes. Compartmentalization does not preclude participants from also participating in many topics.

Another challenge for the program design is to address the different time zones of the speakers. This is, of course, a problem of any online conference. However, the organizers will only be able to take the various wishes into account to a limited extent, because the thematic assignment of accepted papers is already very complex. One possibility to consider time zones better would be to extend the congress to more days, such that sufficient time slots are available.

## Conclusion

In the coming years, it will be an important task for the Council to work with Local Organizers to develop a suitable format for online conferences. This is a question of an appropriate framework and a question of the behavior of congress participants. Therefore, we think that, in addition to organizational and communication optimization, a kind of code of conduct must develop in order to make the exchange of ideas effective.

Based on the experience we have gained over the last two years, we believe the following summary points are of great importance:

- Dealing with the congress portals must be easy. In particular, the information hub of the congress program (e.g., Anymeets), the congress homepage of the EAERE, and the online platform of the virtual venue (e.g., Remo) must be linked with each other and embedded into a coherent framework. This means that the conference activities, the role of the portals in the conference, and the portal's handling must be clearly specified and communicated to the conference participants by, e.g., screenshots, videos, screencasts, checklists, instruction manuals, etc.
- The log-in procedure into the portals must be simple and should not be uncom-

portable due to technical burdens. It would be best if one log-in is sufficient to access all platforms, which is often not possible because of technical restrictions. Please be aware that most of the conference participants have multiple e-mail addresses. Confusion can occur if participants register into the portals with different e-mail addresses.

- Please be aware that technical portals can (temporarily) break down. Therefore, it is crucial to be prepared for various worst-case scenarios. This means that e-mails, mailing lists, specific documents, a channel for providing information, etc., must be ready in case of a technical emergency.
- To make an online congress an event that is more than just a series of sessions, the plenary sessions and the social events need to be adapted to the online format. Our experience shows that setting up a virtual platform that is freely available for participants to meet informally during the congress is only used moderately. We think that a social program should be offered online. Social events should be structured by a program, such as using a professional facilitator to activate participants.
- Incentives to participate in plenary sessions or social events can also be provided by offering prizes or other incentivizing instruments.

We are convinced that with increasing experience, online congresses will become much more attractive. Of course, this is a challenge, but at the same time, this kind of innovation is associated with a high degree of joy for the local organizers. The Berlin team has experienced the organization of the last two online congresses as an exciting and very interesting time.

# (Very) Personal Impressions on COP 26, Scotland (31 October – 12 November 2021)<sup>1</sup>

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The 26<sup>th</sup> Climate Change COP was hosted by the UK and met in Glasgow; I attended as an ‘accredited observer,’ securing one of the 4 slots available to EAERE<sup>2</sup>. This was my first COP, and these are my personal impressions. There were four very separate groups who jostled for space and attention, which in rough order of significance were: the rebellious young, who messaged their anger and frustration mostly from the public square; the officials from 197 countries who were sequestered in rooms trying to negotiate the bones of the way forward; lobbyists for both fossil fuel interests and climate solutions who promoted their very divergent agendas; and academic types like me who listened and engaged with side events in the many ‘pavilions’ in the vast Clyde-side conference centre. The word ‘pavilion’ conveys a sense of spaciousness and an element of grandeur which is very misleading. There are about 100 of them. There were a few exceptions, but most were modest spaces, squashed together, with very limited seating, and lots of collateral – and often not very well socially-spaced – noise from humans in the aisles.

## The Anger from the Public Square

This is both understandable and useful: they speak the truth: actions that reduce and safely store greenhouse gas emissions at scale are needed now; the square gives a voice to those many who are not at the table which include: the

young whose choices of a full life are perhaps irreversibly being narrowed by others; indigenous peoples whose natural habitats and livelihoods are being destroyed; those from low lying island states who face inundation. [The latter were very influential in Paris at getting the acceptable rise in global temperature reduced from 2°C to 1.5 °C]. These voices do get heard by those at the decision-making tables who represent countries that are not highly dependent on fossil fuels, and where there are loud and effective public voices of influence in favour of climate action and for whom ‘free riding’ is not politically acceptable. But many of the 97 countries represented do not meet these two conditions, so there is a huge asymmetry between what should happen and what can happen at any COP; the decision-making model requires consensus, which means that those who favour no action or minimal action have close to a veto on decisions. A second message I got from the public square which is directly relevant to our profession were from many voices who were against the use of markets in general, and, in particular, the use of offsets. The message as regards the latter seemed to be that they would be used by greenwashing corporations to simultaneously burnish their climate credentials while destroying the environment and indigenous livelihoods, by, e.g., investing in oil palm plantations that are established by clearing tropical forests.

<sup>1</sup> Our Assistant Editor Katie Johnson and the editorial team managed at very short notice to compile the papers prepared for the China, EU, India and US modules into a single, very well-presented volume. Monica Eberle found an ‘observer’ slot for me, got our brochure prepared and delivered to my hotel in time and in great shape. Silvia Bertolini did much of the processing to get me registered, and she continued to act as my mentor as I navigated the procedures. Without their steady skilful and patient help failure on all fronts would have been my lot. Thank you all.

<sup>2</sup> Google tells me that “A conference of the parties (COP; French: Conférence des Parties, CP) is the **supreme governing body of an international convention** (treaty, written agreement between actors in international law). It is composed of representatives of the member states of the convention and accredited observers. The inaugural UN Climate Change COP convened in Berlin in 1995”. Their purpose is two-fold: “To review the implementation of the Convention, the Kyoto Protocol and the Paris Agreement, respectively; and to adopt decisions to further develop and implement these three instruments.”

### Some Pavilions were sources of insight

Many organizations, including the European Commission, UK Presidency and the U.S., organized ‘Side Events’ where small numbers of smart people pitch their ideas. A current interest of mine is climate policy for agriculture and land use (including forestry). Up to now, European Union climate policy for this sector has been an oxymoron – ‘all hat and no cattle’, as the Texans put it – but there are now embryonic signs of real change. In parallel, the UK is slowly moving forwards its public payment for public goods philosophy – Environmental Land Management Strategy (ELMS) for the sector. After a lot of searching to find out what is happening where, and a little string pulling, I got admission to: excellent sessions on this topic at the EU pavilion; a great session hosted by Ian Bateman called “When Science Meets Economics: The Right Tree in the Right Place for NetZeroPlus”<sup>3</sup>; and an event promoting effective planning for adaptation hosted by the U.S. pavilion. On Nov. 3, the day before I arrived, EAERE (with 6 other organizations) hosted its own session, addressing a range of key topics<sup>4</sup>.

### My Mission

A core reason for going to my first ever COP was to ‘promote’ our ‘Big Four’ publication (baselining climate policy architecture, past and prospective climate performance, climate diplomacy) for China, EU, India and US) - [www.eaere.org/magazine/](http://www.eaere.org/magazine/) using a [brochure](#) prepared by Monica and the EAERE team to do so. Getting the brochure printed on recycled paper and delivered in time to my Edinburgh hotel was a challenge, but it was waiting for me there when I arrived. However, I had not thought through how best to circulate our brochure. I ended up handing it out to random people I met, and surreptitiously leaving copies on desks in various pavilions. Only two days after I dropped brochures off to the U.S. pavilion, John Kerry and Xie Zhenhua

released their joint declaration (see below). Was this a coincidence? One thinks of Stephen Leacock’s comment: “When I state that my lectures were followed almost immediately by the Union of South Africa, the banana riots in Trinidad and the Turco-Italian war, I think the reader can form some opinion of their importance”.

### Social Ramblings

In addition to the specifics of the COP 26 experience, I enjoyed very much the benefits of being in Scotland. No doubt it has the same share of gobshites<sup>5</sup> as every other society, but I encountered only their generosity and warmth, typified by the following: On going downstairs to access the toilets in the train station in Glasgow, I encountered a barrier to entry which could only be breached by inserting a 50p coin. I was desultorily looking at my irrelevant collection of Euro coins when a man exiting the barrier said to me: ‘Young man, you’ll be needing this’, handed me a 50p coin and disappeared before I could thank him. This simple act of generosity shaved 60 years off my life, and solved an immediate problem, a most congenial and rarely encountered combination.

By the time I got registered, renting a room in Glasgow that had running water and electricity was costing 4 digits per night. I defaulted to Edinburgh, and I found a great place at 19 St. Andrew’s Square (‘IBIS Styles’) 7 minutes-walk from Waverley railway station which has trains to Glasgow departing about every 10 minutes. I grew up in an Irish speaking household; I was surprised to see that every train station along the route added the Irish language (called ‘Gaelic’ in Scotland) place name of the station below the English version. And English as spoken in Scotland has a roll, rhythm and cadence that rivals the melodiousness of Italian. In the distant past, Scottish food was famously unhealthy and lacking in nuance, with deep fried Mars bars a specialty<sup>6</sup>. No more. On Buchanan Street, I reg-

3 The latter took place in a tent on a very cold windy and rainy afternoon. In a melodramatic moment, the ambience reminded me of the last words of Titus Oates (age 32) a member of Scott’s ill-fated expedition to the South Pole in 2012: “I am just going outside and may be some time” as he stepped unshod into a raging blizzard and a temperature of -40°C. In the event, Ian led us afterwards to a most congenial and long-lasting wine reception.

4 Presentations by: Simone Borghesi, Ian Bateman, Phoebe Koundouri, Peter Paul van der Wijs, Harold Pauwels, Shane Swords, Michael Bonte-Friedheim and Markus H.-P. Müller: [www.eaere.org/events/policy-outreach-events/eu-hybrid-side-event-at-cop26-climate-neutrality-and-biodiversity-renewables-assets-reporting-standards-and-sustainable-finance/](http://www.eaere.org/events/policy-outreach-events/eu-hybrid-side-event-at-cop26-climate-neutrality-and-biodiversity-renewables-assets-reporting-standards-and-sustainable-finance/)

5 Definition: “a very unpleasant person”

6 My favourite ever add, viewed on a bill board in London many decades ago: “White Horse Scotch – Great with Haggis, Fantastic Without”.



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ularly escaped upstairs to the Willow Tea Rooms (patronage dominated by women ‘d’un certain age’ and me) and enjoyed the best fish ever in Edinburgh. Every registered COP attendee got a free train bus and boat pass to ‘anywhere in Scotland’. The words ‘free’ and ‘anywhere’ induce strange impulses. For a while, I toyed with the idea of heading north to the Shetlands (600 kilometres each way) but instead I took the train to Dunblane and spent a lovely few hours with Nick Hanley (and encountered also Fiona and Finn) better understanding why they live there in such perfect intellectual, social, cultural and physical harmony.

## Some Conclusions

*Be realistic about what COPs can deliver*

COPs play invaluable roles: It is very useful to convene periodically and give a stage to the voices of the world, document the gaps between promise and performance, identify some pathways to narrow the gap, advance the essential underlying infrastructure, and pay more attention to ‘how’ than to ‘what’. However, the way these meetings are designed to make decisions (consensus) means they can never fulfil the ambitions that the media and the world impose upon them. The big danger of generating expectations from a process that cannot deliver them is that it will result in despair and the collapse of hope.

*Judged by more modest ambition, COP 26 could be judged a success*

It highlighted the scale and urgency of the challenge we face, and the fundamental injustice of the fact that relatively rich and rapidly growing economies are consuming the increasingly scarce capacity of the atmosphere to store greenhouse gasses without engendering climate change at scale; this is already damaging most those least culpable of causing it and this unfairness will accelerate in the future unless we change<sup>7</sup>. There

was very intriguing progress in two areas:

- The first, noted above, was the *U.S.-China Climate Declaration*, issued on Nov. 10, 2021.<sup>8</sup> The final paragraph is worth quoting:

“The two sides intend to establish a ‘Working Group on Enhancing Climate Action in the 2020s,’ which will meet regularly to address the climate crisis and advance the multilateral process, focusing on enhancing concrete actions in this decade. This may include, inter alia, continued policy and technical exchanges, identification of programs and projects in areas of mutual interest, meetings of governmental and non-governmental experts, facilitating participation by local governments, enterprises, think tanks, academics, and other experts, exchanging updates on their respective national efforts, considering the need for additional efforts, and reviewing the implementation of the Joint Statement and this Joint Declaration”. To a significant extent, the prospects of managing climate risk successfully for us all depends on the quality ambition and range of the output of this working group, and the extent to which the political leadership in China and the U.S. respond positively to it.

- The second outcome was the *Global Methane Pledge*, which committed those joining (already > 100) to reduce methane emissions by 30% by 2030.<sup>9</sup> The Participants in the Global Methane Pledge inter alia: “Commit to work together in order to collectively reduce global anthropogenic methane emissions across all sectors by at least 30 percent below 2020 levels by 2030 and take comprehensive domestic actions to achieve that target, focusing on standards to achieve all feasible reductions in the energy and waste sectors and seeking abatement of agricultural emissions through technology innovation as well as incentives and partnerships with farmers”. An important feature is that there will be a “review of progress towards the target of the Global Methane Pledge on an annual basis until 2030 by means of a dedicated ministerial meeting” and that the Climate and Clean Air Coalition

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<sup>7</sup> See: Robinson, M. (2018). *Climate Justice – hope, resilience and the fight for a sustainable future*. Bloomsbury Publishing, for a series of individual testimonies that brilliantly demonstrate the reality and the case for change.

<sup>8</sup> See [COP 26: U.S.-China Climate Declaration Official Text - CFACT](#). This builds on a joint statement they issued in April 2021: [U.S.-China Joint Statement Addressing the Climate Crisis - United States Department of State](#)

<sup>9</sup> Full text at: [Global Methane Pledge | Climate & Clean Air Coalition \(ccacoalition.org\)](#)

will both promote implementation (‘comprehensive domestic actions’) and report on the performance of the pledge.

Both of these commitments are worth tracking carefully, celebrating their achievements and criticizing their failures.

#### *People Matter*

Jorge Luis Borges observed that: “The things of Scandinavia tend to be secret, as if they were a dream”. To which I would add that it is a place that produces far more than its share of individuals with a dogged and talented commitment to advance the public interest and a society that enables them. In many ways, Sweden is showing us a pathway towards a better way to live on this earth.

We are lucky to have Greta Thunberg as the leader (an appellation she swerves) of the resistance in the public square – she combines a deep respect for science with enormous courage and an instinct for populist truths (‘Blah, blah, blah’ etc.). Bert Bohlin (1925-1988) was another hugely influential Swedish force for good; he co-founded the Intergovernmental Panel on Climate Change (IPCC) in 1988 and steered it with great skill and wisdom in its early years. This created an intellectual fulcrum for progress comparable to Greta’s on the popular front. They are the two bookends that support the rest of us.

#### *The Importance of Hope*

The late Archbishop Desmond Tutu observed that “Hope is being able to see that there is light despite all of the darkness.” There is a natural inclination towards hopelessness as regards addressing climate change, but there is light:

In the past, GDP has been a main driver of greenhouse gas emissions. Since 1990, GDP has increased by a factor of 4.6 while greenhouse gas emissions have risen by a factor of 1.43. The fact that emissions have not risen commensurately with GDP is likely to be largely the achievement of the huge policy effort since 1990 to break the link between GDP and emissions,

mainly a lot of smart *regulation* (e.g., the legally binding obligation for car fleets to improve their fuel and carbon efficiency year by year is the driver behind the electrification of road transport), *shrinking caps* on emissions (well designed and delivered carbon trading schemes has driven the decarbonization of power generation), *innovation* has created new low cost options (renewables and energy storage) and *carbon pricing* – the combination of excise duties and now *carbon taxes* on road transport have reduced emissions by more than 50% the level we observe in jurisdictions that have not done so.

A second achievement is specifically European namely the fact that the price faced by electricity generators and their customers across the EU since early May 2021 has exceeded €50 Euro per ton, and on January 4, 2022 it stood at €84.91 - <https://ember-climate.org/carbon-price-viewer> This price will engender a first round effect, as CO<sub>2</sub> incentivises abatement and removal and a second round effect, by supporting innovation to find new, better and cheaper ways to reduce CO<sub>2</sub> emissions and increase CO<sub>2</sub> removals at scale.<sup>10</sup> Via the UK ETS, the United Kingdom is mirroring this price. It is no small climate-policy feat that ~520 million people are daily facing the implications of this price in their electricity use decisions.

But, of course, the core message stands: we have to do a lot more and do it faster. It seems that there is only in the order of 300-500 billion tons of storage capacity left in the atmosphere’s CO<sub>2</sub> storage vault if we are to successfully manage the risks of catastrophic climate change.

#### *Ensuring the integrity of market instruments and the use of offsets*

It will damage, perhaps irreparably, future efforts to address climate change if we abandon the use of well-designed markets to do so. Europe is at the forefront of this effort, so we have a special responsibility to make the case with integrity and skill. As the momentum to use offsets grows, we also have a responsibility to insist that they be used with integrity (no double counting, no destruction of nature).

<sup>10</sup> This is funded by ringfencing the revenues from auctioning 450 million allowances over the 2020-2030 period to be spent on innovation. [Innovation Fund \(europa.eu\)](https://www.europa.eu)





**EAERE**

European Association  
of Environmental and  
Resource Economists

# EAERE Membership

# CALL FOR 2022 EAERE Individual Membership

Join EAERE in calendar year 2022. Individual membership is open to persons who by their profession, training and/or function are involved in environment and resource economics as a science. EAERE offers a rich portfolio of benefits for individual members, making the return on a membership more valuable than ever.

## Individual benefits

- A free personal subscription for the electronic version of the Association's official journals: Environmental and Resource Economics (ERE), published by Springer and Review of Environmental Economics and Policy (REEP), published by University of Chicago Press; Members are offered a discount subscription fee to the paper version of these journals.
- A discounted personal subscription rate for the journals: Annual Reviews; Environment and Development Economics; International Review of Environmental and Resource Economics; Journal of Environmental Economics and Management; Resource and Energy Economics; Resources Policy; Strategic Behavior and the Environment Water Resource and Economics
- A 40.00% discount on books published by Springer;
- Eligibility to participate to the EAERE Annual conference;
- Eligibility to apply for participation in the EAERE Winter and Summer Schools;
- The right to post announcements in the Association's Highlights issued monthly;
- The right to post announcements in the contributed pages of the EAERE website;
- Access to the EAERE membership full directory;
- The right to vote in the EAERE General Assembly and in the EAERE Elections;
- The right to send nominations for the EAERE Awards;
- A discount on personal membership fee for our sister Association AERE (Secondary Membership).

## Collective benefits

Supporting EAERE in: Lobbying for environmental and resource economics research funding from the European Commission and elsewhere; Advancing the science of economics; Advancing the application of environmental economics in the development and application of policy; Advancing the application of environmental economics in business and commerce; Advancing communication between scholars, teachers, students and practitioners

## Membership options and prices

EAERE provides two mutually exclusive options.

EAERE Annual membership (Until Dec 2022): FULL €70.00 or REDUCED €15.00

EAERE Triennial membership (Until Dec 2024): FULL €189.00 or REDUCED €40.50

New members applying for an annual membership can purchase a one-year subscription at discounted rate to the print version of one or both of the EAERE's official journals ERE (€97,76) and REEP (€18.00). Subscription prices will be added to the membership fee.

If you are a member of AERE in calendar year 2022 you can apply for a EAERE Secondary Membership with a discounted fee.

Payments can be done by credit card, bank transfer or Western Union Money Transfer. Please note that an administrative fee of €20.00 will be charged to payments made by bank transfer and Western Union Money Transfer.

# CALL FOR 2022 EAERE Institutional Membership

Join EAERE in calendar year 2022. Institutional membership is open to associations, and public and private institutions which operate in fields connected with the aims of the Association or which pursue the aims and materially support the activities of the Association or individual initiatives promoted by the Association, by providing human, organisational or financial resources.

Incomes from institutional membership fees will be used exclusively and completely to further the aims of the Association. EAERE offers a rich portfolio of benefits for institutional members, making the return on a membership more valuable than ever.

## Benefits

- One non-transferable registration for institutional staff to the EAERE Annual Conference
- One 2022 individual membership in EAERE for a designated staff member (inclusive of an electronic subscription to ERE and ERE, a paper subscription to ERE)
- Two complimentary 2022 individual memberships in EAERE to Ph.D. students
- Recognition at the Annual Conference
- The right to post free announcements in the contributed pages of the EAERE website at no charge
- The right to post announcements and articles in the Association's Highlights issued monthly
- Listing on the EAERE website
- Listing in every issue of Environmental and Resource Economists
- The right to send nominations for the EAERE Awards
- 10% discount for the payment of "group membership" for a minimum of 10 individual members

## Collective benefits

Supporting EAERE in: Lobbying for environmental and resource economics research funding from the European Commission and elsewhere; Advancing the science of economics; Advancing the application of environmental economics in the development and application of policy; Advancing the application of environmental economics in business and commerce; Advancing communication between scholars, teachers, students and practitioners.

## Membership options and prices

EAERE provides two mutually exclusive options.

1. Full institutional membership: € 1,200.00 or € 3,600.00 for a triennial (2022-2024) membership
2. University institutional membership: € 300.00 or € 900.00 for a triennial (2022-2024) membership.

Only Universities, University departments, and University centres can apply for this membership category.

Payments can be done by bank transfer.

## Further information

Further information is available at: [www.eaere.org/institutional-membership](http://www.eaere.org/institutional-membership)

## EAERE Full institutional members – 2022\*

- Basque Centre for Climate Change – BC3, Spain
- The Beijer Institute of Ecological Economics, Sweden
- Fondazione Eni Enrico Mattei – FEEM, Italy
- Research Institute of Capital Formation, Development Bank of Japan Inc. – RICF DBJ, Japan
- Toulouse School of Economics – TSE-R, France
- University of Manchester – UoM, UK
- University of Oslo, Department of Economics, Norway

## EAERE University institutional members – 2022\*

- Ca' Foscari University of Venice, Department of Economics, Italy
- Climate Economics Chair – CEC, France
- Corvinus University of Budapest, Hungary
- Environment for Development Initiative – EfD, Sweden
- Euro-Mediterranean Center on Climate Change Foundation – CMCC, Italy
- European University Institute, FSR Climate – EUI FSR Climate, Italy
- The Grantham Research Institute on Climate Change and the Environment – GRI, UK
- Mercator Research Institute on Global Commons and Climate Change – MCC, Germany
- Paris School of Economics – PSE, France
- Peking University, College of Environmental Sciences and Engineering – CESE-PKU, China
- Research laboratory on Socio-Economic and Environmental Sustainability – ReSEES, Athens University of Economics and Business, Greece
- School of Economics and Business, Norwegian University of Life Sciences – NMBU, Norway
- Technische Universität Berlin – TU Berlin, Germany
- Tilburg Sustainability Center – TSC, Tilburg University, Netherlands
- Umeå University, Department of Economics, Umeå School of Business, Economics and Statistics, Sweden
- University of Bologna, Department of Economics, Italy
- University of Brescia, Italy
- University of Ferrara, Sustainability Environmental Economics and Dynamics Studies – SEEDS, Italy
- University of Helsinki, Department of Economics and Management, Finland
- University of Santiago de Compostela, Instituto de Estudios y Desarrollo de Galicia – IDEGA, Spain
- University of Southern Denmark, Department of Sociology, Environmental and Business Economics, Denmark
- Venice International University – VIU, Italy
- Vrije Universiteit Amsterdam, Department of Spatial Economics, Netherlands
- Wageningen University, Environmental Economics and Natural Resources, Netherlands
- Wegener Center for Climate and Global Change, University of Graz, Austria

**EAERE is grateful to its 2022 Institutional Members for their support!**



The European Association of Environmental and Resource Economists (EAERE) is an international scientific association whose aims are:

\_to contribute to the development and application of environmental, climate and resource economics as a science in Europe;

\_to encourage and improve collaboration and communication between scholars, researchers, policymakers, students in environmental, climate and resource economics in different European countries;

\_to develop and encourage the cooperation across universities and research institutions in Europe.

Founded in 1990, EAERE has approximately 1200 members in over 60 countries from Europe and beyond, from academic and research institutions, international organisations, the public sector, and the business world. Membership is open to individuals who by their profession, training and/or function are involved in environmental, climate and resource economics as a science, and to institutions operating in fields connected with the aims of the Association.

**[www.eaere.org](http://www.eaere.org)**