

CEPR/EAERE Webinar on Climate Policy: U.S. Climate Policy in a Global Context

14 February 2023 – 04:00 – 05:30 PM (Frankfurt/Paris/Amsterdam) – Online

For this **Eleventh CEPR/EAERE Webinar on Climate Policy: U.S. Climate Policy in a Global Context** on February 14, 2023, from 04:00-05:30 PM (CET) / 10:00-11:30 AM (EST), **Joseph Aldy** (Harvard University & Resources For The Future) gave a presentation on **Implementing U.S. Climate Policy through the Inflation Reduction Act**, **Michael Greenstone** (University of Chicago, CEPR & Climate Change RPN Member) on **Progress on U.S. Government's Estimate of the Social Cost of Carbon** and **Robert Stavins** (Harvard University, Resources For The Future & Climate Change RPN Associate Fellow) on **The U.S. and the UNFCCC Negotiations and Agreements**.

Their presentations were followed by a discussion and Q&A session with the audience moderated by **Christian Gollier** (Toulouse School of Economics, EAERE, CEPR & Climate Change RPN Leader).

Key Points of the Webinar

- **Implementing U.S. Climate Policy through the Inflation Reduction Act (IRA)**
 - **U.S. policy objectives and the IRA**

In the last 15 years, a number of approaches have been explored and debated in the U.S. on how to mitigate emissions, including comprehensive economy-wide caps, trade legislation and various kinds of regulatory tools. However, most comprehensive and ambitious efforts have been thwarted through a rather complicated legal process. An effort was engaged in the last 2 years in the White House and Congress on how to use various kinds of subsidies to support the deployment of clean energy technologies, with the IRA being the primary legislative tool in that regard.

Since about 2006, with some ups and downs, we have observed a declining trajectory in the U.S.'s greenhouse gas (GHGs) emissions. It has been notably occurring through the power sector, with the significant push out of coal and a ramping up of natural gas and of non-hydro renewables, primarily wind and solar technologies. The Obama Administration pledged to cut emissions by 17% below the 2005 levels by 2020 and by 26 %-28% by 2025. The Biden Administration has called for an acceleration to reduce emissions by at least half by 2030, a Nationally Determined Contribution (NDC) under the Paris agreement, and to achieve net zero emissions by the year 2050. This primary policy target of reducing

emissions will be layered with several other policy objectives that need to be satisfied to get the majority in both the House and Senate and help inform our understanding of how these policies were developed. We first observe a sort of *Buy American* ethos that is common throughout the IRA. It was seen in previous legislation, such as in the 2009 Recovery Act, the Economic Stimulus Bill, in some Buy American Provisions. Within the David Bacon Act there is also interest in supporting unionized labour. The Act calls on meeting the wages in local markets consistent with unionized wages and having appropriate apprenticeship programmes. Furthermore, environmental justice is something that has come to the forefront with the announcement of the Justice 40 initiative which calls for at least 40% of the benefits of the clean energy transition accruing to disadvantaged people, low-income communities and where there is a high concentration of people of colour. Finally, existing laws place some constraints on how to build the energy economy. A key one in that regard is the National Environmental Policy Act (NEPA), providing environmental reviews of any major energy infrastructure.

The IRA is thought of in terms of the estimated impact that will result in either the outlay of spending or foregone revenues to tax expenditures of about \$369 billion dollars over 10 years. About three quarters of this amount, \$270 billion, takes place through the tax code, with the majority of this going to the power sector including renewable and zero emission sources of power, and support to existing or new nuclear and fossil fuels with carbon capture and storage. About \$35 billion is going to advanced fuels and electric vehicles, \$37 billion for supporting residential homeowners and investing in energy efficiency, and \$37 billion in the manufacturing sector for investments in clean energy. In addition to tax expenditures, there are also different types of spending programmes such as energy loan guarantees at the Department of Energy, as well as new spending programmes at the U.S. Environmental Protection Agency (EPA) intended to focus primarily on low-income communities and targeted to specific goals such as diesel bus retrofits.

Emissions today are about 20% below their 2005 levels. If these trends continue, and with current policies, they are likely to get down to about 30% below 2005 levels by 2030. The implementation of the IRA would probably cut emissions down to about 40%, meaning a much faster decline over this decade. However, is not enough to get you to 50-52% reduction put forward under the Paris agreement.

- **IRA Policy Design Issues and opportunities for research**

The IRA-estimated impact faces lot of uncertainties, which could influence the degree of deployment of clean energy in both directions. This partially depends on the policy instruments used: in terms of appropriations, the upper limit of spending allocated to departments or agencies for a programme by Congress is not always met (*e.g.*, The Department of Energy Loan Guarantee programme under the 2009 Recovery Act spent less than a third of the \$6 billion dollars appropriated for credit subsidies); tax expenditures could be below or above the estimates. It is similar for credit instruments depending on what is guaranteed, such as whether governments are doing a good job when subsidizing new investment through credit instruments and assessing ex-ante what the realized risk and uncertainty will be for the payoffs from those investments. Furthermore, other factors can influence uncertainty in outcomes, such as how executive agencies interpret the statutes, technological change (*e.g.*, the lowering of costs of wind and solar enabled U.S. to deploy more through tax credits over the past 15 years than originally anticipated) or the politics.

An important and debated element of the programme on industrial policy can be illustrated by Wind Power Subsidies. A Wind Farm can benefit from subsidies of 3.4 ¢/kWh a kilowatt hour¹, instead of an average of 0.5 ¢/kWh, if satisfying wage and apprenticeship requirements, and if consistent with Union requirements for domestic contents and being place-based policies by selecting identified energy and low-income communities. The subsidy is unrelated to the emission impact, or the total amount of clean energy deployed. One may wonder how effective these policies will be in delivering industrial policy objectives, and in terms of regrowing certain parts of the U.S which have experienced economic decline. Furthermore, a market for tax credits is established for the first time, with most IRA clean energy tax credits being transferable by developers of a tax credit eligible project. Furthermore, direct pay provisions for a special class of developers allows no-tax paying entities to get an equivalent in value to the tax credit. The transferability is intended to address limited supply in the tax equity market and reduce by around 15% haircut renewable that developers face when monetizing tax credits through tax equity. In 2023, this market could exceed \$10 billion, which raises the question of what information and institutional design are necessary for market efficiency and function.

A new element of the IRA also concerns a trend towards technology neutrality. Starting in 2025, the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) will be emission based. The hydrogen production tax credit will vary with CO₂ intensity of production, while a methane fee on oil and gas operations would effectively reflect the social cost of methane, and a Carbon Capture and Storage Technologies (CCS) tax credit will be valued per unit of stored carbon. It is worth exploring some of these instruments to get a sense of whether subsidy design is better at reflecting cost effectiveness that is associated with carbon pricing, for instance, and how well these work in concert with regulations.

Finally, performance evaluation is an important element to look at when considering that a key objective of the Biden Administration is to ensure that benefits are being shared with historically disadvantaged communities. Lots of investment that could occur and are subsidized by the IRA could deliver benefits for these communities through, for instance, tax credits for renewables displacing fossil fuel power generation and reducing air pollution. It raises the necessity to think of programme design data collection and ex-post evaluation to be able to understand who is enjoying and sharing the benefits of the clean energy deployment that is supported through the IRA. It offers an opportunity for Learning and for Policy updating, in the spirit of the Learning Agenda under the Foundations for evidence-based Policymaking act at the Federal Level.

◆ Progress on the U.S. Government's Estimate of the Social Cost of Carbon (SCC)

The SCC can be defined as the monetary value of the damages associated with the release of one additional ton of CO₂ or, conversely, as the benefits from reducing CO₂. For every climate change mitigation policy, the SCC is central to determining cost effectiveness by enabling analysis of policy trade-offs. As of 2017, the SCC has been used to set up more than 80 regulations with greater than \$1 trillion dollars of gross benefits and is a central piece to the U.S. and other countries to guide thinking about how regulation should be thought of and the benefits of reducing CO₂. In terms of the historical timeline, the first use of SCC dates back to 2008 in the U.S. In 2009, the first U.S. SCC was set by the Interagency Working Group (IWG) on SCC and applied across the government. It was then updated in 2013 and expanded to other GHGs in 2016. A year later, the same week of President Trump's inauguration, the

¹ If this replaces coal electricity emitting 400g of CO₂ per kwh, this is equivalent to a price-signal of 85 \$/tCO₂.

National Academy of Sciences released a report on SCC updates, which did not receive a lot of attention, and the IWG SCC was disbanded in 2018 to be re-established in 2021. Under the Obama Administration, the SCC was \$52/tCO₂, and was then lowered to \$1-8/tCO₂ under the Trump Administration, and then returned to its previous number under the Biden Administration. A recent report from the EPA, published in September 2022, highlights a four times higher new number of \$190/tCO₂.

○ **A new era for Climate Damage Evaluation**

Nobel Prize Winner, Bill Nordhaus, developed a DICE Integrated Assessment Model (IAM), closely related to the PAGE and FUND models, which shows the loss of global GDP depending on global mean temperature rise. However, there are a couple of challenges with the original IAM approach, including both a lack of geographic resolution and the fact that much of the literature on which the SCC models are based is dated and do not reflect the recent explosion of research that has gone on in the last 10 or 15 years. There is a great opportunity to take advantage of advances in research, make progress on discounting on damages and build new holistic models. In this regard, the Climate Impact Lab developed the Data-driven Spatial Climate Model (DSCIM). It is based on the following guiding principles: Global climate damage calculations should be based on best-available empirical evidence and climate models, the data shall globally be representative, the estimate should account for adaptation and its costs and value uncertainty and unequal impacts. The model, which uses fine-grained geographic resolution able to provide estimates for 25 000 separate regions around the world, has been developed and completed in five sectors - mortality, agriculture, energy, labour and coastal - that can be pulled together.

In terms of mortality, very substantial impacts from climate change are found, which stands in contrast with previous models' results, which do not include data from the whole world. Using a response function, no relationship between mortality and an increase in temperature is found for individuals below 5 years old or for the 5 to 64 years age group. On the contrary, a sharp U relationship is found for people over 65 regarding very cold and hot days. Results furthermore indicate that the mortality risk is unequally distributed around the world and is strongly modified by underlying climates. The impact of hot days will be stronger for places in the coldest deciles. Furthermore, adaptation, which depends on the location's level of income plays an important role. Not accounting for adaptation's benefits and costs would overstate the damages in terms of deaths per hundred thousand by the end of the century by about 63%.

Regarding fuel use and electricity, climate change's damages from electricity consumption greatly vary depending on how wealthy a country is. Only the richest deciles can respond with cooling and heating to climate change. Regarding other sectors that express damages as a percentage of local GDP per capita, one can observe that the damages in electricity or in the labour supply are not geographically exactly correlated with the one's mortality.

An important aspect to highlight is the multiple sources of uncertainty in climate change impacts estimates. Some of that uncertainty comes from the climate models, some from the estimates and some from what you assume about emissions and socioeconomic scenarios. Furthermore, compared to the original IAM approach, the DSIM model does not look at a complete set of sectors and should be taken as an underestimate. It also does not account for sectoral and regional interactions. Reversely, it uses empirically based damage function, such as subnational heterogeneity, value uncertainty and endogenous discounting. With this approach, the empirically founded SCC's estimate is \$189 high. Breaking down economic damages by regional levels of incomes, one can observe that OECD countries

actually benefit from an additional ton of CO₂ at about \$11.3, while about 200\$ of damages are spread around low-income countries and the rest of the world. Damages are also unequally distributed when looking at damages as a percentage of the region's 2099 GDP. In OECD countries, the damages will be about 1,5%, and about 12% in low-income countries and 8% in the rest of the world.

A SCC of \$189 per tCO₂, which is almost four times larger than what the U.S. government used previously based on the IAM, has the potential to facilitate much larger reduction and play an important role in getting to 50% reduction by 2030. Large sectors untouched by the IRA can be reached through the regulatory route through SCC, which can serve as a sort of focal point and have a knock-on effect for other governments and organisations.

- **The U.S. and the United Nations Framework Convention on Climate Change (UNFCC) Negotiations and Agreements**

The UNFCC Negotiations started in Rio de Janeiro in 1992, where the framework invention was itself agreed to. Since 1995, there have been annual Conferences of the Parties (COP) of the agreement, with the most recent being COP27 in Sharm el-Sheikh in Egypt in November 2022.

- **Critical COP27 developments: China-U.S. Co-leadership and the Loss and Damage Fund**

The most important COP27 development occurred six thousand miles away from Egypt, in Bali, Indonesia when President Joe Biden and the President of China, Xi Jinping, met on the side-lines of the G20 Summit for a 3-hour meeting. It signalled their return to cooperation on climate change. Their co-leadership, which led to the Paris Agreement, had indeed been abandoned under the Trump administration, with the *America First* policy marking the beginning of a great deal of protectionism and hostility towards China. It evolved under the Biden Administration to *American manufacturing first*, supported by a bipartisan support in the U.S. Congress for protectionism and China bashing, based on both international trade and human rights concerns. However, it may be too soon to say if the political developments in Bali will not be overwhelmed by protectionism and national security considerations.

On the other hand, the most contentious and dramatic decision that took place during the COP 27 is the establishment of a Fund for Loss and Damage, which received last minute support from the U.S. The Paris Agreement, like the Kyoto Protocol, is largely about emissions reductions via NDCs, with further elements in the Agreement addressing Adaptation. However, adaptation is not always possible, such as in small island states or areas with drought in Sub-Saharan Africa. Loss and Damages is thus a third element to cover for impacts that are not addressed by mitigation and adaptation. It has always been controversial because of a bimodal distribution of views. On the one hand, it is an essential issue to consider for the most vulnerable countries in the world, while it has been unacceptable for the major contributors due the worry that it acts as a prescription for international legal liability for bad weather. Consequently, the U.S. was strongly opposed to it, as was China and the European Union. It was thus finessed in the Paris Agreement in the Article 8 but agreed, in Decision 52 that "*it does not (...) provide for any liability or compensation.*" On the demand side, the Fund could indeed eventually add up to trillions of dollars (e.g. the World Bank estimated a cost of \$40 billion in damages for the 2022 Pakistan floods), while on the supply side, there have been some quantitative pledges from European countries in the tens of millions of dollars. If China verbally supported its creation, it would not contribute by claiming to be developing country. This position is linked to the 1992 list of non-annex1 countries, when China's per capita GDP was

less than \$400 per year. The U.S. story winds up in a similar place. If the U.S. government supports the fund, it appears impossible to make the commitment of new funding due to a Republican majority in the House of Representatives. Considering these elements, we may wonder if the new Fund is going to be a first step toward an equitable allocation of responsibility under the Paris agreement, or an empty shell.

- **COP27 further developments and issues**

The COP27 closing statement did not fully embrace the 1.5°C target. However, the pre-Paris IPCC predicted 7°C global warming this century. If the original Paris Agreement's NDCs were complied with, it will go down to 3°C, and to 2.5°C with the enhanced NDCs and the Kigali Amendments on CFC to the Montreal Protocol. This process could be compared to a marathon rather than a sprint; an ongoing action which makes it difficult to assess an individual Conference or the parties numerically in terms of adding up the targets.

Furthermore, a remaining issue concerns article 6 of the Paris agreement, which refers to the fact that individual parties can put in place domestic policies to then link them to bring down the cost and facilitate a greater ambition. For example, California and Quebec have linked their cap-and-trade systems as the EU and Switzerland. Linkages could also concern carbon taxes and performance standards. The trading would be between companies in different jurisdictions or the same company within two jurisdictions, which brings up a question on quantification when looking at compliance with an individual NDC. The Article 6.2 is an accounting mechanism to prevent double counting for international linkages and appears as a key economic sub-article of the entire Paris agreement. Unfortunately, recent developments caused concern that some countries and parties are interpreting article 6.2 like the Kyoto Protocol's Article 17.

The concept of a Climate Club, or a group of countries coming together to price CO₂ emissions, as an alternative to the UNFCCC, has drawn increasing interest, first in the academic community and then when the idea was developed by the Nobel Prize-winning economist, William Nordhaus. It is conceivable that the European CBAM, together with a sort of U.S. CBAM, and other industrialized countries join forces in such a club to bash China. However, in Foreign Ministries around the world, the notion is somewhat frightening, as well as extremely negatively perceived by developing countries.

We may wonder what to expect at next year's COP 28 in Dubai. COP 27 was officially the "Implementation COP," while the 28th is expected to be the "Global Stocktake" one. But, if COP 27 was, in effect, the "Loss and Damage" COP, we might predict that the incoming UEA presidency of COP28 will be the one about Carbon Removal, with renewed attention to carbon capture & storage, carbon capture & utilisation, direct carbon removal, as well as solar radiation management. If so, it might again be a very controversial Conference.