



Senior research associate at the Center for Environmental Policy at Imperial College. Her current work focuses on identifying sustainable and technically feasible Greenhouse Gases Removal (GGR) deployment pathways for the EU and the UK.

Over the last 4 years she has provided quantitative evidence to members of the public and private sectors on the cost, scale-up barriers, and macro-economic impacts of decarbonizing fossil intensive sectors *via* GGR deployment (e.g., e-fuels, CCS and BECCS integration and accelerated carbonation). Her work has been featured in news article, such [The Independent](#), [BBC World News](#), and [Carbon Brief](#).

Piera holds a PhD in Environmental Engineering and an MSc in Industrial Engineering, both from the Polytechnic Department of Engineering at University of Udine, Italy. Before joining Imperial College, she held a Research Scholar position at the International Institute for Applied Systems Analysis (IIASA, Austria).

Current Employment

Research Associate at Imperial College since January 2020

- [CO2RE Hub](#) Researcher
- Guest Research Scholar at [IIASA](#)
- Associate Consultant for [Foresight Transition](#)
- Member of the Youth Advisory Council (YAC), [Clean Growth Leadership Network](#)
- Founder of [TNZ seminars](#)
- Member of [RE4Industry](#) Expert groups
- Postdoc representative at the Center for Environmental Policy (CEP)

Previous employment

Research Scholar at the Ecosystems Services and Management Program

International Institute for Applied Systems Analysis, Austria
August 2018 – December 2019

Postdoctoral Fellow at the Ecosystems Services and Management Program

International Institute for Applied Systems Analysis, Austria
August 2016 – August 2018

Consultant Tropical Future Initiative (TFI)

International Institute for Applied Systems Analysis, Austria
December 2015 – April 2016

Education

PhD (Doctor Europaeus label) in Environmental Engineering

Polytechnic Department of Engineering and Architecture, Udine/IIASA
Italy, Austria
January 2013 - April 2016

Young Scientist Summer Program (YSSP)

International Institute for Applied Systems Analysis, Austria
June – August 2014

M.Sc. in Industrial Engineering

Polytechnic Department of Engineering and Architecture University of Udine, Italy
2010-2012

B.Sc. in Industrial Engineering

Polytechnic Department of Engineering and Architecture University of Udine, Italy,
2006-2010

Doctoral Education

- 04/2014: Spring School in Multiple Criteria Decision Aiding (MCDA). University of Perugia. Special courses in Multiple Attribute Utility Theory, Ordinal Regression and Robust Ordinal Regression, Outranking methods, MCDA and environmental decision making
- 01/2013-13/2013: Winter School in Multivariate Regression Analysis & Spatial Econometrics. Jacobs University, Bremen, Germany

Teaching

Academic year 2020-2021:

- Lecture on Business for Engineers, Institute for Molecular Science and Engineering (IMSE), MRes Molecular Engineering, Imperial College
- Lecture on CCS Economics and Policy, Energy policy module, MSc Environmental Technology, Imperial College

Academic year 2021-2022:

- Lecture on Business for Engineers, Institute for Molecular Science and Engineering (IMSE), MRes Molecular Engineering, Imperial College London
- Lecture on Sustainable GGR pathways, Energy policy module, MSc Environmental Technology, Imperial College
- Small Group Seminars (SGS) leader, MSc Environmental Technology, Imperial College

Academic year 2022-2023:

- Co-convenor of the MSc Course in Clean Fossil Fuels (CENG97030/CENG97029), Chemical Engineering Department, Imperial College

Supervision

PhD students

Judy Xie. Project title: Socially equitable pathways to net zero, Center for Environmental Policy, Imperial College

PhD students (YSSP¹ program)

- Pratama Yoga, 2nd year PhD student, Imperial College London

¹ YSSP: Young Scientist Summer Program, more information available [here](#)

- Mandova Hana, 3rd year PhD student, University of Leeds
- Kasparas Spokas, 2nd year PhD student, Princeton University
- An Ha Truong, 3rd year PhD student, University of Hanoi
- Maria Xylia, 3rd year PhD student, KTH Stockholm

MSc students

- Jonathan Mancer (ongoing), MSc Environmental Technology, ICL
- Mackenzie Claudia (2021), MSc Environmental Technology, ICL
- Fantoni Zulficar (2020), MSc Environmental Technology, ICL
- Santin Maurizio (2016), MSc Industrial Engineering, University of Udine
- Bonotto Monica (2016), MSc Industrial Engineering, University of Udine

Research interests

- Technical feasibility, economics, and scale-up challenges of GGR for the industrial (iron and steel, cement and aviation industries) and power sectors
- Role of biomass-based energy generation technologies in low carbon energy systems (mitigation and removal services, costs, and optimal supply chain configurations)
- Socio-economic impacts of energy systems transition including labour demand variation and value creation

Research Projects

- [CO₂ Removal Hub](#): Greenhouse Gas Removal Demonstrator, 2020-2024, **UKRI (UK)**, lead: Smith School, Oxford University, Role: Researcher Co-Investigator
- [NEGEM](#): Quantifying and Deploying Responsible Negative Emissions in Climate Resilient Pathways, 2020-2024, **EU Commission**, lead: VTT Finland, Role: Researcher Co-Investigator
- Comparative assessment and region-specific optimization of GGR, 2017-2020, **NERC (UK)**, lead: Imperial College. Role: Researcher Co-Investigator
- [S2Biom](#): Delivery of Sustainable supply of non- food biomass to support a resource efficient biomass supply in Europe, 2013-2016, **EU Commission** lead: IIASA, Role: Researcher Co-Investigator

Consultancy Activities

- Scaling Sustainable Aviation Fuel with DAC; **ClimateWorks Foundation**, Lead: IIASA
- Direct Air Capture Markets and Policy Study 2030-2050; **Rolls Royce Environmental Advisory Committee Project**
- Maturity of CCUS Technologies and Readiness for Deployment; **IEAGHG program**
- Greenhouse Gas Removals Programme Phase 1: Assessment, Project Monitoring and Support; **Department for Business Energy and Industrial Strategy (BEIS)**
- Accelerated Carbonation for Building Materials; **IEAGHG program**
- Assessing the techno-economic performance, opportunities, and challenges

of mature and nearly mature negative emissions technologies (NETs);
IEAGHG program

- Quantifying the socio-economic value of CCUS: a review; **IEAGHG program**
- Techno-economic potential of low-carbon steelmaking in Europe; **Anglo American Ltd**
- A comparative lifecycle assessment of low-carbon H₂ infrastructure; **Equinor**
- Carbonation of Industrial Waste: A Techno-Economic Scoping Study; **Total Energies**

Invited talks

- The industrial decarbonization challenge: narrowing existing economic imbalances in low carbon clusters. **CCSRC Conference**, 21 April 2022 (Keynote)
- Bioenergy and Fit for 55. Delivering for 2030, preparing for 2050, EU Sustainable Energy Week, 12 October 2021 (webinar)
- A spatial framework for levelled up and low-carbon Industrial clusters, **Global Alliance of Universities on Climate (GAUC)**, 29 June 2021 (keynote)
- Energy Systems Transitions in the Context of Sustainable Development Goals, **Chevron Climate Energy Environment Webinar Series**, 27 May 2021 (webinar)
- The Near-Far Problem: Surviving Climate Change, Future of Humanity Summit, **London School of Economics**, 27 March 2021 (panel discussion)
- Socially equitable energy systems transition, Cambridge NetZero Webinar Series, **University of Cambridge**, 24 November 2020 (webinar)
- Carbon Removal and Return – Can CCS Decarbonise Industry in South America and help the oceans? **UNFCCC COP25**, 4 December 2019, Madrid (panel discussion)
- Creating value while reaching net Zero. **US Department of Energy (DOE)** Annual meeting, 26 August 2019, Pittsburgh, USA (panel discussion)
- Deep decarbonization scenarios for the UK power sector. **British Institute for Energy Economics**, 5 June 2019 (keynote)
- Bio-energy supply chains optimization in line with sustainable development goals. **Swedish University of Agricultural Science (SLU)**, 4 November 2018 (keynote)
- Spatial explicit tools for sustainable biomass supply chains, **BOKU University Wien**, 4 June 2017 (keynote)

Media appearance

- Prime Time TV: [Newsnight](#), BBC Two, 04 April 2022.
- News Article: Greenhouse gas removal: How could it help the UK reach net-zero by 2050? [CarbonBrief](#)
- News Article: Changement climatique : qu'est-ce que la capture du carbone et peut-elle sauver la planète? [BBC World News](#)
- News Article: What is carbon capture and storage, and could it help halt the climate crisis? [The Independent](#)

Awards and Grants

- News Article. Countries transitioning to zero carbon should look at more than technology cost. [ScienceDaily](#)
- News Article: Reducing US coal emissions through biomass and carbon capture would boost employment. [ScienceDaily](#)

Fellowship and Awards

- "Women, Science and Technology" Prize. Funder: University of Udine, AY 2015-2016
- Best Poster Award, PhD Expo 2015. Funder: Italian Minister for University and Research

Research Proposal

- S3-CRM: Securing a Sustainable Supply of Critical Raw Materials. EPSRC Standard Grant. Team: Imperial College (lead), Sheffield University. Role: Principal Investigator. Status: Under review
- Quantifying and Qualifying the Role and Value of Grid Scale Energy Storage in the Net Zero Transition. EPSRC Standard Grant. Team: Imperial College (lead), New Castle University, Cranfield University, Sheffield University. Role: Researcher Co-Investigator. Status: rejected
- Value Chain Assessment of Batteries for Secure, Resilient Energy Futures. EPSRC Standard Grant. team: University of Sheffield (lead), Imperial College London. Role: Co-Investigator. Status: In preparation

Reviewing and Editorial roles

- Member of the Editorial Board member of [iScience](#), at *Cell Press*
- Guest Editor for [Current Sustainable/Renewable Energy Reports](#) at *Springer*
- Reviewer for journals such as *Joule*, *One Earth*, *iScience*, *International Journal of Greenhouse Gas Control*, *Applied Energy*, *Energy Policy*, *Climate Science*
- Expert panel member for the Technical Programme Committee of the 16th International GHGT Conference

Other Activities

- Organization Committee of the International CCS Forum, Taormina, Italy, present
- Founder of Transition to Net Zero (TNZ) Seminar Series, Imperial College London
- Post Doc Representative, Center For Environmental policy (CEP), Imperial College London

Publications

h-index = 15,
616 total citations

Under review

Pratama Y., Patrizio P., Mac Dowell N. Sticks and carrots in the power system transitions to net-zero. Under review in *Joule*

Chiquier S., Patrizio P., Bui M., Sunny N., Mac Dowell N. A comparative analysis of the efficiency, timing, and permanence of CO₂ removal pathways. Under review in Energy & Environmental Science.

Articles in peer reviewed journals

Patrizio P., Sunny N., Mac Dowell N. (2022). Inefficient investments as a key to narrowing regional economic imbalances. *iScience* 25, 103911

Patrizio P., Fajardy M., Bui M., Mac Dowell N. (2021). CO₂ mitigation or removal, the optimal uses of biomass in energy systems decarbonization. *iScience*, 24, 102765

Patrizio P., Pratama Y., Mac Dowell N. (2020). Socially equitable energy systems transition. *Joule*, 8: 1700-1713

Zhang D., Bui M., Fajardy M., Patrizio P., Kraxner F., Mac Dowell N. (2020) Unlocking the potential of BECCS with indigenous sources of biomass at a national scale. *Sustainable Energy & Fuels*, 4: 226-253

Fajardy M., Patrizio P., Daggash H., Mac Dowell N. (2019). Negative Emissions: Priorities for Research and Policy Design. *Frontiers in Climate*.

Mandová H., Patrizio P., Leduc S., Kjærstad J., Wang C., Wetterlund E., Kraxner F., Gale W. (2019) Achieving carbon-neutral iron and steelmaking in Europe through the deployment of bioenergy with carbon capture and storage. *Journal of Cleaner Production*, 218: 118-129.

Xylia M., Leduc S., Laurent A., Patrizio P., Van der Meer Y., Kraxner F., Semida S. (2019) Impact of bus electrification on carbon emissions: the case of Stockholm. *Journal of Cleaner Production* 09: 74-87.

Truong A., Patrizio P., Leduc S., Kraxner F., Duong M. (2019). Reducing emissions of the fast-growing Vietnamese coal sector: the chances offered by biomass co-firing. *Journal of Cleaner Production* 215: 1301-1311.

Patrizio P., Leduc S., Kraxner F., Fuss S., Kindermann G., Mesfun S., Spokas K., Mendoza A., MacDowell N., Wetterlund E., Lundgren J., Dotzauer E., Yowargana P. and Obersteiner M. (2018). Reducing US coal emissions can boost employment. *Joule* 2: 1-16.

Mendoza Ponce A., Corona-Núñez R., Kraxner F., Leduc S., Patrizio P. (2018). Identifying effects of land use cover changes and climate change on terrestrial ecosystems and carbon stocks in Mexico. *Global Environmental Change* 53: 12-23.

Mesfun S., Leduc S., Patrizio P., Wetterlund E., Mendoza Ponce A., Lammens T., Igor Staritsky I., Elbersen B., Lundgren J., Kraxner F. (2018). Spatio-temporal assessment of integrating intermittent electricity in the EU and Western Balkans power sector under ambitious CO₂ emission policies, *Energy* 164: 676-693.

Mandová H., Leduc S., Wang C., Wetterlund E., Patrizio P., Gale W., Kraxner F. (2018). Possibilities for CO₂ emission reduction using biomass in European integrated steel plants. *Biomass and Bioenergy* 115: 231-243..

Hoo P., Patrizio P., Leduc S., Hashim H., Kraxner F., Tan ST., Ho W.S. (2017). Optimal biomethane Injection into Natural Gas Grid – Biogas from Palm Oil Mill Effluent (POME) in Malaysia. *Energy Procedia* 105: 562-569.

Xylia M., Leduc S., Patrizio P., Kraxner F., Silveira S. (2017). Locating charging infrastructure for electric buses in Stockholm. *Transportation Research Part C: Emerging Technologies* 78: 183-200.

Patrizio P., Leduc S., Chinese D., Kraxner F. (2017). Internalizing the external costs of biogas supply chains in the Italian energy context. *Energy* 125: 85-96

Xylia M., Leduc S., Patrizio P., Silveira S., Kraxner F. (2017). Developing a dynamic optimization model for electric bus charging infrastructure. *Transportation Research Procedia* 27: 776-783

Patrizio P., Chinese D. (2016). The impact of regional factors and new bio -- methane incentive schemes on the structure, profitability and CO₂ balance of biogas plants in Italy. *Renewable Energy* 99: 573-583

Patrizio P., Leduc S., Chinese D. Dotzauer E., Kraxner F. (2015). Biomethane as transport fuel -- A comparison with other biogas utilization pathways in northern Italy. *Applied Energy* 157: 25-34

Chinese D., Patrizio P., Nardin G. (2014). Effects of changes in Italian bioenergy promotion schemes for agricultural biogas projects: Insights from a regional optimization model. *Energy Policy* 75:189-205.

Book Chapters

Patrizio P. (2022). Socially Equitable Energy Transitions: Analytical Challenges and Policy Implications. In: Bui and Mac Dowell (eds). *Greenhouse Gas Removal Technologies*. Energy and Environmental Series (August 2022)

Xie J., Patrizio P. Mac Dowell N. (2021) Socio-economic considerations in the quantitative systems modelling of carbon capture and storage. In: *Sustainable Carbon Capture: Technologies and Applications* (in press)

Patrizio P., Leduc S., Kraxner F., Fuss S., Kindermann G., Spokas K., Wetterlund E., Lundgren J., Yowargana P. and Obersteiner M. (2019) Chapter 11 - Killing two birds with one stone: a negative emissions strategy for a soft landing of the US coal sector. In: J.C. Magalhães Pires et al. (eds.) (Academic Press) pp 219–36.

Kraxner F.; Leduc S.; Serrano Leon H.; Fuss S.; Patrizio P.; Yowargana P. (2016). Expanding renewable energy within the Alpine ecological network. In: Plassmann et al. (Eds.), *Alpine Nature 2030 - Creating [ecological] connectivity*

for generations to come (book). Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Chinese D., Patrizio P., Bonotto M. (2014) A Service Station Location Model to Explore Prospects and Policies for Alternative Transport Fuels: A Case of CNG Distribution in Italy. In: de Sousa J., Rossi R. (eds) Computer-based Modelling and Optimization in Transportation. Advances in Intelligent Systems and Computing, vol 262. Springer

Computer Skills

MS Office, MS Project, Matlab, GAMS, ArcGIS, Python, LATEX

Languages

Italian (Native), English (professional), French (Basic)

Hobbies

Yoga, cycling and (sustainable) travelling