

SÓNIA MARTINS DA CUNHA

Ph.D.

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📍 Portugal



I have recently defended my Ph.D. thesis for the MIT Portugal Ph.D. in Sustainable Energy Systems from IST in Portugal. The goal of the Ph.D. was to provide a better understanding of the relationship between economic development and the use of natural resources. The work focused on studying the material and economic flows that make up the socioeconomic metabolism of a country. During the Ph.D. I spent four months at IndEcol at NTNU in Norway. I was a board member of the International Society of Industrial Ecology (ISIE) student chapter. Between 2016 and 2018, I was a member of the IST team working on the Sharing Cities Project. The Sharing Cities project was a European project shared by six different countries focusing on smart cities. My background was mechanical engineering, having completed the Integrated Master in Mechanical Engineering at IST in Lisbon. My master thesis focused on building energy simulation and was attributed top marks.

EXPERIENCE

nov 2019 – nov 2021

Board Member-At-Large of the Student Chapter of the International Society for Industrial Ecology

International Society for Industrial Ecology

Elected as a member of the society in November 2019 after being nominated to run for the position. Led the team organizing the virtual networking event of 2020 for the ISIE student members.

14-19 jul 2019
Lisbon, Portugal

Presenter and member of the team organizing the Urban Analytics IN+ Summer School

IN+ Center for Innovation, Technology and Policy Research (<http://in3.dem.ist.utl.pt/>),

Instituto Superior Técnico

<http://in3.dem.ist.utl.pt/summerschool/>

Part of the organizing team of the Urban Analytics IN+ Summer School, taking a more active role with the content development team. Prepared and presented a class focused on introducing students to programming with Python and using it to gain new insights from urban data.

apr 2016 – mar 2018
Lisbon, Portugal

Researcher for the Sharing Cities Project

IN+ Center for Innovation, Technology and Policy Research (<http://in3.dem.ist.utl.pt/>),

Instituto Superior Técnico

<http://in3.dem.ist.utl.pt/> and <http://www.sharingcities.eu/>

Worked as part of the IST team for the Sharing Cities Project – an international smart cities project that focuses on urban issues such as energy use, low carbon transport and buildings, and ways to leverage urban data.

Active role in work packages focusing on building energy retrofits, urban and building energy management platforms, business models, and evaluation of deployed solutions. Also contributed to the work packages related to implementing other initiatives and linked with the citizen, including the development of an urban digital social market. The project joined professionals from 34 government, industry, and academia partners in 6 different European cities, creating a network of people interested in actively contributing to more sustainable cities.

nov 2016
Lisbon

Invited lecturer

Instituto Superior Técnico, Technical University of Lisbon, Portugal

Invited to teach a theoretical and an exercise class regarding building energy simulation to 4th-year Architecture students of the course Environmental Design, following the work developed in the master thesis.

EDUCATION

sep 2016 – may 2022
Lisbon, Portugal

Ph.D. in Sustainable Energy Systems

Supervised by Professor Paulo Ferrão

MIT Portugal

<https://www.mitportugal.org/>

The MIT Portugal Ph.D. Program in Sustainable Energy Systems is offered in Lisbon by Instituto Superior Técnico (IST) and the Lisbon School of Economics and Management (ISEG). The first year offered courses focused on energy, environment, sustainability, renewable energy resources, energy systems economics and modeling, optimization of energy systems, energy in buildings, economics, project evaluation and externalities, and entrepreneurship and innovation.

IN+ Center for Innovation, Technology and Policy Research, Instituto Superior Técnico

<http://in3.dem.ist.utl.pt/>

The research work has been developed at IN+ with Professor Paulo Ferrão. The work produced aims to understand the relationship between material use and economic development. This was achieved by creating a program in Python to track material flows across an economy based on freely accessible data, Input-Output Analysis, and the principle of material balance. The results show how a country's material use has evolved through the years and relates to other countries and its economic development.

IndEcol – Industrial Ecology Programme, Norwegian University of Science and Technology

<https://www.ntnu.edu/web/indecol>

A period of the Ph.D. between August 2021 and December 2021 was spent at IndEcol under the supervision of Professor Edgar Hertwich.

(Funded by a PhD scholarship from the Fundação para a Ciência e a Tecnologia through MIT Portugal)

- apr 2017 – dec 2021
Europe
- Innoenergy Ph.D. School Program**
EIT InnoEnergy
<https://www.innoenergy.com/for-students-learners/for-phd-candidates/phd-school/>
EIT InnoEnergy enables doctoral candidates to complement their research with essential entrepreneurial, innovation, business, and personal skills while promoting the creation of a network between individual researchers across Europe.
- Mobility period from August 2021 to December 2021 at NTNU, Trondheim, Norway, under the supervision of Professor Edgar Hertwich.
- (Funded by EIT Innoenergy)
- sep 2010 – nov 2015
Lisbon, Portugal
- Integrated Masters in Mechanical Engineering**
Instituto Superior Técnico, Technical University of Lisbon
<https://fenix.tecnico.ulisboa.pt/cursos/memec>
- The first three years of the program were focused on fundamental disciplines such as mathematics, chemistry, material science, mechanics, electronics, thermodynamics, programming, and fluid mechanics, among other subjects. In the last two years, the elective courses were from the Energy branch and focused on heat transfer, combustion, aerodynamics, mechanical designs, renewable energy, project management, and energy management.
- Thesis: *The impacts of data availability in building energy performance simulation*, supervised by Professor Paulo Ferrão and Dr. André Pina.
- aug 2013 – dec 2013
Trondheim, Norway
- Erasmus Exchange Program**
NTNU - Norwegian University of Science and Technology
<https://www.ntnu.edu/>
- I studied one semester abroad in Norway during the 4th year of the Integrated Master in Mechanical Engineering as part of the Exchange Program. This was a great experience that contributed to both academic and personal growth.

COMPLEMENTARY EDUCATION

- 5 oct – 9 oct 2020
- Data Science Essentials: the case of wind energy**
DTU Wind Energy (www.vindenergi.dtu.dk)
This course was designed for future energy domain professionals who wish to understand essential data science tools, allowing them to select the best data science tool for different analyses of multi-disciplinary and multidimensional data sets. The programming language used in the course was *Python*. Use of packages for artificial intelligence such as TensorFlow.
(Financiado pela EIT Innoenergy)
- 27 may – 7 jun 2019
Barcelona, Spain
- Managing Innovation and Entrepreneurship – Ph.D. School 2019**
ESADE Business School

The extensive program of this two-week summer school was designed around the concept of a new tech-based entrepreneurial venture, especially in sustainable energy. The content included the following topics: entrepreneurship, creativity and design thinking, and innovation, innovation and strategy, entrepreneurial finance, marketing for start-ups, measuring innovation, dealing with intellectual property rights, entrepreneurship and leadership.

(Funded by EIT Innoenergy)

11-15 jun 2018 — **IWI – International Workshop on Innovating**

Boston, USA

Massachusetts Institute of Technology (MIT)

<https://iwi.mit.edu/>

This one-week workshop organized by MIT and MIT Portugal focused on entrepreneurship and innovation, from identifying a market need to design thinking and business models.

(Funded by the IWI workshop)

5-9 feb 2018

Paris, France

Economic, Scientific, and Technological Intelligence

ENSTA ParisTech

An Innoenergy Ph.D. School course, this one-week course included very diverse subjects, from the Triz method to security in nuclear power plants, dissemination of information for people living close to a nuclear power plant, the role of oil in the 2003 Iraq war, and the geopolitical and strategic dimension of mining and energy resources among others.

(Funded by EIT Innoenergy)

18-22 sep 2017

Grenoble, France

Energy Economics

Grenoble École de Management

A one-week course, part of the Innoenergy Ph.D. School curriculum. It included the sessions focusing on the mechanics of the energy market and other aspects such as the drivers for investment in the electricity sector or demand response.

(Funded by EIT Innoenergy)

2010

Lisbon, Portugal

Master Class 2010 – Hands-on Particle Physics

LIP, Instituto Superior Técnico, University of Lisbon

2010

Lisbon, Portugal

Introduction to Solid Works

Laboratório de Tecnologias de Informação of the Mechanical Engineering Department, Instituto Superior Técnico, University of Lisbon

2010

Certificate in Advanced English: Cambridge ESOL Level 2 Certificate in ESOL International

University of Cambridge

2008

Physics Summer School

Universidade Júnior, Departamento de física, Universidade do Porto, Porto, Portugal

2007

Initiation to Photography

Nouvelle Photo, Leiria, Portugal

SCIENTIFIC PUBLICATIONS

- 2022 | **Can structural changes lead to dematerialization? Lessons from the Portuguese socioeconomic metabolism between 1995 and 2017**
Resources, Conservation and Recycling
Cunha, S., & Ferrão, P. (2022). Can structural changes lead to dematerialization? Lessons from the Portuguese socioeconomic metabolism between 1995 and 2017. *Resources, Conservation and Recycling*, 180, 106169. <https://doi.org/10.1016/J.RESCONREC.2022.106169>
- 2021 | **A framework to analyze the dynamics of the socioeconomic metabolism of countries: A Portuguese case study**
Journal of Industrial Ecology
Cunha, S., & Ferrão, P. (2021). A framework to analyze the dynamics of the socioeconomic metabolism of countries: A Portuguese case study. *Journal of Industrial Ecology*, jiec.13184. <https://doi.org/10.1111/JIEC.13184>
- 2017 | **Addressing the challenges of public housing retrofits**
Energy Procedia
Monteiro, C. S., Causone, F., Cunha, S., Pina, A., & Erba, S. (2017). Addressing the challenges of public housing retrofits. *Energy Procedia*, 134, 442-451.

CONFERENCES

- 16-18 may
2022
Lisbon | **The effects of economic crisis in the material consumption of European countries**
Encontro Ciência 2022, Conference presentation
<https://www.encontrociencia.pt/2022/?acao=seessoestematicas>
Cunha, S., Ferrão. (2022, 16-18 May). *The effects of economic crisis in the material consumption of European countries* [Conference presentation]. Encontro Ciência 2022, Lisbon, Portugal.
- 21 jun 2021
Virtual | **Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017**
International Industrial Ecology Day 2021, Virtual poster presentation
Cunha, S., Ferrão, P. (2021, 21 June). *Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017* [Virtual conference poster presentation]. International Industrial Ecology Day 2021, virtual.
The poster was awarded second place in the poster competition.

- 21 jun 2021
Virtual
- Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017**
International Industrial Ecology Day 2021, Virtual poster presentation
- Cunha, S.,** Ferrão, P. (2021, 21 June). *Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017* [Virtual conference poster presentation]. International Industrial Ecology Day 2021, virtual.
- The poster was awarded second place in the poster competition.
- 27 may 2021
Virtual
- Analysis of the socioeconomic metabolism of nations: PIOTs compiled from freely available data**
The ISIE Socioeconomic Metabolism perpetual online conference
Session 9: Progress in modeling the socioeconomic metabolism - combining material flow principles and input-output analysis, Virtual conference presentation
- Cunha, S.,** (2021, 27 May). *Analysis of the socioeconomic metabolism of nations: PIOTs compiled from freely available data* [Virtual conference presentation]. The ISIE Socioeconomic Metabolism perpetual online conference
- 14-16 oct 2019
Paris, France
- Decrypting circular economy**
InnoEnergy Ph.D. School Annual Conference 2019, Poster Presentation
- Cunha, S.,** Ferrão, P. (2019, 14-16 October). *Decrypting circular economy* [Conference poster presentation]. InnoEnergy Ph.D. School Annual Conference 2019, Paris, France.
- (Funded by EIT Innoenergy)
- 7-11 jul 2019
Beijing, China
- Clustering the metabolism of nations: An assessment of material productivity and economic development of 60 nations**
ISIE 2019: 10th International Conference on Industrial Ecology, Conference presentation
<https://is4ie.org/events/isie-conferences/45>
- Cunha, S.,** Silva, C., Ferrão, P. (2019, 7 – 11 July). *Clustering the metabolism of nations: An assessment of material productivity and economic development of 60 nations* [Conference presentation]. ISIE 2019: 10th International Conference on Industrial Ecology, Beijing, China.
- 3-5 oct 2018
Budapest, Hungary
- Urban metabolism for a sustainable future**
InnoEnergy Ph.D. School Annual Conference 2018, Poster Presentation
- Cunha, S.** (2018, 3-5 October). *Urban metabolism for a sustainable future* [Conference poster presentation]. InnoEnergy Ph.D. School Annual Conference 2018, Budapest, Hungary.
- (Funded by EIT Innoenergy)
- 7-8 jun 2018
Ljubljana, Slovenia
- Energy Transition enhanced by Sharing Energy Management Systems on local energy districts**
CIRED 2018 Ljubljana Workshop, Conference paper, and presentation
<https://www.cired-repository.org/handle/20.500.12455/1165>
- Nunes, V.,** Moreira, J., Cunha, S., Sousa, C., Rolim, C., Aires Messias, A. (2018, 7-8 June). *Energy Transition enhanced by Sharing Energy Management Systems on local energy districts* [Conference presentation]. CIRED 2018 Ljubljana Workshop, Ljubljana, Slovenia.
- 3 may 2018
Lisbon, Portugal
- The impact of solar PV generation in cities**
APREN: Cycle of Round Tables – “APREN and the Universities” | Day of the Sun , Round table presentation
<https://www.apren.pt/pt/apren/eventos-apren/dia-do-sol-2018>

Cunha, S. (2018, 3 May). *The impact of solar PV generation in cities* [Conference presentation]. APREN: Cycle of Round Tables – “APREN and the Universities” | Day of the Sun, Lisbon, Portugal.

7-9 aug
2017
San
Francisco,
USA

[Energy and Environmental Simulation of the Built Environment at the City Level](#)

IBPSA: Building Simulation 2017, Special session presentation

<https://www.ibpsa.us/building-simulation-2017-san-francisco>

Causone, F., Chen, Y., Pina, A., Cunha, S., Monteiro, C. S., Eicker, U., Reinhart, C., Cerezo, C., Ramponi, R. (2017, 7-9 August). Energy and Environmental Simulation of the Built Environment at the City Level [Conference special session presentation], Building Simulation 2017, San Francisco, USA.

3-5 jul 2017
Lisbon,
Portugal

[Assessing the potential of solar energy use in urban neighborhoods](#)

Ciência 2017, Poster presentation

<https://www.encontrociencia.pt/2017/poster/>

Cunha, S., Monteiro, C. S., Pina, A., Silva, C. (2017, 3-5 July). *Assessing the potential of solar energy use in urban neighborhoods* [Conference poster]. Ciência 2017, Lisbon, Portugal.

25-29 jun
2017
Chicago,
USA

[Analysis of energy savings potential of building retrofitting at urban scale](#)

ISIE-ISSST 2017: Science in Support of Sustainable and Resilient Communities, Conference presentation

<https://is4ie.org/events/isie-conferences/1>

Cunha, S., Monteiro, C. S., Pina, A. (2017, 25-29 June). *Analysis of energy savings potential of building retrofitting at urban scale* [Conference presentation]. ISIE-ISSST 2017: Science in Support of Sustainable and Resilient Communities, Chicago, USA.

29 may-2
jun 2017
Noordwijk,
Netherlands

[Assessing the potential of solar energy use in urban neighborhoods](#)

NASA, ESA, C3P: 2017 International Workshop on Environment and Alternative Energy, Conference and poster presentation

<https://www.pgsworkshop.com/pastworkshops/>

Cunha, S., Monteiro, C. S., Pina, A., Silva, C. (2017, 29 May – 2 June). *Assessing the potential of solar energy use in urban neighborhoods* [Conference presentation and poster]. 2017 International Workshop on Environment and Alternative Energy organized by NASA, ESA, and C3P, Noordwijk, Netherlands.

(Funded by Fundação Luso-Americana para o desenvolvimento)

26 may
2017
MAAT,
Lisbon,
Portugal

[City Sensing – Feel the city: Buildings dashboard for urban energy management](#)

Post-Internet Cities | International Conference, Video installation

<https://www.youtube.com/watch?v=-8ssMT9GVlo>

<https://postinternetcities.weebly.com/>

Monteiro, C. S., Cunha, S., Pina, A. (2017, 25 May). *City Sensing – Feel the city: Buildings dashboard for urban energy management*, Post-Internet Cities International Conference, Museu de Arte, Arquitetura e Tecnologia - MAAT, Lisboa, Portugal.

OTHER SCIENTIFIC PUBLICATIONS

may 2022 | PhD thesis -

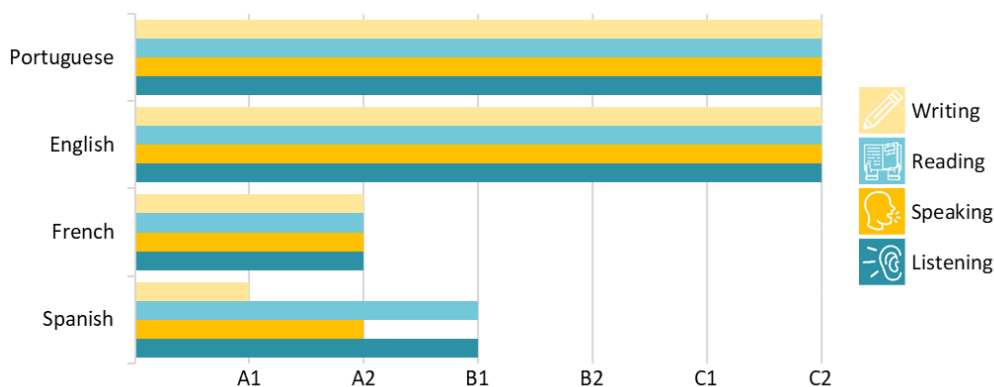
- 2018 | **Local monitoring programme design**
Sharing Cities
<http://nws.euocities.eu/MediaShell/media/D8-3-Local-monitoring-programme-design.pdf>
Zavitas, K., Carolina, C., Causone, F., Cunha, S., Antonellis, S., Nigris, M., Girardi, P., Polak, J., Rolim, C., Silva, E., Sivakumar, A., Tatti, A., Temporelli, A. (2018). *Local monitoring programme design* [Deliverable 8.3]. Sharing Cities Project.
- 2017 | **Core and site-specific data collection protocols**
Sharing Cities
<http://nws.euocities.eu/MediaShell/media/D8-2-Core-and-site-specific-data-collection-protocols.pdf>
Zavitas, K., Polak, J., Causone, F., Cunha, S., Tatti, A., Girardi, P., Pina, A., Temporelli, A. (2017). *Core and site-specific data collection protocols* (Deliverable 8.2). Sharing Cities Project.
- 2016 | **Common monitoring and evaluation framework**
Sharing Cities
<http://nws.euocities.eu/MediaShell/media/CommonMonitoringandEvaluationFramework.pdf>
Zavitas, K., Dong, Y., Polak, J., Causone, F., Cunha, S., Girardi, P., Pina, A., Temporelli, A. (2016). *Common monitoring and evaluation framework* [Deliverable 8.1]. Sharing Cities Project.
- nov 2015 | **Master thesis - The impacts of data availability in building energy performance simulation**
Instituto Superior Técnico, Technical University of Lisbon
<https://fenix.tecnico.ulisboa.pt/cursos/memec/dissertacao/846778572210985>
Cunha, S. (2015). *The impacts of data availability in building energy performance simulation* [Master thesis] Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal

AWARDS

- 2021 | **IE Day Poster Awards: 2nd place**
International Society for Industrial Ecology
Awarded for the poster presentation titled «Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017» at the 2021 IE day virtual conference (<https://is4ie.org/announcements/1244>)
- 2015 | **Diploma of Academic Excellence**
Instituto Superior Técnico, Technical University of Lisbon
Awarded by the Pedagogic Council of Instituto Superior Técnico of the University of Lisbon, Portugal, for her accomplishments in the 5th year of the Integrated Masters in Mechanical Engineering.
- 2014 | **Diploma of Merit**
Instituto Superior Técnico, Technical University of Lisbon
Awarded by the Pedagogic Council of Instituto Superior Técnico of the University of Lisbon, Portugal, for her accomplishments in the 4th year of the Integrated Masters in Mechanical Engineering.

- 2013 **Diploma of Merit**
 Instituto Superior Técnico, Technical University of Lisbon
 Awarded by the Pedagogic Council of Instituto Superior Técnico of the University of Lisbon, Portugal, for her accomplishments in the 3rd year of the Integrated Masters in Mechanical Engineering.
- 2012 **Diploma of Merit**
 Instituto Superior Técnico, Technical University of Lisbon
 Awarded by the Pedagogic Council of Instituto Superior Técnico of the University of Lisbon, Portugal, for her accomplishments in the 2nd year of the Integrated Masters in Mechanical Engineering.
- 2010 **Diploma of Merit**
 Escola Secundária Raul Proença
 Awarded by Escola Secundária Raul Proença for having finished high school with an average grade of 19 out of 20.
- 2010 **monIT Award “Explore radiofrequencies”**
 monIT
 1st place awarded for a project competition in the field of radio frequencies.

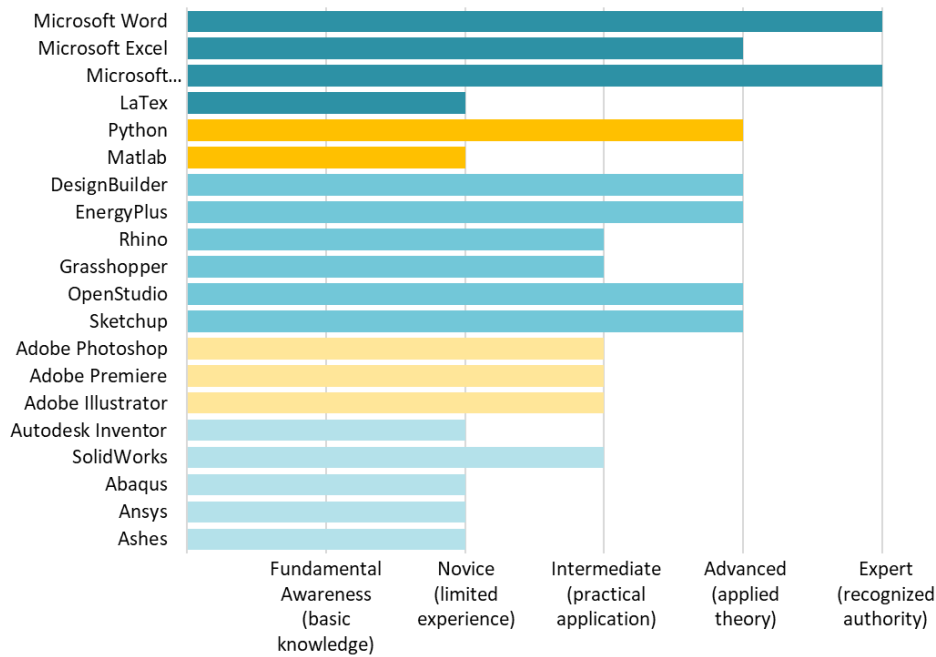
Languages



Obs.:

Native Portuguese speaker, but very comfortable using English in formal and informal settings. Attended private English classes for ten years and made daily use of the language in 2013. Attended three years of French in school and used it while traveling, occasionally listening to podcasts teaching French. Understand and manage informal, simple conversations in Spanish, being used to watch Spanish shows from an early age and Spanish being a very similar language to Portuguese.

COMPUTER SKILLS



Obs.:

Very comfortable using Word, Excel, and PowerPoint, having started using these tools at a young age and making a continuous effort to learn their new features with each new update to be faster at obtaining the intended result. Used Latex as a word processor in some projects during the master's degree, much like Matlab.

Started to use Python to expedite the calculations involved in the Ph.D. research, knowledge of various packages such as *pandas*, *geopandas*, *matplotlib*, and *optimize*, among others. Can collect data available online through APIs.

The work developed for the Master thesis and the Sharing Cities Project required the use of energy modeling tools. Very good knowledge of three different interfaces for EnergyPlus and how to make changes directly to the EnergyPlus IDF file.

Learned to use Photoshop, Premiere, and Illustrator as a hobby, which has proven helpful on various occasions for the work for Sharing Cities and the Ph.D.

As a student used software such as Autodesk Inventor, SolidWorks, Abaqus, Ansys, and Ashes for several course projects.

OTHER SKILLS

Creativity	I have always had the need to create, learn new things, and apply them to problem-solving. I enjoy being challenged to solve new problems with innovative and elegant solutions.
Problem-solving	Given my background in engineering and my love of science, I tend to be rational and analytical about each problem or piece of information, giving others and myself the benefit of the doubt.
Critical thinking	
Independence	While the work involved in a Ph.D. can be very independent, which suited me very well, I acquired collaboration and teamwork skills while working on the Sharing Cities project and several other smaller projects with my colleagues at IN+.
Collaboration	Through these experiences and the time spent at conferences and the Innoenergy Ph.D. school, I also learned my communication and public speaking skills.
Teamwork	

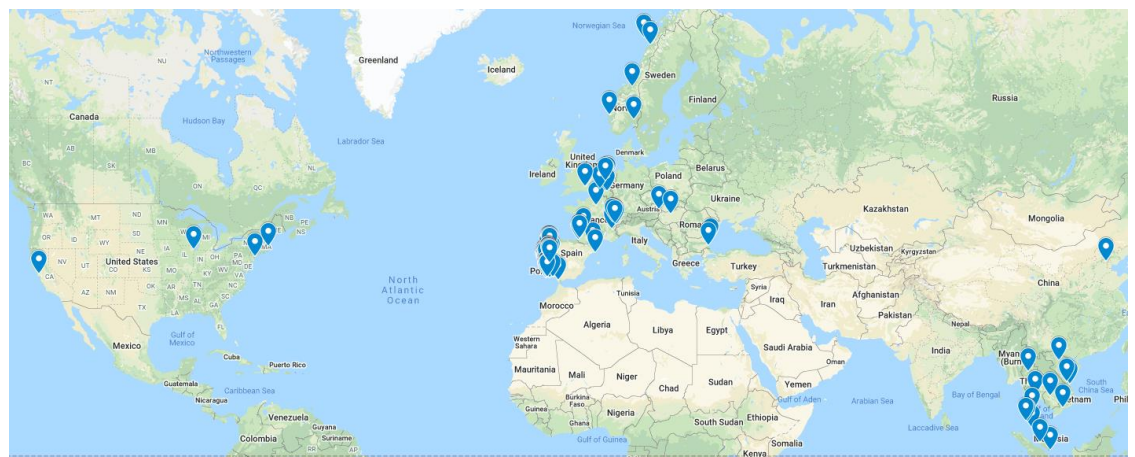
Interpersonal communication	My adaptability was most helpful during the various changes during my Ph.D., whether in terms of the topic of study in supervisors.
Active listening	It is not uncommon in a group situation that I lead the group, which has led me to learn more about the different types of leadership and their suitability for various conditions.
Public speaking	My father always showed us ways to keep our things, schoolwork, and even computer folders organized. This is something that I have always held as I have observed the benefits, whether in how the organization of data can help better understand its meaning or how an organized notebook can aid in tracking the evolution of a particular project.
Adaptability	
Leadership	
Organization	

OTHER INTERESTS

- Andorra
- Austria
- Belgium
- Bulgaria
- Cambodia
- China
- France
- Hungary
- Malaysia
- Netherlands
- Norway
- Singapore
- Spain
- Switzerland
- Thailand
- United Kingdom
- United States
- Vietnam

Traveling

Visited 18 countries so far, being used to travel for pleasure and work, alone or not.



Sustainability

Very interested in learning new ways to live more sustainably without compromising the quality of life in terms of alternative transport, passive buildings, low-impact healthy eating, and water usage. Concerned about how science and engineering can find effective solutions that the population can easily and effectively take up in developed or developing countries.

- Yoga
- Watersports

Sports

Started practicing yoga more seriously at the end of 2018. Enjoy watersports such as bodyboarding, surfing, or windsurfing.

- Photography
- Cooking
- Baking
- Needlework
- Macramé
- Painting
- Knitting
- Sewing
- Pottery

Hobbies

Started photographing at an early age and have kept the hobby ever since, always looking forward to improving and new photographic challenges—experience with small photography jobs and editing and illustrating images.

Fond of cooking and baking, constantly trying new cuisine, recipe or creating a new dish.

Always looking forward to learning a new craft that can serve as an outlet for creativity.

Recently, the preferred outlets have been sewing, knitting, crocheting, doing macramé pieces, and painting watercolors.

Driving License

B and B1