SÓNIA MARTINS DA CUNHA

Ph.D.

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

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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 – I

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

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. InOn 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 <u>https://www.ntnu.edu/</u> 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

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)

Barcelona, Spain

27 may – 7 jun 2019 + 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 - Boston, USA	 IWI – International Workshop on Innovating 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
	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 106169. and Recycling, 180. 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 <u>https://www.encontrociencia.pt/2022/?accao=sessoestematicas</u>
	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). <i>Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017</i> [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). <i>Key sectors in the socioeconomic development of the Portuguese economy between 1995 and 2017</i> [Virtual conference poster presentation]. International Industrial Ecology Day 2021, virtual.
	The poster was awarded second place in the poster competition.
- 27 may 2021 Virtual	
Virtual	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). <i>Analysis of the socioeconomic metabolism of nations: PIOTs compiled from freely available data</i> [Virtual conference presentation]. The ISIE Socioeconomic Metabolism perpetual online conference
14-16 oct 2019 -	Decrypting circular economy
Paris, France	InnoEnergy Ph.D. School Annual Conference 2019, Poster Presentation
	Cunha, S., Ferrão, P. (2019, 14-16 October). <i>Decrypting circular economy</i> [Conference poster presentation]. InnoEnergy Ph.D. School Annual Conference 2019, Paris, France.
	(Funded by EIT Innoenergy)
7-11 jul 2019 – Beijing, China	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). <i>Clustering the metabolism of nations: An assessment of material productivity and economic development of 60 nations</i> [Conference presentation]. ISIE 2019: 10th International Conference on Industrial Ecology, Beijing, China.
3-5 oct 2018 -	Urban metabolism for a sustainable future
Budapest, Hungary	InnoEnergy Ph.D. School Annual Conference 2018, Poster Presentation
	Cunha, S . (2018, 3-5 October). <i>Urban metabolism for a sustainable future</i> [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.
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Lisbon, Portugal	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 -	Energy and Environmental Simulation of the Built Environment at the City Level
an Francisco, USA	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 -	Assessing the potential of solar energy use in urban neighborhoods
Lisbon, Portugal	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 -	Analysis of energy savings potential of building retrofitting at urban scale
Chicago, USA	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 -	Assessing the potential of solar energy use in urban neighborhoods
Noordwijk,	NASA, ESA, C3P: 2017 International Workshop on Environment and Alternative Energy,
Netherlands	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 -	City Sensing – Feel the city: Buildings dashboard for urban energy management
MAAT, Lisbon,	Post-Internet Cities International Conference, Video installation
Portugal	https://www.youtube.com/watch?v=-8ssMT9GVIo
	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 -	Analysis of the socioeconomic metabolism of nations: methods and applications PhD Thesis
	Cunha, S. (2022). Analysis of the socioeconomic metabolism of nations: methods and applications [PhD Thesis]
2018 -	Local monitoring programme design Sharing Cities
	http://nws.eurocities.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). <i>Local monitoring programme</i> <i>design</i> [Deliverable 8.3]. Sharing Cities Project.
2017 -	Core and site-specific data collection protocols
	Sharing Cities http://nws.eurocities.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.eurocities.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

OTHER PUBLICATIONS

nov 2021 + As mudanças estruturais da economia portuguesa estão a contribuir para a sustentabilidade ambiental?

Jornal i

https://ionline.sapo.pt/artigo/754524/-as-mudancas-estruturais-da-economia-portuguesaestao-a-contribuir-para-a-sustentabilidade-ambiental-?seccao=Opiniao i

Ferrão, P., Cunha, S. (2021). As mudanças estruturais da economia portuguesa estão a contribuir para a sustentabilidade ambiental. Jornal i

oct 2021 + Por um Sistema de Gestão dos Consumos Intensivos de Materiais para ajudar a indústria, a economia e o ambiente

Jornal i

https://ionline.sapo.pt/artigo/749093/por-um-sistema-de-gestao-dos-consumos-intensivosde-materiais-para-ajudar-a-ind-stria-a-economia-e-o-ambiente?seccao=Opiniao_i

Ferrão, P., Cunha, S. (2021). Por um Sistema de Gestão dos Consumos Intensivos de Materiais para ajudar a indústria, a economia e o ambiente. Jornal i

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

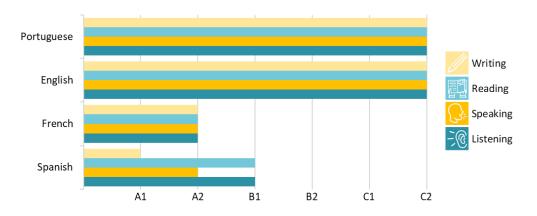
Awarded by Escola Secundária Raul Proença for having finished high school with an average grade of 19 out of 20.

²⁰¹⁰ + monIT Award "Explore radiofrequencies"

monIT

1st place awarded for a project competition in the field of radio frequencies.

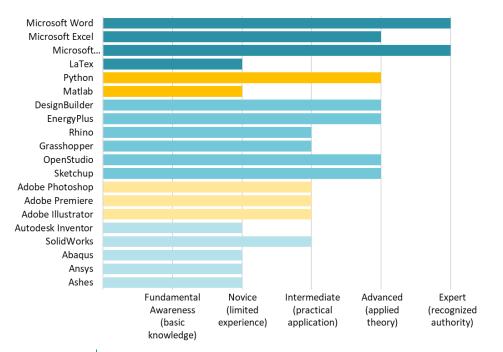




Obs.:

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

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.

Obs.:

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

Problem-solving Critical thinking

Independence

Collaboration

Teamwork

Interpersonal

communication

Active listening

Public speaking

Adaptability

Leadership

Organization

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. 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.

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+. Through these experiences and the time spent at conferences and the Innoenergy Ph.D. school, I also learned my communication and public speaking skills.

My adaptability was most helpful during the various changes during my Ph.D., whether in terms of the topic of study in supervisors.

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.

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.

OTHER INTERESTS

Andorra + Traveling

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

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

Hobbies

Photography -Cooking Baking Needlework Macramé Painting Knitting Sewing Pottery

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 kraft 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

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