IUSS
Scuola Universitaria Superiore Pavia

PhD SDC

Call for applications PhD National Course in

Sustainable Development and Climate change (SDC)

41° cycle - Academic Year 2025/2026

DEADLINE FOR SUBMISSION 13:00 (Italian Time) 22 August 2025

Changes or additions to the call will be published on the "Call for applications and announcements / Call for PhD programmes" page of the School's official website

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Art. 1 - ESTABLISHMENT OF THE DOCTORAL COURSE IN SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE

The Scuola Universitaria Superiore IUSS, Piazza della Vittoria n. 15 – 27100 Pavia (hereafter "the School"), hereby announces a Call for Applications to enroll in the **41st cycle of the National Doctoral Course in Sustainable Development and Climate change** (hereafter PhD-SDC) for the **2025/2026 academic year**.

PhD Programme Coordinator: **Professor Roberto Buizza – phd-sdc.coordinator@iusspavia.it**

1.1 Course Description and Objectives

The **Doctoral Course in Sustainable Development and Climate Change (PhD-SDC)** has a duration of **three years** and aims to equip talented students with the skills to build a more resilient society – one that will be able to address and manage effectively the problems of climate change. A society capable of rethinking the processes of sustainable development, and the objectives of which are not aimed solely at economic growth. The course is focused on the interrelation of complex issues such as technological progress, availability of natural resources, migration, human rights, climate change, access to food and water and the quality of life of present and future generations.

The combined challenges of sustainability and climate change need to be firmly embedded in university education. Universities should aim to identify and create innovative projects going beyond a traditional, single-discipline approach, so that by effectively combining a variety of abilities, methods and communicative skills, society will be able to manage the present challenges.

The doctoral program is divided into three interconnected curricula and based on the collaboration with several universities uniformly distributed over the Italian territory. To ensure that PhD students follow a multi- and interdisciplinary educational path, the program uses two interconnected networks:

- A network of curricula covering the specific disciplinary fields

- A network of universities, public research institutions, and institutions involved in the PhD program, coordinated by a national committee that integrates and manages the complexity by establishing interaction between the curricula.

The doctoral program focuses on a single theme, but develops it under three curricula to allow for in-depth study in different disciplinary areas. Thus, the theme of sustainable development and climate change defines the direction of the program: it can be thought of as the doctoral program's mission, which, through the resources, the skills, and the tools characteristic of the different disciplinary fields, will be achieved by defining concrete goals that will form the students' research topics. The interaction and the scientific collaboration between students from different fields will be fostered by a multidisciplinary approach implemented at two levels. The first one is centrally coordinated and connects all students from all curricula allowing the connection between different disciplinary fields. The second involves only PhDs from the specific curriculum to share goals and tools from the specific disciplinary field.

The PhD program, which lasts three years, is divided into the following three curricula, the description of which

(with the related SSD – Scientific-Disciplinary Sectors) is reported in the “Educational Programme” attachment and is an integral part of this announcement.

The PhD programme lasts 3 academic years and it offers three curricula, described in detail in the “Educational Programme”. The three curricula are:

- CU ALPHA - ONE HEALTH: EARTH SYSTEM AND HUMAN LIFE
- CU BETA - HUMAN SOCIETY: SOCIO-ECONOMIC IMPACTS, INSTITUTIONS AND THEORIES
- CU GAMMA - TECHNOLOGY AND TERRITORY: SUSTAINABLE STRATEGIES AND SOLUTIONS FOR THE TRANSITION

1.2 Affiliated bodies

1. *Scuola Superiore di Studi Universitari e Perfezionamento Sant'Anna*
2. *Scuola Normale Superiore di PISA*
3. *Università degli Studi di BRESCIA*
4. *Libera Università di BOLZANO*
5. *Università degli Studi di MESSINA*
6. *Università degli Studi di MODENA e REGGIO EMILIA*
7. *Università degli Studi di Napoli Federico II*
8. *Università degli Studi INSUBRIA Varese-Como*
9. *Università degli Studi di PADOVA*
10. *Università degli Studi di SASSARI*
11. *Università degli Studi di TORINO*
12. *Università degli Studi di TRIESTE*
13. *Università Politecnica delle MARCHE*
14. *Università degli Studi di PALERMO*
15. *Università Cattolica del Sacro Cuore*
16. *Università "Ca' Foscari" VENEZIA*
17. *Politecnico di TORINO*
18. *Università "Carlo Cattaneo" - LIUC*
10. *Università degli Studi di CASSINO e del LAZIO MERIDIONALE*
20. *Università degli Studi di BARI ALDO MORO*
21. *Consiglio Nazionale delle Ricerche (CNR)*

1.3 Scholarships

The attached document describes the **36** scholarships available. The number of scholarships may be increased if further funding should be available before the beginning of the PhD course. Each scholarship is linked to a specific research topic, that is, there is a requirement for the recipients to focus their doctoral research on one of the topics listed in the above-mentioned document and to conduct their research activity at the host university. Each individual scholarship can only be assigned to those candidates who are evaluated as eligible by the Selection Board.

Interviews held during the selection process will allow the Selection Board to establish whether the candidates have the necessary knowledge and skills to be admitted to the doctoral course and to study the selected scholarship research topics. For further information on the doctoral course and its "Educational Programme", please visit the phd-sdc.it or email phd-sdc@iusspavia.it.

Art. 2 – ADMISSION REQUIREMENTS

Applications are welcome from all qualified candidates regardless of age or nationality. Eligible candidates must have the following academic qualifications:

a) Master's degree (Laurea Magistrale or Laurea Specialistica or Laurea Vecchio Ordinamento);

b) Analogous academic qualification awarded abroad (comparable to an Italian master's degree, in terms of duration and study content) and recognized by the Selection Board as suitable for application to the course.

Applications from candidates who are still to graduate will be considered pending. **The required degree must be obtained by no later than the start of the PhD program (November 1st, 2025).**

Art. 3 - APPLICATIONS

3.1 Application Procedure

Applications must be submitted exclusively online by **22 August, 2025 at 13:00 Italian time**. The application fees are **30 euro** to be paid before the deadline to avoid exclusion. The application fees cannot be reimbursed under any circumstances.

Please refer to the application procedure described below.

- Go to the following link: https://pica.cineca.it/iuss/dottorato-41/
- Log in if you have already registered;
- If you are logging in for the first time, click on "New Registration" and enter the following data:
  - Name
  - Surname
  - Gender
  - Date of birth

- Fiscal Code (for Italian citizen only)
- State of birth
- Place of birth
- Phone number

Once you have completed registration your login credentials will be sent to the email address provided. You will be able to log in once you receive an email confirming registration.

In order to apply, you have to upload the following documents:

- Curriculum Vitae
- Valid ID (clearly visible)
- Research Proposal
- Letter of Purpose
- Academic qualification (for those candidates who have not yet obtained the required qualification the procedure will required University name and major)
- Other titles

Once all the required documents have been uploaded, click "save" and return to the dashboard.

You will be asked to verify – through the "verify" button – the data you entered; only after verifying that the information present is correct, you can continue and finalize the registration payment.

You have to click on "payment" and follow the instructions provided by the platform in order to use the "PagoPA" system. You have to sign the application and submit it.

Successful submission of the application will be confirmed to the email address provided in the registration details. If you have not yet received a confirmation email after 24 hours please contact the help desk of PICA platform.

3.2 Required Accompanying Documents

a)	**A scan of a valid form of photographic ID**	Please scan both sides of the document. If the ID document is not written in Latin characters, you must provide a certified Italian translation. **Please note that if you do not provide a certified translation your ID document will not accepted**.
b)	**Curriculum Vitae**	Language: English

		Length: max 2000 words Must include: - academic qualifications and training path; - research and/or work experience (if any); - list of publications (if any); - other relevant qualifications/documents that provide information on the applicant's academic and professional experience.
c)	**Proof of university degree awards needed for the admission, including the following information:** 1. University; 2. Degree type; 3. Full name of the degree; 4. Major; 5. Date of graduation (or expected date); 6. Final mark/grade; 7. List of exams undertaken and the associated grade awarded .	Language: Italian, English, French or Spanish. For academic documents in all other languages applicants must provide an official translation provided by the university issuing the degree or by an authorized body or translator. **Without a certified translation the documents will not be accepted**. Type of certificate for degrees awarded in: 1. **Italian public universities:** self-declaration* of master's degree award, signed and dated; 2. **EU and non-EU member state universities**: where available, certificates, transcripts of records master's degree or diploma supplement, if available.
d)	**Proof of other academic qualifications,** **including the following information:** 1. University; 2. Degree type; 3. Full name of the degree; 4. Major; 5. Date of graduation (or expected date); 6. Final mark/grade; 7. List of exams undertaken, the associated grade awarded.	Language: Italian, English, French or Spanish. For all other languages, applicants must provide an official translation provided by the university issuing the degree or by an authorized body or translator. **Without a certified translation the documents will not be accepted**. Type of certificate for degrees awarded in: 1. **Italian public universities:** self-declaration* of of bachelor's or master's degree award, signed and dated; 2. **EU and non-EU member state universities**: where available, certificates, transcripts of records of bachelor's or master's degree or diploma supplement, if available.

e)	*For applicants due to be awarded their master's degree:* **Proof of exams taken and grades awarded.**	Language: Italian, English, French or Spanish. For all other languages, applicants must provide an official translation provided by the university issuing the degree or by an authorized body or translator. **Without a certified translation the documents will not be accepted**.
f)	**Research Proposal**	Language: English The **Research Proposal** (1,000-2,500 words - except bibliography) should focus on the scholarship research topic chosen as <u>first preference</u> and must include: - Abstract (max 250 words); - Scope of research and questions; - Methodology; - Expected results and impacts.
g)	**Letter of Purpose**	Language: English The **Letter of Purpose** (max 500 words) must include your motivations for conducting the proposed research, that is the research topic listed as your <u>first preference</u>, and it must also mention your interest in the other research topics selected (if any) based on relevant skills and experience.

***** Current regulations do not recognize certificates issued by other Public Administrations. Qualifications included in the application must be self-certified if issued by Italian public universities.

With the exception of a), which can be in the original language, and c) and d), and e) which can be in Italian, English, French or Spanish, **all documents must be in English**. For documents issued in a different language, an official translation (into Italian or English, by the issuing university or by an authorized body) must be provided.

<u>All documents referred to in a) and c) - or, for applicants due to be awarded their master's degree, in e) - are strictly required. Failing to submit any of the said documents during application will result in the candidate's exclusion from admission.</u>

Art. 4 – ADMISSION PROCEDURE

Evaluation	Selection will be based on an assessment of the qualifications listed in the "Qualification Assessment" section followed by an interview. The Selection Board will award a score from 1 to 100. **1. Qualification Assessment:** The Selection Board will assess the applicants' scientific qualifications and determine an overall score up to a maximum of 60 points. Applicants who receive a score of at least 35 will be invited to attend an interview. The Selection Board will award scores based on: - CV and academic qualifications (Required documents b), c) and d)): up to a maximum of 20 points; - Research Proposal and Letter of Purpose (Required documents e) and f)): up to a maximum of 40 points. At this stage candidates may already be determined non-eligible for one or more of the selected scholarships. **2. Interview:** interviews will be conducted online in English and will focus on the applicant's scientific background, Research Proposal and Letter of Purpose. The candidate may use slides and the screen sharing option within the platform. The Selection Board can invite a proven expert for each research topic to participate in the interview. This expert could be a member of the Academic Board. The Selection Board will determine a score for the interviews up to a maximum of 40 points. A minimum of 25 points is required to continue the process. <u>During the interview, the Selection Board will verify that the candidate has the necessary knowledge and skills for attending the doctoral course and will proceed to evaluate the eligibility of the candidate for the research topics selected.</u> At this stage, subject to the candidate's authorization and based on their curriculum, the Selection Board will asses eligibility for scholarships other than their preferred choice(s). If the assessment in positive, eligibility for the alternative scholarship will be taken into consideration only in case of unassigned scholarships after the final ranking.

Qualifications Assessment	- Curriculum Vitae; - Diploma supplement or transcripts of master's degree grades or levels; - List of publications (if any) as stated on CV; - Research Proposal; - Letter of Purpose; - Any other relevant qualifications listed on the CV that provide evidence of academic and professional experience.
Assessment Results	The results of the qualification assessment will be published on the IUSS website – on the "Call for Applications" page, by 19 September 2025.
Interview Schedule	The interviews will be conducted starting from 22 September 2025. Candidates will be given reasonable notice of the date and timing of the interview.
Special needs	People with disabilities can apply for special equipment and/or other aids during the application process.

Candidates must be connected online via both audio and video. Failing to connect at the time and date of the interview or lacking ID proof will be regarded as withdrawal from the application process.

Art. 5 – SELECTION BOARD

The Selection Board for admission to PhD programmes is appointed by the Rector of the university. The list of the Board Members is published on the School website – "Call for Applications" page. The Selection Board is divided into subcommittees, corresponding to the different curricula. The subcommittees will be responsible for arranging and conducting the relevant interviews and can be joined by experts, for each of the research topics. The experts may also be part of the Academic Board.

Art. 6 – RANKING AND ASSIGNMENT OF SCHOLARSHIPS

Following the interviews, the final ranking for each curriculum will be published on the School's website – "Call for Applications" page by **15 October 2025.**

The final ranking:

- Will be in decreasing order of scores (in the event of a tie, the youngest candidate will be given precedence);
- Will confirm the candidate's eligibility to study the research topics of their choice or additional research topics based on the assessment of the Selection Board.

The scholarships will be assigned according to the following procedure:

1. Each candidate will be notified by email and offered a scholarship in observance of the final ranking and of their order of preference as formally declared at the application stage;
2. Candidates must confirm acceptance by replying to the email within 48 hours;
3. Once scholarships are assigned, they are no longer obtainable by other candidates;
4. Candidates who reject the scholarship or fail to confirm before the deadline will forfeit the right to the scholarship offered and to any further scholarship. The place will be offered to the next eligible candidate.

This procedure will continue until all scholarships are assigned, including any alternative scholarships for which candidates were deemed eligible by the Selection Board during assessment, up until the beginning of the Phd course.

Art.7 – ENROLMENT

7.1 Enrolment Procedure

Publication of the rankings on the School's online Official Register (Albo Ufficiale) shall be considered official notification. The Doctoral Course Programme will start on **1 November 2025.**

Successful candidates will be notified of the final date for enrolment – failure to enrol by that date will result in their exclusion from the doctoral course.

The following is a summary of the documents to be submitted to the enrolment office:

a) for candidates who obtained their master's degree abroad a Declaration of Local Value (or a copy of the application to the competent authority) or a Diploma Supplement is required;

b) for candidates awarded their master's degree ("laurea magistrale") after the deadline for applications to the course but no later than November 1st 2025, a degree certificate or self-declaration of the qualification including grades, date and place of degree awarded must be sent by email to phd-sdc@iusspavia.it.

In order to enroll candidates need to complete the procedure on Service Esse3 – Reserved Area; more information will be provided to you by the secretariat.

Any different form of payment and enrollment from those specified in this document are not accepted.

For any student the actual entrance in Italy and the arrival to the host University must occur before the **31st of January 2026** to avoid exclusion from the PhD course.

7.2 Additional Requirements for Visa Applicants

Non-EU students entering Italy should apply for a specific study visa using the online procedure on the Universitaly portal **within 5 days since the acceptance of the scholarship**. Students must apply to the local Police Department ("Questura") within eight (8) days of arriving in Italy for a residence permit for study purposes.

For further information, please go to IUSS website.

7.3 Registration Fee

PhD students must pay the registration fee for each academic year. The registration fee includes the regional study tax and the stamp duty.

In case of withdrawal from the doctoral course candidates cannot be reimbursed the registration fee.

Art.8 – SCHOLARSHIPS

The scholarships cover the entire duration of the PhD program and are awarded for the first year. They are renewed annually for admission to the subsequent years, subject to a positive evaluation by the Academic Board.

The annual amount of the scholarship is € 19.021,02, including National Social Security Contributions (INPS). This amount is exempt from the IRPEF tax and it is subject to the payment of National Social Security contribution (INPS "gestione separata"), of which two thirds are paid by the administration and one third by the PhD student.

The scholarships may not be cumulated with other scholarships granted for any reason, with the exception of those granted by national or foreign institutions to enhance the student's research activity with periods of stay abroad.

The scholarship cannot be awarded to those who have already benefited, even partially, from a doctoral scholarship in the past.

The scholarship may be increased by 50% for an average period of 6 months stay abroad and, in any case, until a maximum period of 12 months.
The School will also make an annual budget, amounting to not less than 20% of the scholarship, available

to all PhD students pursuant to article 9 of Italian Ministerial Decree 226/2021 to cover research activity-related expenses in Italy and abroad, as provided for by internal rules.
The School shall insure the students against accidents and civil liability for the entire duration of the Programme.

Art. 9 – LIMITATIONS ON OTHER EMPLOYMENT

Admission to the PhD course implies a full-time commitment and no other type of employment is allowed. However, art. 17 of the "Regolamento per i corsi di dottorato della Scuola" allows the student to occasionally work within strict guidelines for other entities while enrolled in the course. Please refer to the Regulations for more details.

Art. 10 – MANAGEMENT OF PERSONAL DATA

The School, as Controller (piazza Vittoria, 15, 27100 Pavia PV – PEC direzione@pec-iusspavia.it), in full conformance with Legislative Decree n. 196/2003 and with any subsequent updates, and with article 13 of the EU General Data Protection Regulation n. 679/2016, collects and processes personal data in order to manage the application for participation in the doctoral competition.

Data will be kept and may be used after the completion of the selection procedure for operational, administrative, accounting and/or other purposes related to the management of institutional activities and legal obligations, as well as for informing the successful applicants of any opportunities. Any data subjects wishing to exercise their statutory rights as per articles 15-22 of Reg. UE/2016/679 may do so by writing an email to the Controller.

Further information on the management of personal data by the School can be found at: https://www.iusspavia.it/en/privacy.

Transparent Administration

The School operates in compliance with Law no. 190/2012 (Provisions for the prevention and repression of corruption and illegality in public administration), applying the measures identified in the "Piano Integrato" that can be found in the "Trasparenza" section (in Italian) on the School's web site at: https://trasparenza.iusspavia.it.

Art 11 – REFERENCE RULES

For any items or information not included in this announcement, please refer to the "Regulations for Doctoral Courses" issued by the D.R. n. 74/2024 and the "Regulation for the PhD in Sustainable Development and Climate Change".

Submission of an application using the procedure described in art. 3 implies acceptance of the regulations contained in this announcement and of those that apply to PhD courses.

Procedure Supervisor

Giovanna Spinelli, Head of Education Unit – Palazzo del Broletto, Piazza della Vittoria n. 15 – 27100 Pavia – tel +39 0382375811, fax +39 0382375899, e-mail: info@iusspavia.it.

Disclaimer

The Italian version of this document is the official and legally binding announcement document. The English version is not legally binding and is only meant to provide information.

Curriculum: CU-Alpha: One health: Earth system and human life

Development of sustainable biotechnologies for metal recovery from vehicle batteries and PCBs

Reference Person: Amato Alessia (a.amato@univpm.it)

Host University/Institute: Università Politecnica delle Marche / Dipartimento di Scienze della Vita e dell'Ambiente

Research Keywords: Recovery of strategic raw materials

Biotechnologies and green hydrometallurgy

Environmental sustainability

Reference ERCs: PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 12: Responsible Consumption and Production

Description of the research topic

The project will focus on the development of sustainable processes (able to combine biotechnologies and green hydrometallurgy) for the recovery of strategic metals (e.g. Cu, Co, Li) from lithium batteries and printed circuit boards. The idea is to supply to the market innovative solutions to implement in the field of end-of-life electric vehicles fields. The project will integrate experimental activities, development of models to understand the involved mechanisms and environmental sustainability assessment. In this regard, standardized methods, such as Life Cycle Assessment, will be used to drive the sustainable optimization of the proposed solutions.

Research team and environment

The Environmental Technologies group is part of the Department of Life and Environmental Sciences (Polytechnic University of Marche).

The group deals with the development and optimization of processes for environmental applications, based on hydrometallurgical and biotechnological methods. The measurements of environemntal sustainability and circularity are peculiarities of the research lines of the group. The research team is composed of: a full professor, an associate professor, a researcher, several research fellows, PhD students and interns. It has available a lab with dedicated equipment (e.g. XRF).

Suggested skills for this research topic

Lab experience, Knowledge in environemntal sustainability assessment (e.g. life cycle assessment), chemical knowledge, basic computer knowledge

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

Scholarship code

CU41.CU-Alpha.02

Curriculum: CU-Alpha: One health: Earth system and human life

Modelling climate change impacts on air pollution in Europe under current and future scenarios

Reference Person: Bigi Alessandro (abigi@unimore.it)

Host University/Institute: Università degli Studi di Modena e Reggio Emilia / Dipartimento di Ingegneria 'Enzo Ferrari'

Research Keywords: Atmospheric modelling

Climate change

Air pollution

Reference ERCs: PE10_1 Atmospheric chemistry, atmospheric composition, air pollution

PE10_3 Climatology and climate change

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

Air pollution and climate change are closely linked and represent two major environmental challenges. Climate change has been unequivocally attributed to anthropogenic emissions by the IPCC, and climate forcing compounds are often co-emitted along with air pollutants.

The main objective of the project is to investigate the impact of climate change on air pollution by means of Chemical Transport Modelling (CTM). CTM will be applied to study aerosol and air pollutant evolution under current and future climate at the European scale, investigating the effect of the combined change in atmospheric temperature and precipitation patterns. Data from regulatory and scientific research networks (e.g. AERONET, ACTRIS) as well as from satellite will be used to compare historical simulations in different model configurations to optimize the setup used for the future scenarios. Artificial Intelligence algorithms will be tested to improve the horizontal resolution of the simulation output. Air pollution scenarios will focus on projections to 2050, in line with CMIP6, relying on the high resolution meteorological fields provided by the EURO-CORDEX program. Specific emission scenarios could also be tested for winter and summer seasons with the overall aim to support synergistic policies addressing both climate change and air pollution. The project will be developed in close collaboration with the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA).

Research team and environment

Research activities will be hosted at the LARMA Lab of the Dept. of Eng. "Enzo Ferrari" (http://tiny.cc/larm) and at the AOC Lab of ENEA (http://tiny.cc/fom7yz). LARMA works on atmospheric modelling and monitoring, collaborating with partners of the international research infrastructures ACTRIS and ICOS. LARMA is also in charge of the Geophysical Observatory of Modena and of the local AERONET sun photometer. The AOC Lab focuses on meteorological and air quality simulations on European, national, local domains, and on atmospheric and meteorological monitoring, being partner of ACTRIS, ICOS and AERONET. ENEA is also partner of the CAMS Service for the air quality forecast at European level.

Suggested skills for this research topic

The candidate is expected to have a solid background in physics, math, earth/environmental sciences or related disciplines, as well as experience in the analysis of observational data and/or numerical simulations. A training in atmospheric chemistry/physics, data analysis, atmospheric modelling, coding (e.g. in R, Fortran, matlab, python, Unix shell) are considered a key asset. A strong attitude to coding is highly desirable.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Urban air pollution toxicity by spatial source-resolved modelling of aerosol oxidative potential

Reference Person: Bigi Alessandro (abigi@unimore.it)

Host University/Institute: Università degli Studi di Modena e Reggio Emilia / Dipartimento di Ingegneria 'Enzo Ferrari'

Research Keywords: Airborne aerosol
Source apportionment
Oxidative potential

Reference ERCs: PE10_1 Atmospheric chemistry, atmospheric composition, air pollution

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 11: Sustainable Cities and Communities

Description of the research topic

WHO has identified air pollution as the largest pollution risk worldwide, with important societal and economic implications. Reactive oxygen species and redox-active transition metals, associated with different aerosol components and specific emission sources, can induce oxidative stress of biological tissues. In the last decade the oxidative potential (OP) of aerosols has been used as a metric for their toxicity, although large uncertainties remain on the most appropriate analytical protocol.

The project aims to improve our understanding of the spatio-temporal variability of aerosol toxicity in urban areas and of its attribution to the emission sources. This goal will be pursued by spatially distributed aerosol sampling for OP and metal content at several fixed locations, eventually combined with mobile mapping of aerosol parameters with potential health impacts (e.g. size distribution, ultrafine particle level). The tasks will include: – sample collection – analytical determinations – source apportionment of the OP – spatial modelling of fixed and mobile observations over the urban area, possibly supported by machine learning algorithms combining ancillary spatial information (e.g. land cover, satellite retrievals). The expected results are: – the apportionment of sources of toxic compounds – the assessment of their spatial variability, their impact and their risk to human health – the presentation of this research at international conferences and in high impact journals.

Research team and environment

Research activities will be hosted at the LARMA Lab of the Dept. of Eng. "Enzo Ferrari" (http://tiny.cc/larm) and at the Institute for Atmospheric Pollution Research of CNR

(http://tiny.cc/iiacnr). LARMA has long term experience on atmospheric modelling and monitoring by fixed and portable equipment, in collaboration with the research infrastructures ACTRIS and ICOS. The CNR-IIA is involved in the assessment of emissions, air concentrations and sources of atmospheric pollutants, either in outdoor (remotely and ground-based) or indoor environments, by high-sensitivity online and offline instrumentation. It also collaborates with excellence networks, such as EMEP and the BAQUNIN Project.

Suggested skills for this research topic

The candidate is expected to have a solid background in chemistry, physics, math, earth/environmental sciences or related disciplines, as well as experience in the analysis of observational data and/or numerical simulations. A training in atmospheric chemistry/physics, data analysis, atmospheric modelling, coding (e.g. in R, Fortran, matlab, python, Unix shell) are considered a key asset. A strong attitude to experimental measurements is highly desirable.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Multi - risk methods for assessing climate resilience and impacts on socio - ecological systems

Reference Person: Critto Andrea (critto@unive.it)

Host University/Institute: Università Ca' Foscari di Venezia / Dipartimento di Scienze Ambientali, Informatica e Statistica

Research Keywords: Multi-hazard risk

Machine Learning and Explainable AI

Climate Resilience

Reference ERCs: SH7_6 Environmental and climate change, societal impact and policy

PE4_18 Environment chemistry

PE6_11 Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

Climate change is intensifying the frequency and severity of natural hazards such as heatwaves, droughts, floods, sea level rise, leading to increasingly complex multi-hazard scenarios. The growing interconnectivity of socio-economic and environmental systems is further amplifying risks, with cascading effects that may lead into high-impact crises. At the same time, the increased availability of big data (e.g., Earth Observations, social media, climate projections, environmental monitoring) and advancements in artificial intelligence (AI) are transforming risk assessment, enabling deeper insights into hazard interactions. However, there are still major challenges in understanding multi-risk dynamics, in particular with regards to the analysis of changes in vulnerability due to multi-hazard events and the modelling of cascading impacts across multiple scales and sectors. Network Science provides a framework for modelling how systemic risks propagate across interconnected systems, identifying critical vulnerabilities and allowing for proactive resilience planning. This research topic aims at investigating systemic risk modelling, data science and AI, developing transferable multi-risk methodologies across scales and sectors, to unlock sustainable adaptation and resilience strategies.

Research team and environment

We will make available to the PhD fellow the labs, tools and infrastructures of the CMCC@Ca'Foscari, a strategic partnership between Ca'Foscari University of Venice and CMCC Foundation. Our multidisciplinary research team includes environmental scientists, climatologists, economists, conducting national and international research on the interaction between climate, environment, economy, society. The fellow will benefit from CMCC's computational infrastructure and will be provided with a workstation (equipped with PC, printer, Wi-Fi access, etc.); access to University Libraries; a personal e-mail; access to online scientific journals, and access to international and EU professional databases.

Suggested skills for this research topic

The ideal candidate should have a strong background in environmental sciences and/or statistics, with expertise in climate change risk assessment, data science, machine learning, or network science for analyzing hazard interactions. Experience with geospatial analysis (GIS, remote sensing, Earth Observations data) is highly desirable. Proficiency in Python, R, or MATLAB is essential, along with knowledge of machine learning (Neural networks, Bayesian Networks, ...), agent-based models, or Explainable AI (e.g., SHAP values). The candidate should possess strong analytical, interdisciplinary, and communication skills, with fluency in English.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Geophysical investigations of cryosphere as tool for assessing impacts of climate change

Reference Person: Guglielmin Mauro (mauro.guglielmin@uninsubria.it)

Host University/Institute: Università dell'Insubria / Scienze Teoriche ed Applicate

Research Keywords: Permafrost degradation
Ground ice
Permafrost ecosystems

Reference ERCs: PE10_18 Cryosphere, dynamics of snow and ice cover, sea ice, permafrosts and ice sheets
PE10_4 Terrestrial ecology, land cover change
PE10_13 Physical geography, geomorphology

Reference SDGs: GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

The research will be focused on the analyses of the impacts of the climate change on permafrost environments and the related ecosystems in polar areas and alpine mountains. In these areas permafrost is thawing almost everywhere, changing deeply the landscape and triggering surface instability that interacts with the evolution of the ecosystems. The research will focus on these complex and dynamic relationships and on the identification of the ground and massive ice in different polar and alpine areas to compare how different types and amount of ice can influence landscape changes and the terrestrial ecosystem changes. The research fits with the PNR 2021-27 within the general topic of Climate, Energy and Sustanaible Mobility and more in particular with the frame of 5.5.2 Climate Change, Mitigation and Adaption. In detail the research here proposed can contribute to several subtopics like 5.5.2.2 because it will contribute to monitoring and understanding of the relationships between Climate and Earth System. Moreover, the research can contribute also to the 5.5.2.4 because the analysis of the risks related to the permafrost degradation especially in the alpine environment or in the coastal polar environment can contribute to the improvement of the modelling of the future scenarios of impacts on the infrastructure and on the populations and economy at local scale.

Research team and environment

The research team is part of the Climate Change Research Center of Insubria University and works in polar and alpine areas. Here it will be possible work in a multidisciplinar team

including the CRyosphere Lab with researchers, post Doc and three Phd students experts of permafrost measurements and modelling, remote sensing, soils and geophysical investigations. This group interacts with the Botany and Climate Change Lab in which other experts of terrestrial ecology are working.The team is working in cooperation of many international Institutions.

Suggested skills for this research topic

The candidate should have basic knowledge on the climate change, on the climate change impacts on the cryosphere and on the ecosystems of periglacial environment. Basic knowledge on GIS and statistical analyses are also welcome. The candidates should be ready to work in a dynamic, international context with an important field work activity in polar environment.The candidates should have basic knowledge on geophysical investigation especially GPR, EM and ERT.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

Scholarship code

CU41.CU-Alpha.06

Curriculum: CU-Alpha: One health: Earth system and human life

The effect of climate-related combined stresses on food security and quality

Reference Person: Lucini Luigi (luigi.lucini@unicatt.it)

Host University/Institute: Università Cattolica del Sacro Cuore / Department for Sustainable Food Process (DISTAS)

Research Keywords: Food security

Food quality

Reference ERCs: LS9_8 Applied plant sciences, plant breeding, agroecology and soil biology

LS9_5 Food biotechnology and bioengineering

Reference SDGs: GOAL 2: Zero Hunger

Description of the research topic

Climate change imposes co-occurring stresses, the effects of which have been traditionally studied individually. However, stresses (different abiotic and/or biotic) are putting pressure on agriculture simultaneously. The project will investigate the effect of combined stresses in relevant crops, focusing on the plant holobiont and considering both food security and functional/technological quality aspects. To this aim, the project will use more traditional approaches together with multi-omics, to gain a comprehensive view of the multifaceted responses of plants to climate change.

Research team and environment

The project will be carried out within the department for sustainable Food process at Università Cattolica del Sacro Cuore. The team will include plant scientists, agricultural microbiologists, and food technologists to ensure a multidisciplinary approach to the topic proposed.

Suggested skills for this research topic

the ideal candidate should have a background related to agri-food chemistry or microbiology, rather than plant biochemistry

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Assessing the impact of global warming on endocrine disruptors using the zebrafish model

Reference Person: Marino Fabio (marinof@unime.it)

Host University/Institute: Università degli Studi di Messina / Dipartimento di Scienze Chimiche, Biologiche, Farmaceutiche ed Ambientale

Research Keywords: Zebrafish model in pathology

Endocrine disruptors

Pituitary disorders

Reference ERCs: LS9_10 Veterinary and applied animal sciences

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 13: Climate Action

Description of the research topic

Environmental pollutants that serve as endocrine disruptors may affect the hormonal system, leading to health consequences. These compounds can mimic, block, or modify the functions of hormones, which can result in reproductive disorders, immune dysfunction, or tumours pathogenesis. Endocrine disruptors can enter the body through air, water and food, and directly through the skin. Climate change can worsen this problem by increasing the release of environmental pollutants, stability, and distribution of pollutants which affects human and wildlife health. Increases in temperature can contribute to bioaccumulation and dispersion of these toxic compounds. Dioxin-like substances, such as polychlorinated biphenyls (PCBs) and some pesticides can bind to the aryl hydrocarbon receptor (AhR) and are known to interfere with normal hormone regulation. Chronic exposure to these toxic substances may lead to development of pituitary tumours by altering AhR pathways, interfering with hormones. and promoting abnormal and malignant growth of cells. It is necessary to understand these exposures in the context of human health. In this project, we will explore the impacts of increasing temperature to the toxicological impacts of pollutants, using the zebrafish model (Danio rerio), with the intent of developing innovative biomarkers used to detect and diagnose pathological changes leading also to pituitary neoplasms, associated with endocrine disruptors.

Research team and environment

The Research team of Veterinary and Comparative Pathology of UNIME runs the Institute for Comparative, Experimental, Forensic and Aquatic Pathology, a facility for experimental aquatic in vivo models kept in recirculating aquaculture systems (RAS), performing

histological, immunohistochemical and molecular analysis for diagnosis in aquaculture and translational research for human health

Suggested skills for this research topic

Knowledge regarding the legislation on aquatic animal model used in experimental research, specific training in vivo models for experimental research, knowledge on fish diseases and disorders.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Towards a better understanding of changes in extreme rainfall in Mediterranean area

Reference Person: Noto Leonardo (leonardo.noto@unipa.it)

Host University/Institute: Università di Palermo / Dipartimento di Ingegneria

Research Keywords: Extreme rainfall
Climate models
Climate change

Reference ERCs: PE10_3 Climatology and climate change
PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution
PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

The Mediterranean area is considered an "hot spot" of climate change. Several studies have confirmed that this region is warming at a higher rate than other parts of the world. However, while trends related to rising temperatures are quite well consolidated, the evidence regarding rainfall is more uncertain.

In specific areas of the Mediterranean, such as Sicily, a progressive reduction in total rainfall is being observed, accompanied by an increase in the frequency and intensity of extreme events.

In this context, the research project aims to contribute to the understanding of the signs of climate change in Sicily, with a specific focus on extreme rainfall. Different characteristics of extreme precipitation, such as frequency, magnitude and seasonality, will be analyzed using different statistical frameworks and different methodologies (e.g., using both linear and circular statistics), as well as different data sources (e.g., rain gauges data, radar maps and reanalysis-based datasets).

This preliminary phase will be useful for developing a methodology to examine future changes in extreme precipitation. By critically analyzing and correcting the results provided by various regional climate models and high-resolution models (i.e., Convection-Permitting

Models), the consistency, significance and robustness of the projections will be evaluated, thus providing a concrete contribution to climate risk management on a regional scale.

Research team and environment

The research activity will be held at the University of Palermo and will be coordinated by Prof. Leonardo V. Noto, full professor of hydrology. His expertise ranges from hydrological modeling, ecohydrology, to climate change aspects. The team is also composed of some researchers, post-doc, and Ph.D. students with great experience in the above-mentioned topics. Particularly, Dr. Dario Treppiedi, has a strong experience on extreme events analysis and modeling, cooperating with Prof. G. Villarini (Princeton Univ.). The candidate will thus find an enthusiastic team to carry on working on the modeling aspects of this technology.

Suggested skills for this research topic

The candidate will need to have some knowledge about statistics, climatology, and atmospheric physics. Other required skills regard the knowledge of the mostly known programming languages, such as R, Matlab and Python.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Study on detection and degradation of small microplastics and nanoplastics in aquatic environments

Reference Person: Passananti Monica (monica.passananti@unito.it)

Host University/Institute: Universita' degli Studi di Torino / Dipartimento di Chimica

Research Keywords: Nanoplastics
Photodegradation
Wastewater treatment

Reference ERCs: PE10_9 Biogeochemistry, biogeochemical cycles, environmental chemistry
PE4_15 Photochemistry
PE4_5 Analytical chemistry

Reference SDGs: GOAL 6: Clean Water and Sanitation, GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action

Description of the research topic

Nowadays we are surrounded by plastic materials, as more than 370 million tonnes of plastics were produced in 2023 and this amount is expected to grow every year. Small microplastics (MPs) and nanoplastics (NPs) have been found everywhere. The aim of this PhD project is to better understand the impact of small MP and NP pollution on freshwaters and wastewater, which will be obtained through the following objectives:

a) to evaluate the ability of MPs and NPs to release chemicals, that are present as additives or derived from degradation of the polymer skeleton, and assess the interaction between plastic particles and organic pollutants. This will help to evaluate the impact of MPs and NPs on freshwaters and elucidate their role in the transport of contaminants.

b) to understand the effect of MPs and NPs on wastewater treatments, and particularly the Advanced Oxidation Processes (AOP), to see whether plastic particles can compromise the removal of organic pollutants and contribute to the occurrence of toxic compounds in treated waters.

c) to sample and measure NPs and small MPs in freshwaters and wastewaters to assess their presence and concentration. A method to detect these particles will be developed and optimised, and its application will provide useful data on the concentration and type of MPs and NPs in natural samples and wastewaters.

The project will be carried out in the framework of the project NATtA - An investigation on the impact of nanoplastics on freshwater and wastewater treatments (MIUR Call FARE project CUP R20T85832Z).

Research team and environment

The project will be carried out at the Department of Chemistry of UNITO (which is one of the Department of Excellence 2023-2027 selected by MUR), in the Chemistry Energy and Environment (CEA) research group. CEA group has a long history in studying processes and mechanisms that define the chemistry of surface waters, and the mechanisms involved in the advanced oxidation processes (AOP). The Department of Chemistry and the CEA group have a wide range of instrumentation for simulating AOP and environmental-like conditions (reactors, lamps, etc...), and for the analysis of liquid and particle phase. The research environment is dynamic and stimulating, suitable for carrying out this PhD project.

Suggested skills for this research topic

The candidate should be fluent in English and have communication, organization, and interpersonal skills. Applicants should have a background in environmental chemistry and/or analytical chemistry. The candidate should have basic knowledge on photochemistry, kinetic competition methods and kinetic simulations, on advanced oxydation processes, polymers, radical chemistry and environmental degradation.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Numerical modeling of tornado winds in the Po Valley

Reference Person: Ricci Alessio (alessio.ricci@iusspavia.it)

Host University/Institute: Istituto Universitario Studi Superiori (IUSS) di Pavia / Classe di Scienze e Tecnologie

Research Keywords: Tornadic wind

Computational fluid dynamics (CFD)

Complex environment

Reference ERCs: PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics

PE8_4 Computational engineering

PE8_5 Fluid mechanics

Reference SDGs: GOAL 13: Climate Action

Description of the research topic

Extreme weather events such as tornadoes are increasingly documented in Italy. A recent study conducted by CNR-ISAC confirmed the existence of specific areas that are more frequently affected by this phenomenon. One of these areas is represented by the Po Valley. Tornadoes, along with downbursts, are highly localized atmospheric phenomena with an impact radius of only few hundreds of meters to a few tens of kilometers, and winds that are among the most violent ever recorded in nature. Winds of such intensity are devastating for both civil structures and strategic infrastructures. However, since these are very localized phenomena, meteorological models operating at the horizontal grid resolutions of few kilometers and coarse time scales are unable to capture events that occur over a very short spatiotempral scales. It is therefore essential to adopt numerical models with extremely high resolution capable of replicating their localized and unsteady nature at the scale of buildings. In a completely innovative approach, high-resolution computational fluid dynamics (CFD) and cloud model simulations will be used to reproduce tornadoes on both flat terrain and in more complex surroundings of Po Valley. These numerical simulations will aim to quantify the dynamical proceses of tornado genesis - through validation with real-world measurements and laboratory tests already present in the literature. Validated models will further be used to evaluate tornadic wind impact on structures.

Research team and environment

The PhD candidate will carry out the research study at IUSS of Pavia, in the CARISMA group, in close collaboration with the McGill University, Department of Atmospheric and Oceanic Sciences. The student co-supervised by Dr. A. Ricci from IUSS of Pavia, Italy, and Prof. D. Romanic from McGill University, Canada, will benefit from the extensive experience of the two groups in climatology, wind measurement and modeling; wind effects on infrastructures and environment; impact assessment of extreme natural events; risk management of natural and anthropogenic hazards.

Suggested skills for this research topic

The candidate should have knowledge of Computational Fluid Dynamics, mesoscale cloud models used in atmospheric sciences, atmospheric dynamics, data analysis and statistics. Programming skills in Matlab/Python/Fortran/C++ and knowledge of signal processing could also be beneficial. Team working attitude and excellent knowledge of spoken and written English are highly desirable.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Lifecourse approaches to investigate long-term effects of climate change-related environmental risks

Reference Person: Richiardi Lorenzo (lorenzo.richiardi@unito.it)

Host University/Institute: Università degli Studi di Torino / Dipartimento di Scienze Mediche

Research Keywords: Life-course epidemiology
Environmental epidemiology
Health trajectories

Reference ERCs: LS7_9 Public health and epidemiology
LS7_11 Environmental health, occupational medicine
LS7_12 Health care, including care for the ageing population

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 10: Reduced Inequality, GOAL 11: Sustainable Cities and Communities

Description of the research topic

While the acute effects of extreme climate conditions are well-documented, the long-term impacts of climate change remain understudied and underestimated. Climate-related exposures can affect health outcomes at different times, triggering biological responses that accumulate silently over the lifespan. These effects may take years to manifest, resulting in a greater-than-expected disease burden, early-onset multimorbidity before old age, and potential impacts on future generations. However, timely and appropriate interventions may help modify these effects, mitigating their long-term consequences.

This project, based on Italian birth cohort data, aims at adopting of a life-course epidemiology approach to

- estimate the health burden attributable to climate change through (i) identification of critical time windows of vulnerability during which exposures can influence the course of trajectories favouring the development of long-term outcomes; (2) characterisation of chains of risk associated with adverse environmental conditions, health damaging behaviours, illnesses, and their interactions across the lifespan.

- assess how uneven hazard distributions shape life-course trajectories in different communities in relation to their characteristics (rural/urban, climate zones, socio-economic index)

- assess the impact of supportive actions to alter unfavourable health trajectories, including early preventive interventions, mitigation strategies, modifiable contextual factors.

Research team and environment

The research team is composed of a multidisciplinary group of scientists working in environmental, life-course, molecular, and cancer epidemiology, including epidemiologists, biostatisticians, and molecular biologists. The team collaborates with a national network of birth cohort researchers and is a member of the Italian Network for Environmental Health. It has access to birth cohorts such as NINFEA (www.progettoninfea.it) and Piccolipiu (www.piccolipiu.it). The team is based at the Department of Medical Sciences, University of Turin, a large multidisciplinary department with research interests ranging from basic biological research to clinical applications, covering 16 medical disciplines.

Suggested skills for this research topic

Multidisciplinary attitude, basic knowledge in quantitative research (biostatistics, epidemiology, statistical software), interest in health inequalities, environmental determinants of human health and public health, teamwork, willingness to learn and acquire new skills

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Improving small-scale ocean predictions with probabilistic forecasting

Reference Person: Storto Andrea (andrea.storto@cnr.it)

Host University/Institute: Consiglio Nazionale delle Ricerche / ISMAR (Istituto di Scienze Marine)

Research Keywords: Ocean predictability
Deep learning
Probabilistic forecasting

Reference ERCs: PE10_8 Oceanography (physical, chemical, biological, geological)
PE10_21 Earth system modelling and interactions
PE6_12 Scientific computing, simulation and modelling tools

Reference SDGs: GOAL 7: Affordable and Clean Energy, GOAL 13: Climate Action, GOAL 14: Life Below Water

Description of the research topic

Ensemble forecasting is increasingly attracting the attention of the ocean forecasting community, as recent studies pointed out the ability of probabilistic systems to extend the forecast horizon of ocean meso- and submeso- scale processes. In this Ph.D. project, the grant recipient will develop state-of-the-art stochastic physics schemes for ocean general circulation models to enable probabilistic forecasting and assess their impact on the predictability of small-scale oceanic features in realistic case studies. The project will build upon stochastic schemes previously implemented for the NEMO general circulation model, complemented with new methods eventually based on deep learning to adaptively infer the ocean model's small-scale uncertainty and subgrid variability.

Research team and environment

The group on Ocean and Climate variability at CNR ISMAR, Rome, focusses on understanding the changes in the oceans over a broad range of scales, using mostly numerical tools such as general circulation models and reanalyses. It includes about 10 staff members (including reseracher, postdocs and students), and can benefit from local clusters plus agreements with HPC centers to run the simulations.

Suggested skills for this research topic

Background in geophysics, Earth Sciences, environmental modelling or applied mathematics is preferable, with experience in numerical codes.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

Scholarship code

CU41.CU-Alpha.13

Curriculum: CU-Alpha: One health: Earth system and human life

Earth observation in crises monitoring and civil protection

Reference Person: Taramelli Andrea (andrea.taramelli@iusspavia.it)

Host University/Institute: Istituto Universitario Studi Superiori (IUSS) di Pavia / Classe di Scienze Tecnologie e Società

Research Keywords: Earth observation

Crises management

Geospatial data governance

Reference ERCs: PE10_14 Physical geography

PE10_15 Earth observations from space/remote sensing

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 16: Peace and Justice Strong Institutions, GOAL 15: Life on Land

Description of the research topic

In an era of profound transformations and escalating global threats, Earth Observation (EO) plays a key role in monitoring sensitive areas of the planet and addressing emerging challenges. EO technologies not only support surveillance and civil protection efforts but also serve as essential tools for enhancing quality of life, aligning with the United Nations Sustainable Development Goals (SDGs) and the UN Global Geospatial Information Management Initiative (UN-GGIM). The integration of satellite technologies with in-situ survey systems, geomatic and geo-information tools (GGI), and Information and Communication Technologies (ICT) significantly strengthens the response capacity of infrastructures and institutions responsible for crisis management, mitigating the risk of escalation. This synergy fosters more effective coordination among key stakeholders and ensures timely access to accurate, up-to-date data – critical elements for emergency response and the protection of civilian populations. This PhD research aims to analyse the use of EO data in environmental monitoring and civil protection, with a particular focus on integrating satellite information from the Copernicus programme into emergency and disaster management policies. Special attention will be given to the contribution of EO technologies to sustainable development and adaptation strategies for emergencies, in line with EU and UN priorities. Moreover, the study will address the legal and economic dimensions of EO data and geospatial information management, with a particular emphasis on their role in the context of the National Recovery and Resilience Plan (NRRP). The ultimate objective is to develop an integrated framework that underscores the potential of EO technologies in tackling global challenges, contributing to the formulation of innovative public policies grounded in reliable scientific data.

Research team and environment

The research team consists of principal investigator, senior researchers, post docs and PhD students from distinct cultural and knowledge backgrounds (e.g., geography, geology, geomorphology, natural sciences, ecology, engineering, social and communication sciences). The team operates in a stimulating and collaborative research environment, where equity, diversity, and inclusion are essential principles. Indeed, the research environment is a young and dynamic environment that offers opportunities for integration, professional development and personal rewards.

Suggested skills for this research topic

Knowledge of Copernicus

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Alpha: One health: Earth system and human life

Computational modeling of atmospheric multiphase chemical processes

Reference Person: Tasinato Nicola (nicola.tasinato@sns.it)

Host University/Institute: Scuola Normale Superiore / Classe di Scienze

Research Keywords: Quantum chemical calculations

Atmospheric reactivity, kinetics and spectroscopy

Aerosol formation and chemistry

Reference ERCs: PE4_13 Theoretical and computational chemistry

PE4_18 Environment chemistry

PE4_12 Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 13: Climate Action

Description of the research topic

Aerosols profoundly influence human health, air quality and climate. However, their contribution to radiative forcing remains highly uncertain. Furthermore, atmospheric models relying on gas- and aqueous-phase chemistry cannot explain the high concentrations of particulate matter during haze events in densely populated regions, revealing gaps in the current understanding of the mechanisms driving aerosol formation and their influence on atmospheric chemistry. To this end, multiphase chemistry, whose investigation is quite complicated, needs to be considered. Experimental outcomes are difficult to interpret since they are tuned by matrix effects, and hence they are hardly portable into atmospheric models.

This research topic aims at deepening the understanding of multiphase chemical processes by exploiting computational quantum chemistry. The interaction of trace gases, particularly volatile organic compounds and polycyclic aromatic hydrocarbons, with solid substrates will be simulated, obtaining adsorption energies and desorption rates required for modeling gas uptake and gas-particle partitioning. The reactivity of adsorbed species will be investigated with the aim of elucidating reaction mechanisms and their chemical kinetics.

The outcomes of the research will provide insights into multiphase processes at the molecular level and will produce quantitative data for atmospheric models, thus improving the ability to predict atmospheric changes.

Research team and environment

The scientific activity of the STARK group at SNS aims at the development and application of theoretical-computational methodologies for structural and spectroscopic characterization and the study of chemical reactivity and kinetics of molecular systems. The group has access to the high-performance computing facilities of the Village Cluster, equipped 100+ servers, 3000+ CPUs and 300 TB of storage.

The team includes:

- Nicola Tasinato (Associate professor)

- Daniela Alvarado Jiménez (PhD)

- Muhamad Atif (PhD)

- Ayda Badri (PhD)

- Clelia Barboro (PhD)

- Pietro Maria Curzietti (PhD)

- Rossella Di Giovanni (PhD)

- Nadjib Rais (Post-doc)

- Zoi Salta (Researcher)

- Aafia Sehar (PhD)

Suggested skills for this research topic

Basic knowledge in thermodynamics, spectroscopy, chemical kinetics, and quantum chemistry.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Language and metaphors in underserved populations to promote environmental literacy

Reference Person: Bambini Valentina (valentina.bambini@iusspavia.it)

Host University/Institute: University School for Advanced Studies IUSS Pavia / Department of Humanities and Life Sciences

Research Keywords: Communication
Language
Mental health

Reference ERCs: SH4_11 Pragmatics, sociolinguistics, linguistic anthropology, discourse analysis

Reference SDGs: GOAL 3: Good Health and Well-being

Description of the research topic

Language and figurative expressions were showed to be a key element for communicating climate change and shaping sustainable societies, yet large inequalities remain in terms of climate change education and awareness. Vulnerable groups include people with medical conditions such as poor mental health, who might experience linguistic and societal barriers and whose health can be worsened by climate change impact. The project will aim at identified linguistic strategies for feasible and effective intervention programs to promote climate change education and awareness in underserved populations, with specific reference to people with mental illnesses. Particular attention will be paid to metaphors, focusing on how they can be used to increase knowledge about the health impacts of climate change and to prepare and help cope with climate hazards, while targeting at the same time the challenge of metaphorical comprehension in mental illness.

The position is funded by the ERC project "PROcessing MEtaphors: Neurochronometry, Acquisition and DEcay" (PROMENADE), CUP: I17G22000450006.

Research team and environment

The Laboratory of Neurolinguistics and Experimental Pragmatics at IUSS (https://www.neplab.it/) is devoted to the study of the neurocognitive correlates of language processing in typical and atypical conditions and across the lifespan, with a focus on pragmatics and metaphor. The team includes the PI Valentina Bambini, researchers and postdoctoral fellows, as well as PhD students, in an interdisciplinary and lively research

environment. The Lab is fully equipped for behavioral and EEG experiments and has numerous connections with clinical facilities.

Suggested skills for this research topic

As-native knowledge of Italian is required. Experience in linguistics and pragmatics, psycho/neurolinguistics, and training in with mental rehabilitation are a plus.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Use of Satellite Data for Territorial Sustainability Analysis

Reference Person: Bergantino Angela Stefania (angelastefania.bergantino@uniba.it)

Host University/Institute: Università degli Studi di Bari Aldo Moro / Dipartimento di Economia, Management e Diritto dell'Impresa

Research Keywords: Environmental economics

Satellite data

Infrastructures, firms, Policies for sustainable territories

Reference ERCs: SH7_6 Environmental and climate change, societal impact and policy

SH7_7 Cities; urban, regional and rural studies

SH7_10 GIS, spatial analysis; big data in geographical studies
SH1_12 Environmental economics; resource and energy economics; agricultural economics

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure; GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

The proposed research project explores the use of advanced satellite data to analyze territorial sustainability, focusing in particular on the monitoring of network and nodal infrastructures and their environmental and socio-economic impact (i.e. roads, airports, energy plants, production plants, ecc.). The main objective is to develop innovative and integrative methodologies that use Earth observation (EO) technologies to provide solutions and guidelines to land management problems. The project will therefore contribute to the valorisation of investments in the space sector with particular reference to the field of remote sensing applied to territorial development policies and to a more effective and sustainable management of natural resources and infrastructures. The ultimate objective of the project is to be able to develop a replicable model that can be adopted in Italy and other EU regions and contexts for similar studies of territorial sustainability and yield policy insights and raccomandations. The candidate will be encouraged to adopt a multi-disciplinary approach and use a wide range of empirical techniques (discrete choice models, spatial econometrics, big data and machine learning techniques, agent-based on experimental methods).

Research team and environment

The research activity will be mainly carried out at the Laboratory of Applied Economics and the GRINS Multisciplinary Territorial Policy Lab and Mobility Research Center at the University of Bari.

Suggested skills for this research topic

Candidates should preferably have an academic background in economics and data analysis and, possibly, knowledge of econometrics. They should have good skills in data modelling, analytical capabilities, the ability to handle and analyze large datasets, also through Machine Learning Techniques and perform quantitative research within social sciences. Good knowledge of Stata, R and Python and of other econometric/programming software is particularly appreciated. Ability and willingness to work in collaborative, multi-disciplinary environment and experience of both quantitative and qualitative research works are value added. Fluency in both spoken and written English is required and working knowledge of Italian is recommended given the potential need for field work.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Green transition and gender mainstreaming

Reference Person: Biavaschi Paola (paola.biavaschi@uninsubria.it)

Host University/Institute: Università degli Studi dell'Insubria / Dip.to di Scienze Umane e dell'Innovazione per il Territorio (DISUIT)

Research Keywords: Green transition

Climate change

Gender equality

Reference ERCs: SH3_7 Kinship; diversity and identities, gender, interethnic relations

SH7_6 Environmental and climate change, societal impact and policy

SH2_4 Legal studies, constitutions, human rights, comparative law

Reference SDGs: GOAL 5: Gender Equality, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

According to the Strategy for Gender Equality 2020-2025, gender mainstreaming should be the watchword. Environmental sustainability and gender equality represent essential objectives to achieve the major task of shifting the global economy to more sustainable models. With the ecological transition ongoing, a claim arose for a transition that could be "just", by preventing possible negative effects of this transformation from impacting on vulnerable groups of society, including women. However, the measures adopted to mitigate social consequences of the ecological transition are likely to exacerbate gender discriminations and inequalities among workers, if they are not linked to comprehensive strategies aimed at reducing structural inequalities, addressing the problem of unequal distribution of informal care work, reducing segregation and pushing employment in women dominated sectors. Although a common thought is that there can never be climate justice as long as there is no equality between men and women, there is need for more, in-depth research exploring the interconnection between these different dimensions, especially in a comparative law perspective. The present research topic is related to addressing the lack of a clear framing of the problem in the scientific arena: in fact, since interpretations of green transition processes are mostly based on traditional notions of progress, development, work, and gender, they may be less effective in promoting social transformation.

Research team and environment

The research team is composed of six PhD candidates and three post-doc fellows, all supervised by the Reference person. Several of the candidates and fellows have been enaged in gender equality research for a long time. Therefore, the new PhD candidate will have a chance to pursue research, surrounded by colleagues who will be sharing their skills and experience, enabling the candidate to effectively achieve her/his goals.

Suggested skills for this research topic

The candidate will need a comprehensive set of skills: particularly, she/he will have to possess the ability to analyse the current, state-of-the-art debate regarding gender equality, by examining the most up-to-date available scientific literature. Most of all, the candidate will have to be able to incorporate the gender issue within themes pertaining to the green transition and climate change; this will be accomplished through the ability, possessed by the candidate, to conduct human and social studies, alongside environment-related studies. Finally, she/he will need to be skilled in combining these different research approaches and blend them with a comparative law perspective.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Regulatory dimension of the public policies oriented to decarbonization and climate neutrality

Reference Person: Chiti Edoardo (edoardo.chiti@santannapisa.it)

Host University/Institute: Scuola Superiore Sant'Anna - Pisa / Centro Interdisciplinare Sostenibilità e Clima

Research Keywords: Environmental Law

Climate law

Ecological law

Reference ERCs: SH2_4 Legal studies, constitutions, human rights, comparative law

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action

Description of the research topic

We welcome projects addressing the legal and regulatory dimension of the public policies oriented to decarbonization and climate neutrality, in Europe or elsewhere. In particular, we encourage submissions concerning (i) the scientific analysis and assessment of some key policies and legislations, including the European Climate Law adopted in the context of the Green Deal; (ii) the scientific bases and real achievements of the processes through which such legislations are implemented at the administrative law, including the implementing arrangements relying on planning; (iii) the economic impact of the various climate change legislations. Submissions are expected to rely on genuine trans-disciplinarity and to combine strong theoretical foundations with an applied social sciences approach.

Research team and environment

The research will be mainly carried out at the Sant'Anna School of Advanced Studies (Pisa – Italy). In this context, the research will be developed within the "Institute of Law, Politics and Development", together with the "Interdisciplinary Center Sustainability and Climate".

Suggested skills for this research topic

Openness towards interdisciplinary approaches, as well as a solid competence in humanities and social sciences areas, with specific reference to all domains of law, philosophy and environmental studies, will be specifically appreciated.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Ethics of Emergency and Environmental Humanities

Reference Person: Pirni Alberto (alberto.pirni@santannapisa.it)

Host University/Institute: Scuola Superiore Sant'Anna - Pisa / Centro Interdisciplinare Sostenibilità e Clima

Research Keywords: Ethics of Climate Change
Ethics of Emergency
Environmental Humanities

Reference ERCs: SH5_10 Ethics and its applications; social philosophy
SH5_8 Cultural studies, cultural identities and memories, cultural heritage
SH7_6 Environmental and climate change, societal impact and policy

Reference SDGs: GOAL 4: Good Quality Education, GOAL 13: Climate Action, GOAL 17: Partnerships to Achieve the Goal

Description of the research topic

The research revolves around the interplay between the ethics of emergency and environmental humanities. Due to the worldwide rising of environmental emergencies coming from the series of phenomena we are used to group under the label of climate change, beyond the technical equipment and structures, it is even more urgent contributing to the strengthening of the not just technical, rather ethical and social competence of the people in charge to directly/indirectly address those emergencies.

From this point of view, the research focusses on the development of a perspective of emergency ethics, with particular reference to the implementation of decision-making processes enhanced by a solid ethical normative framework (deontological ethics, consequentialist ethics and virtue ethics), together with an innovative perspective of "moral dilemmas" related to the management/protection/use of the resource. A part of exclusive relevance is constituted by the contribution that can come from the so-called “environmental humanities”, thus trying to broaden and deepen competences and sensitivity, and empathic capacity in the planning - also at policy level - and management in the field of the climate emergency.

We encourage ambitious submissions relying on genuine transdisciplinarity and on a plurality of disciplinary approaches, including ethical theories, law sectors, political science, and environmental economics.

Research team and environment

The research will be mainly carried out at the Sant'Anna School of Advanced Studies (Pisa – Italy). In this context, the research will be developed within the "Institute of Law, Politics and Development", together with the "Interdisciplinary Center Sustainability and Climate".

Suggested skills for this research topic

Openness towards interdisciplinary approaches, as well as a solid competence in humanities and social sciences areas, with specific reference to all domains of philosophy and law, will be specifically appreciated.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Climate Change & transportation: a critical and complex interrelationship

Reference Person: Maggi Elena (elena.maggi@uninsubria.it)

Host University/Institute: Università degli Studi dell'Insubria / Economia (DiECO)

Research Keywords: Climate Change impact
Transport infrastructure
Policies for sustainable transport

Reference ERCs: SH7_9 Energy, transportation and mobility
SH7_6 Environmental and climate change, societal impact and policy
SH1_12 Environmental economics; resource and energy economics; agricultural economics

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

Transport is responsible for about one third of global GHG emissions and, while the emissions by other industries decreased in the last two decades, those by transport means, especially road and aviation, increased. We are still far from achieving the objective of rebalancing the modal share. The external costs from transportation negatively impact both at global and local level, affecting the health and well-being of individuals and the community quality of life in urban and rural areas. At the same time, the ever more frequent extreme weather events (heavy precipitation, wildfires, floods, etc.) increasingly affect transport infrastructures, services, and travel behavior, impacting both passenger and freight transportation/logistics and several supply chains. Climate change is expected to reinforce this trend, as the frequency and intensity of extreme events increases. Several territories, especially the most remote ones, are becoming more and more fragile and risk to be less accessible, a cause of low resilient transport systems. The economic and social consequences, in terms of loss of competitiveness and social exclusion, are evident. The interrelationship between climate change and transportation is very complex and needs to be analyzed by an interdisciplinary approach and using different methodologies, to identify the most adequate transport policies and appropriate mitigation and adaptation strategies, considering the environmental, social and economic sustainability.

Research team and environment

The PhD student will be involved in research by Insubria Experimental Economics Centre (InExEc) and the University of Insubria' Department of Economics, that has been promoted by the University and Research Ministry as Department of Excellence 2023-2027. A Ph.D. programme in Methods and Models for Economic Decisions (MMED) is active, where Elena Maggi is a lecturer and member of the board. The PhD student will have the chance to take part in the research area "Transport, regulation and sustainable development". This research area is coordinated by Elena Maggi and collaborates with several national and international universities specialized on Transport Economics, Sustainability and Policy.

Suggested skills for this research topic

The PhD student should have good skills in data analysis and modelling. A background in economic studies and a good knowledge of Stata or other econometric software are particularly appreciated. Good quantitative skills and transport and sustainability knowledge are valuable assets. Fluency in English, both written and spoken, and, possibly, a good knowledge of Italian (to perform interviews to Italian companies) is required. Ability and willingness to work in collaborative, multi-disciplinary environment and experience of both quantitative and qualitative research works are also very appreciated skills.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Ethics and Regulation of Climate Change: Analysis and Proposal of Adaptation and Mitigation Models

Reference Person: Pirni Alberto (alberto.pirni@santannapisa.it)

Host University/Institute: Scuola Superiore Sant'Anna / Centro Interdisciplinare Sostenibilità e Clima

Research Keywords: Ethics of Climate Change

Regulatory Frameworks of Climate Change

Adaptation and Mitigation: Policy and Regulation

Reference ERCs: SH5_10 Ethics and its applications; social philosophy

SH2_4 Legal studies, constitutions, human rights, comparative law

SH7_6 Environmental and climate change, societal impact and policy

Reference SDGs: GOAL 10: Reduced Inequality, GOAL 13: Climate Action, GOAL 17: Partnerships to Achieve the Goal

Description of the research topic

The research aims to address the ethical and legal dimensions of climate change governance at the international, regional and national levels. The main goal of the research is twofold. From a methodological point of view, the research requires a constitutive interplay between the ethics of climate change and the legal and regulatory frameworks related to this specific domain. From a thematic point of view, it is necessary to pay special attention to the following key issues: i) as regards the ethics of climate change: reference to framework values, theories of individual/institutional motivation, theories of direct/indirect reciprocity, as well as theories of intergenerational justice; ii) as regards the legal domain of climate change: reference to relevant international agreements, such as the UNFCCC and the Paris Agreement; as well as the emergence of new subjects of law (the rights of future generations and the rights of nature both in legislative and jurisprudential developments, with attention to Global South experiences). A specific reference to the documents and decisions emanating from the Conference of the Parties (COP), as well as to the regulatory frameworks regarding adaptation and mitigation measures at the national, macro-regional and international levels will be particularly appreciated.

We encourage ambitious submissions relying on genuine transdisciplinarity, including ethical theories, law sectors, political science, and environmental economics.

Research team and environment

The research will be mainly carried out at the Sant'Anna School of Advanced Studies (Pisa – Italy). In this context, the research will be developed within the "Institute of Law, Politics and Development", together with the "Interdisciplinary Center Sustainability and Climate".

Due to the specificity of the project, the research path includes a constitutive interplay and secondment at the "CMCC – Centro Euro-Mediterraneo sui Cambiamenti Climatici", an Italian leading research center focused on understanding the interaction between climate change and society.

Suggested skills for this research topic

Openness towards interdisciplinary approaches, as well as a solid competence in humanities and social sciences areas, with specific reference to all domains of philosophy and law, will be specifically appreciated.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

Scholarship code

CU41.CU-Beta.08

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Strategies for the environmental improvement of textile products in the Lombardy region

Reference Person: Iraldo Alberto (fabio.iraldo@santannapisa.it)

Host University/Institute: Scuola Superiore Sant'Anna / Centro Interdisciplinare Sostenibilità e Clima

Research Keywords: Circular Economy

Eco Design

Life Cycle Approach

Reference ERCs: SH1_10 Management; strategy; organisational behaviour

SH1_12 Environmental economics; resource and energy economics; agricultural economics

Reference SDGs: GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action, GOAL 17: Partnerships to Achieve the Goal

Description of the research topic

The in-depth study aims to identify the strengths and elements of further possible strengthening of the current textile products of the Lombardy region in terms of environmental and sustainability aspects considered priorities for the sector, in order to define possible competitive enhancement strategies and, at the same time, possible improvement actions for these products through EcoDesign actions, to achieve even higher environmental performance. 1. Define a framework of the situation on existing tools for Lombardy textile ecosystems and systematization of available studies; 2. Collection and analysis of existing LCA/PEF studies and other literature inputs, datasets, etc. relating to representative products of the Lombardy textile production context; 3. Design and setup of the dataset structure, specific for the supply chain and for the Lombardy region, which once completed can flow into the Italian LCA Database (e.g.: Arcadia II and Amelia PNRR); 4. Development of Guidelines relating to EcoDesign choices and methods of communicating environmental performance (claims) relating to the representative Lombardy textile products identified.

Research team and environment

The team will include experts and specialists from different disciplines and research areas, coordinated by Prof. Fabio Iraldo

Suggested skills for this research topic

Research skills related to sustainability and environmental management

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Health and Climate Change: Reducing Inequalities and Achieving Sustainable Development

Reference Person: Sannella Alessandra (alessandra.sannella@unicas.it)

Host University/Institute: University of Cassino and Southern Lazio / Department of Human, Social and Health Sciences (DSUSS)

Research Keywords: Health and Social Transition
Health and Climate Change
Health and Inequality

Reference ERCs: SH3_1 Social structure, social mobility, social innovation
LS7_9 Public health and epidemiology
SH3_14 Social studies of science and technology

Reference SDGs: GOAL 1: No Poverty, GOAL 3: Good Health and Well-being, GOAL 10: Reduced Inequality

Description of the research topic

The main objective of research is to study and analyze the impact of accelerated climate change on population health. Proposals are encouraged to adopt a One Health approach as their research focus and to characterize their studies with a transdisciplinary framework. Integrating diverse scientific perspectives will be crucial for innovative research that employs a mixed-methods methodological approach. Identifying potential correlations between the effects of climate change acceleration and health outcomes—such as neurodegenerative, cardiovascular, and mental health diseases—will be valuable. It will be important to pinpoint specific intervention areas, including the redefinition of citizens' quality of life through eco-sustainable projects, the assessment of initiatives undertaken at the institutional level for the health of communities, the analysis of social perceptions and behaviours, and the examination of human mobility patterns. Additionally, incorporating tools from the Fourth Industrial Revolution, such as Artificial Intelligence and robotics, can facilitate the development of socio-health innovations to reduce inequalities and promote social justice and health, particularly for populations at greater risk of vulnerability. The research may propose sustainable health tools aligned with One Health principles through innovative policy development.

Research team and environment

The research environment is fundamentally supported by a culture of inclusion and collaboration within the research group, guided by a "circle" management approach. The team emphasizes peer-to-peer research efforts, and all identified practices will benefit applicants. Candidates will have the opportunity to participate in the International Observatory for Sustainable Development and Global Health 2030 (IOHS 2030). Additionally, the doctoral candidate will be entered into international academic research.

Suggested skills for this research topic

the candidate must have mastery of research tools with a transdisciplinary one health approach. They will be encouraged when they have skills of adaptation to study in an international environment. Familiarity with health sociology is useful.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Abandonment of remote rural areas: trade-offs for biodiversity, ecosystem services, and land use

Reference Person: Spano Donatella (spano@uniss.it)

Host University/Institute: Università di Sassari / Dipartimento di Agraria

Research Keywords: Resilience of agro-ecosystems
Land management
Climate change

Reference ERCs: LS9_8 Applied plant sciences, plant breeding, agroecology and soil biology

Reference SDGs: GOAL 2: Zero Hunger, GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action

Description of the research topic

Remote rural areas across Europe are increasingly facing abandonment and marginalization due to demographic shifts, socio-economic changes, and declining agricultural viability. Moreover, climate change is threatening agricultural production and ecosystem functions of rural areas. For these reasons, there is a need to investigate the complex socio-ecological dynamics underlying these processes and to assess their impact on biodiversity, ecosystem services, and land management. Different bio-climatic areas can have different responses to these threats and dynamics, allowing for a comparative evaluation of how abandonment and marginalization unfold in various rural settings. Special attention will be given to the role of traditional land-use practices, the resilience of agro-ecosystems, and the governance frameworks that influence land use decisions. By combining spatial analysis, field assessments, and stakeholder engagement, the trade-offs associated with land abandonment, such as potential biodiversity gains from rewilding versus the loss of cultural landscapes and traditional knowledge will be analyzed. Land management strategies will be considered to balance conservation goals with the needs and rights of rural communities. The outcomes will support policymakers and land managers in designing targeted interventions to mitigate negative effects while promoting adaptive strategies for biodiversity conservation and the sustainable provision of ecosystem services.

Research team and environment

Il Dipartimento di Agraria possiede (i) laboratori di campo per sperimentazioni di carattere agronomico; (ii) laboratori di ricerca per l'analisi di suoli, alimenti, foraggi, effluenti di

allevamento, acqua e aria; (iii) laboratorio di agrometeorologia ed ecofisiologia, specializzato in tecniche micrometeorologiche di monitoraggio.

Il dottorando potrà avvalersi del network di collaborazioni coi centri interdipartimentali "Innovative Agriculture" (su agricoltura di precisione) e "Nucleo di Ricerca sulla Desertificazione" (NRD), e con la Fondazione Centro Euro-Mediterraneo sui Cambiamenti (CMCC), ampliando l'opportunità di lavorare in un ambiente internazionale e multidisciplinare.

Suggested skills for this research topic

The candidate will need strong interdisciplinary research skills, combining ecological and socio-economic analysis to assess trade-offs linked to rural abandonment. Proficiency in GIS and remote sensing is essential for spatial analysis of land use changes, along with statistical skills for integrating environmental and social data. Knowledge of biodiversity and ecosystem service frameworks, experience with stakeholder engagement, and qualitative research methods are also important. Strong communication and writing abilities are required to present findings effectively to both academic and policy audiences.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Beta: Human society: socio-economic impacts, institutions, and theories

Understanding sustainable development between institutional arrangements and market regulation

Reference Person: Velliscig Lydia (lydia.velliscig@iusspavia.it)

Host University/Institute: Scuola Universitaria Superiore IUSS Pavia / Classe di Scienze, Tecnologie e Società

Research Keywords: Comparative law

Economic Analysis of Law

Risk Management and Financing Law and Policy

Reference ERCs: SH2_4 Legal studies, constitutions, human rights, comparative law

SH2_5 International relations, global and transnational governance

SH2_1 Political systems, governance

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action, GOAL 16: Peace and Justice Strong Institutions

Description of the research topic

Mitigating climate change and supporting sustainable development represent a shared commitment and a top priority. In this context, developing initiatives aimed at identifying effective public-private partnerships to create innovative forms of protection against climate change-related risks is crucial for financing sustainable development. Strengthening the legal, regulatory, and institutional environment is an effective way for public institutions to mobilize resources and encourage capital market development. More generally, cooperation between the public and private sectors facilitates a better alignment of private incentives with public goals and helps create a policy framework that fosters market development in these areas. The candidate will critically examine, from the perspective of comparative law and economics, the legal and institutional responses implemented in different legal systems to manage and govern climate change-related risks, which must be addressed in light of sustainable development. Particular attention will be given to the regulation of risks, liability and incentive mechanisms, and the identification of risk financing strategies based on insurance, reinsurance, and other financial tools, including capital market instruments, with the aim of identifying critical issues and potential areas for improvement.

Research team and environment

Research activities at IUSS adopt a highly innovative and multidisciplinary approach, and candidates will have the opportunity to engage in a stimulating academic environment. Specifically, the Legal Science Research Group at IUSS focuses on key legal, economic, institutional, and policy aspects related to the management of large-scale and emerging risks at both the national and international levels. From the perspective of comparative law and economics, the Legal Science Research Group examines the legal and institutional mechanisms designed to enhance the physical and financial resilience of both the economy and society in response to extreme events.

Suggested skills for this research topic

Legal background (Law Degree), preferably a good background in comparative law; openness to transdisciplinary research; intellectual curiosity; team-working skills.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Multilevel and multifactorial Evaluation of LEvee performance for climate change adaptation (MELE)

Reference Person: Ceccato Francesca (francesca.ceccato.1@unipd.it)

Host University/Institute: Università degli studi di Padova / Dipartimento di Ingegneria Civile, Edile e Ambientale

Research Keywords: Levee Performance Assessment
Flood Risk Management
Soil-Water-Vegetation Interaction

Reference ERCs: PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics
PE10_20 Geohazards
PE10_4 Terrestrial ecology, land cover change

Reference SDGs: GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

River levees play a crucial role in flood protection, but their vulnerability to failure is often underestimated or not fully accounted for. There is a clear need for improved methodologies that can provide a more comprehensive evaluation of levee performance and vulnerability to different failure mechanisms at various scales, from individual critical sections to the entire river basin. This would support more targeted and cost-effective risk reduction interventions and levee management strategies in the context of climate change adaptation.

The main research topic of this project is the multi-level and multi-factorial evaluation of river levee performance for climate change adaptation. Specifically, the project aims to develop an innovative procedure to assess the vulnerability and performance of river levees against different failure mechanisms, taking into account factors that are often overlooked in current practices.

The research will combine advanced numerical modeling, enhancement of geophysical/geotechnical survey procedures, remote sensing data, and a multi-criteria decision approach within a GIS framework.

The overall goal is to provide operational tools and guidelines for more effective levee risk assessment and management, improving flood resilience under climate change scenarios.

Research team and environment

The research team comprises a multidisciplinary group including:

Prof. Francesca Ceccato (Geotechnical Engineering)

Prof. Giorgio Cassiani (Geophysics)

Prof. Simonetta Cola (Geotechnical Engineering)

Dr. Giorgia Dalla Santa (Geotechnical Engineering)

Dr. Luca Peruzzo (Geophysics)

Dr. Lorenzo Picco (Hydraulic Engineering and River Morphology)

Dr. Mattia Pivato (Hydraulic Engineering)

The project will also involve close collaboration with relevant stakeholders, including river basin authorities, regional governments, and civil protection agencies, ensuring the research outcomes are aligned with practical needs and can effectively contribute to improved flood risk management strategies.

Suggested skills for this research topic

Candidates with a background in civil/environmental engineering, geology, or related fields, and a keen interest in tackling complex problems at the intersection of geotechnics, hydraulics, and climate change adaptation, would be well-suited for this project. The ideal candidate for this research project should possess:

- a strong background in soil mechanics,
- experience in interpreting geophysical and geotechnical investigation data for characterizing soil properties and heterogeneities,
- Knowledge of remote sensing techniques and GIS tools for spatial data analysis and mapping.
- The knowledge of Italian (at least level B1)

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Optimization of beef production systems facing climate change

Reference Person: Atzori Alberto Stanislao (asatzori@uniss.it)

Host University/Institute: Università di Sassari / DIpartimento di Agraria

Research Keywords: Beef finishing, nutriton and growth

Nitrogen and methane reduction

Economic gains

Reference ERCs: LS9_10 Veterinary and applied animal sciences

SH1_12 Environmental economics; resource and energy economics; agricultural economics

Reference SDGs: GOAL 12: Responsible Consumption and Production, GOAL 13: Climate Action, GOAL 17: Partnerships to Achieve the Goal

Description of the research topic

The research will focus non the optimization of beef production system among Sardinia and Veneto to improve efficiency of beef production chain at Italian level. The beef production chain have large margin of improvement in: improving cow calf system in Sardinia; improving the finishgin phase both in Sardinia and Veneto feedlots; improve the meat quality with animals and carcass evaluations. The project aim to find the most important practice to raise specialized breeds and crosses with local breeds that could improve the production system in technical economical and enviromental terms, especially mitigation of emissions and adaptation to climate change. The activity will include experimental trials and modelling of animal performance to define new farm protocols targeting efficiency.

Research team and environment

THe research team is composed by an associate professor, other 4 PhDstudents, 2 postdoc and 5 fellow researchers. The facilities include nutrition lab and experimental farm.

Suggested skills for this research topic

Experimental trials experience, work in farm, modelling, lab analysis

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Digital and Remote Neuropsychology Assessment for Sustainable and Equitable Healthcare Practices

Reference Person: Cerami Chiara (chiara.cerami@iusspavia.it)

Host University/Institute: Scuola Universitaria Superiore IUSS di Pavia / IUSS Cognitive Neuroscience (ICoN) Center

Research Keywords: Teleneuropsychology
Neurodegenerative disorders
Environmental sustainability

Reference ERCs: SH4_4 Neuropsychology
LS5_10 Ageing of the nervous system
LS5_11 Neurological and neurodegenerative disorders

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 10: Reduced Inequality, GOAL 11: Sustainable Cities and Communities

Description of the research topic

The increasing prevalence of cognitive disorders poses a major challenge to global healthcare systems. At the same time, climate change, resource scarcity, and social vulnerability call for a profound transformation of how health services are conceived and delivered. Remote assessment of cognitive performances with the support of a digital tool has been proposed as a possible more sustainable solution to reach a larger number of individuals, reducing inequalities for marginalized people (e.g., frail elderly, people living in remote areas) and impact on the environment (e.g., dematerialization of assessment forms and reports). In view of a more sustainable development of healthcare and social systems, the project will focus on exploring how digital and remote neuropsychology can promote equitable models of access to neuropsychological care in at risk and vulnerable neurological populations, especially in individuals living in areas affected by environmental instability or with limited access to traditional services. By comparing traditional and remote approaches, there will be explored the environmental footprint and resource efficiency of different clinical workflows. By integrating neuroscience, technology, and sustainability, the final aim is to detect more resilient and climate-conscious medical practices in clinical neuropsychology.

Research team and environment

The Project will take place at the Brain eHealth in Aging (BeA) IUSS-Maugeri Laboratory, which is devoted to the development and validation of predictive, diagnostic and prognostic digital cognitive markers in elderly populations. It will rely on clinical facilities of Neurology Unit of IRCCS Maugeri Milano Camaldoli. The team includes the PI Chiara Cerami, clinical researchers and postdoctoral fellows, as well as PhD students, in a multidisciplinary environment. The Lab is equipped with different solutions for digital/remote assessment of cognitive functioning and has strong expertise on neurodegenerative disorders.

Suggested skills for this research topic

As-native knowledge of Italian is required. Experience with clinical neuropsychology and neurological populations is recommended. Training in telemedicine is a plus.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Analysis of cost and effectiveness of flood risk management measures in Italy and Europe

Reference Person: Dottori Francesco (francesco.dottori@iusspavia.it)

Host University/Institute: Scuola Universitaria Superiore IUSS Pavia / Classe di Scienze Tecnologie e Società

Research Keywords: Flood risk

Risk-based design

Flood management measures

Reference ERCs: PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution

SH7_6 Environmental and climate change, societal impact and policy

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

In the last years, several European countries have been hit by disastrous flood events. In many cases, existing flood defence infrastructures could not prevent devastating flood impacts, as occurred in Italy in 2023-2024 and in Spain in 2024. The aim of the research project is to investigate the capacity of existing and in-project flood protection and risk management measures to effectively reduce flood risk in Italy and in Europe, in light of the changes in frequency and intensity of extreme floods foreseen by scientific literature.

To reach this objective, the project will make use of the flood hazard and risk maps produced by the member states of the European Union, which are updated every six years according the EU Floods Directive 2007/60. The integration of these maps with climatic, hydrological and hydraulic simulations will allow to identify present and future trends of flood risk in the areas of interest. Moreover, the project will leverage existing databases that describe costs and technical details of risk reduction measures, including both structural flood protections (e.g. river dykes, detention areas) and non-structural measures (e.g. early warning systems, flood insurance programs).

The joint analysis of these datasets will enable the comparison of the investments in risk reduction measures with the resulting economic, social and environmental and benefits.

The outcomes of the project will be used to propose improvements to current approaches applied in the design of flood risk reduction measures.

Research team and environment

The research activity will be carried out at the CARISMA Research Centre, at the University School for Advanced Studies (IUSS) in Pavia, Italy. CARISMA comprises 36 members among professors, researchers and PhD students, coming from different continents and with disciplinary profiles ranging from climate science to engineering and economics. Ongoing research activities focus on climate models and datasets in risk analysis and management, and multi-hazard risk assessment methodologies in support of sustainable development. The Centre has access to the High Performance Computing Data Centre of IUSS for data analysis and numerical simulations.

Suggested skills for this research topic

The ideal candidate should have an engineering background with competences in hydraulics and hydrology. Knowledge of languages other than English is not compulsory.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Urban Resilience to Climate Change: adaptation and community engagement strategies

Reference Person: Grossi Giovanna (giovanna.grossi@unibs.it)

Host University/Institute: Università degli studi di Brescia / DICATAM

Research Keywords: Urban Resilience

Adaptation strategy

Participatory reserach

Reference ERCs: PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution

SH7_6 Environmental and climate change, societal impact and policy

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

Urban areas are more vulnerable to climate change than rural areas. Namely, the unnatural built environment is enhancing the impact of a changed meteorological forcing, especially as far as stormwater management and water supply systems are concerned. On the other hand the population of cities is globally expected to increase, as is the soil consumption. Ecosystem services provided by urban soils have an unvaluable role in adaptation practices and need to be protected by raising awareness in citizens and engaging them in monitoring the urban environment. Nevertheless best practices shared at the international level need to be discussed also with Public Authorities and Enterprises, besides Universities and Citizens (the quadruple helix model of innovation).

This research project is addressing how cities can cope with climate change, by mitigating the effects on the water issues in the short term and by improving their capacity to effectively respond on the mid- term.

Research activities are expected to be framed in an interdisciplinary setting, including urban hydraulics, urban planning and community-based participatory approach. Early warning systems and their potential implementation will be considered with reference to at least 2 case studies featuring different socio-economic context. Adaptation strategies based on these tools will be co-developed by the communities of practices set up for each case study to support an efficient sustainable management of urban areas.

Research team and environment

The PhD candidate will be supervised by Giovanna Grossi and supported by colleagues in the same department

Suggested skills for this research topic

Knowledge of GIS, hydrology and hydraulic models, interest and some experience in community-based participatory research

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Decarbonisation of urban systems

Reference Person: Lombardi Patrizia (patrizia.lombardi@polito.it)

Host University/Institute: Politecnico di Torino / Dipartimento Interateneo di Scienze, Progetto e Politiche del Territorio (DIST)

Research Keywords: Decarbonization, mitigation and adaptation

Urban systems planning and regeneration

Digitalization and evaluation KPI

Reference ERCs: SH7_6 Environmental and climate change, societal impact and policy

PE8_6 Energy processes engineering

SH7_10 GIS, spatial analysis; big data in geographical studies

Reference SDGs: GOAL 7: Affordable and Clean Energy, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

The EU is setting a new 2040 greenhouse gas reduction target, building on the 55% cut by 2030. Cities, responsible for over 70% of global emissions and home to more than 70% of the EU population, are central to this effort. Urban areas generate around 85% of the EU's GDP, making them key to decarbonizing both society and the economy. Buildings and transport offer the highest reduction potential, as highlighted by the EU Mission Climate-Neutral and Smart Cities. To meet these goals, member states must develop new tools, capacities, and inclusive decision-making processes that engage stakeholders and mobilize financial resources. However, several challenges remain. First, there is a lack of accessible, shared data on emissions and key drivers, which are essential for planning, envisioning, implementing, managing and measuring progress. Second, planning remains fragmented across sectors, limiting the development of integrated strategies. Third, community engagement and PPP partnerships, which are required respectively for inclusive decision making and implementing progress, are hindered by lack of transparency and information. This research aims to develop multi-dimensional digital based frameworks or systems that provides useful support for decision-makers, combining data, planning tools, and evaluation processes. The goal is to integrate energy, economic, environmental, urban planning, and policy analysis into a coherent system to support effective urban decarbonization.

Research team and environment

The research team is composed by experts in energy, sustainable urban systems, assessment and evaluation

Suggested skills for this research topic

The candidate should have a degree in planning/architecture or in environmental/energy/industrial/management engineering

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

PhD SDC
SUSTAINABLE DEVELOPMENT
AND CLIMATE CHANGE

Scholarship code

CU41.CU-Gamma.07

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Development of regional strategies for mitigation and adaptation to climate change.

Reference Person: Manzan Marco (manzan@units.it)

Host University/Institute: Università degli Studi di Trieste / DIpartimento di Ingegneria e Architettura

Research Keywords: Regional mitigation

Regional adaptation

Climatic change

Reference ERCs: PE8_6 Energy processes engineering

PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage

PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics

Reference SDGs: GOAL 7: Affordable and Clean Energy, GOAL 11: Sustainable Cities and Communities, GOAL 12: Responsible Consumption and Production

Description of the research topic

This aim of this PhD program is to study adaptation and mitigation strategies with particular attention to the Friuli Venezia Giulia region, contributing to the development of a regional plan for mitigation and adaptation to climate change. The research will evolve through the description of the territorial, climatic and regional regulatory framework, with data collection, inventories and research carried out by the competent bodies. This will allow to critically unify the experiences and initiatives carried out by different entities enriching them with international experiences. This research will lead to the identification of vulnerabilities, risks and opportunities related to the reduction of climate-altering emissions, also with a quantification of the impact of policies already undertaken.

The research will explore possible alternatives for the implementation of adaptation actions that lead to the reduction of the negative impacts of climate change, as well as mitigation through the reduction of climate-altering emissions and the possible increase in emissions storage, developing a methodology replicable in other territories.

Research team and environment

The research will be carried out using the facilities of the Energy Efficiency in Buildings Lab. The laboratory uses both numerical and experimental methodologies. The laboratory provides PhD students with various calculation codes with the relative licenses and the necessary IT tools.The experimental facilities allow the researcher to perform various measurements related to the performance of the building fabric and HVAC systems.

The student will be placed in an environment with other doctoral or post-doctoral students and researchers as well as structured research staff.The researcher will carry out a research period of 12 months, distributed over the three-year period at the offices of the Friuli Venezia Giulia Region and/or in functionally connected structures.

Suggested skills for this research topic

Degree in Engineering or Architecture with knowledge of energy management, energy production, renewable energies exploitation, land management .

The knowledge of Italian (at least level B2) is required.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Mapping Emerging ESG-Related Technologies through Secondary Data – A Platform-Based Approach

Reference Person: Puliga Gloria (gpuliga@liuc.it)

Host University/Institute: LIUC - Università Carlo Cattaneo / Scuola di Ingegneria

Research Keywords: ESG-driven tech intelligence via secondary data

Foresight for emerging ESG technologies

Mapping ESG innovation trends

Reference ERCs: SH1_9 Industrial organisation; entrepreneurship; R&D and innovation

Reference SDGs: GOAL 9: Industry, Innovation and Infrastructure, GOAL 13: Climate Action, GOAL 17: Partnerships to Achieve the Goal

Description of the research topic

Technological progress has accelerated significantly in recent years. This PhD project aims to investigate the evolution of technologies related to ESG dimensions by leveraging patents, scientific literature, corporate disclosures, and other secondary data sources. A core component will be the use and further development of PATTERN, an open-access platform created within the Interreg V-A Italy–Switzerland program. PATTERN enables users to explore territorialized patent data across Italy, supporting technology mapping and strategic foresight. Research objectives include:

– Developing a framework to identify ESG-driven technological trends using secondary data.

– Designing indicators to assess technological maturity, diffusion, and ESG alignment.

– Extending PATTERN by integrating new datasets (e.g., ESG reports, innovation rankings) and advanced analytics.

– Detecting early signals of innovation and technological convergence.

– Mapping key actors (firms, inventors, institutions) and their roles in ESG-related innovation.

– Creating visual tools to enhance PATTERN's strategic value.

The project adopts a mixed-methods approach, combining patent analytics, text mining, and network analysis, with iterative platform development. Collaboration with research centers, institutions, and companies will ensure practical impact. Expected outcomes include a

framework for ESG-oriented technology intelligence and an enhanced PATTERN platform to support data-driven innovation strategies.

Research team and environment

The research team and environment at LIUC comprise experienced faculty members like Professor Raffaella Manzini, supported by interdisciplinary hubs and research centers within the School of Industrial Engineering. The PATTERN platform is embedded in a broader ecosystem coordinated by the Innovation and Patent Observatory, an initiative that brings together researchers, companies, institutions, and policy makers to monitor technological trends and promote innovation culture. This observatory is enriched by partnerships with firms, industry associations (such as ECOLE and UNIVA Servizi), and academic institutions (e.g. SUPSI, University of Genoa, Cork University Business School).

Suggested skills for this research topic

- Technology and Innovation Management: basic understanding of how technological innovation evolves, how it is managed within firms, and familiarity with secondary sources and their use as indicators for technology intelligence.

- Quantitative Data Analysis: ability to work with large datasets using tools such as Excel, Python, R, or similar, especially for statistical analysis, trend detection, and data visualization. Foundational skills in extracting and analyzing information from unstructured data sources.

- Digital Platform Design: interest in the logic and architecture of research-support platforms.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Flood risk in urban areas under climate change: risk management

Reference Person: Righetti Maurizio (maurizio.righetti@unibz.it)

Host University/Institute: Libera università di Bolzano / Facolta di Scienze Agrarie Ambientali e Alimentari

Research Keywords: Hydrogeological risk

Climate change-extreme events

Urban areas

Reference ERCs: PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution

PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics

PE6_12 Scientific computing, simulation and modelling tools

Reference SDGs: GOAL 3: Good Health and Well-being, GOAL 11: Sustainable Cities and Communities, GOAL 13: Climate Action

Description of the research topic

Urban areas in mountainous regions are particularly vulnerable to climate change-induced flooding due to factors like increased precipitation, accelerated snowmelt, and changes in drainage patterns. Urbanization further exacerbates these risks by increasing impervious surfaces, reducing infiltration, and potentially overloading drainage systems. Adaptation measures, such as improving drainage infrastructure and implementing low-impact development techniques, are crucial for mitigating these impacts. The research will be developed considering real cases in sud tirol region.

The research topic fits within the PNR 2021-2027 especially regarding the climate change, its mitigation and the security of social systems.

Research team and environment

The activities will be carried out with the support of the researchers at LTFD (LaboraTory of Fluid Dynamic) of university of Bolzano, that comprises 16 members among professors, researchers PhD students and with the support/collaboration of Agenzia Protezione Civile (Civil Protection Agency) of Bolzano Province.

Suggested skills for this research topic

The main skills required of the candidate are the willingness to participate in the working and interdisciplinary team, creating a relaxed environment but pursuing clear research aims. Furthermore, it is necessary that the candidate be willing to learn and to get to know and apply new aspects from different disciplines and to work in collaboration with public parntners (Agenzia Protezione Civile Bolzano) on the analysis of real cases. From the point of view of technical skills, the candidate should have the basics of programming (Fortran and/or Matlab) or the use of at least 2D hydraulic modelling software (Basement, Flow-2D, etc.) and hydrological modelling.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Redefining Hydrological Extremes in a Changing Climate: A New Paradigm for Data-Scarce Modelling

Reference Person: Manfreda Salvatore (salvatore.manfreda@unina.it)

Host University/Institute: Università degli Studi di Napoli Federico II / Dipartimento di Ingegneria Civile Edile e Ambientale (DICEA)

Research Keywords: Hydrological Extremes
Hydrological Modelling
Stochastic models

Reference ERCs: PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution
PE10_3 Climatology and climate change
PE10_21 Earth system modelling and interactions

Reference SDGs: GOAL 6: Clean Water and Sanitation, GOAL 13: Climate Action

Description of the research topic

Climate change is intensifying the frequency and magnitude of hydrological extremes, challenging water resource management and climate adaptation—especially in data-scarce regions. Traditional hydrological models, reliant on dense and long-term datasets, often fail to represent the non-stationary and uncertain behavior of extreme events in these contexts. This PhD project aims to develop a novel modelling framework for the simulation and prediction of hydrological extremes under data limitations. The approach integrates physically based hydrological modelling with stochastic methods and advanced calibration strategies to improve reliability in representing extremes. Innovative data sources—such as remote sensing, reanalysis products, and citizen science—will be used to support model forcing, calibration, and validation. The research will: (1) assess existing models for extremes under non-stationarity and scarcity, (2) enhance modelling through data integration, (3) combine deterministic and probabilistic approaches to capture process and uncertainty, (4) apply regional and Bayesian calibration methods, and (5) validate the framework in diverse, climate-sensitive case studies. The outcome will define a new paradigm for modelling extremes, offering practical solutions for prediction and planning in regions most vulnerable to climate change and least equipped with observational infrastructure.

Research team and environment

HydroLAB coordinated by Prof. Salvatore Manfreda is operating in the department DICEA of the University of Naples Federico II which is a leading institute in hydraulic construction and hydrological studies particularly devoted in the optimization of water management systems. HydroLAB is developing new innovative technologies for environmental monitoring using remote sensing and camera systems. The environment is a stimulating and challenging one with a strong and significant international dimension.

Suggested skills for this research topic

Strong background in hydrology or water resources; experience with hydrological/hydraulic modelling; knowledge of climate change impacts on the hydrological cycle; familiarity with calibration and uncertainty analysis; understanding of stochastic methods for extremes; proficiency in Python, R or MATLAB; experience with GIS and remote sensing data; ability to work with alternative data sources (e.g., reanalysis, citizen science); good communication skills in English; capacity for independent research and interdisciplinary collaboration.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Curriculum: CU-Gamma: Technology and Territory: sustainable strategies and solutions for the transition

Sustainable forest management: challenges and innovative solutions for climate-resilient ecosystems

Reference Person: Spano Donatella (spano@uniss.it)

Host University/Institute: Università di Sassari / Dipartimento di Agraria

Research Keywords: Nature Based Solution
Community Based solutions
Climate Change

Reference ERCs: LS8_1 Ecosystem and community ecology, macroecology
LS8_11 Behavioural ecology and evolution
SH7_5 Sustainability sciences, environment and resources

Reference SDGs: GOAL 13: Climate Action, GOAL 15: Life on Land

Description of the research topic

Forests play a crucial role in preserving habitats and the environment, as well as in sustaining local communities due to the diversity of ecosystem services they provide (i.e., economic, social, environmental, cultural, etc.). At the same time, climate change is increasing the frequency and severity of extreme events (e.g., drought, fire, etc.), threatening forest ecosystems functionality and productivity, especially in Mediterranean areas. In this context, it is urgent to recognize the challenges that forests are facing and to identify innovative solutions for making forests more resilient to climate change.

Sustainable management practices can play an important role in adapting forests to climate pressures by preserving, at the same time, the delivery of associated ecosystem services. Understanding barriers (economic, structural, cultural) and opportunities in adopting sustainable management practices (including Nature Based Solutions), as well as associated ecosystem services, can help in identifying innovative solutions to be potentially adopted by local communities and governments. Such understanding will support the development of guidelines/policies for sustainable forest management.

Research team and environment

The PhD student will be based at the University of Sassari, the Laboratory of Agrometeorology and Ecophysiology. The laboratory consists of a team of experts, including

specialists in agriculture and forest systems, ecophysiologists, agrometeorologists, and experts in climate change impact and risk assessment. Our team is comprised of experienced senior scientists and young researchers, postdocs, and PhD students, along with researchers from UNISS and the Euro-Mediterranean Center on Climate Change Foundation (CMCC). All resources for carrying desk and on-field work will be provided. The student will collaborate with external teams involved in ongoing projects at UNISS and CMCC.

Suggested skills for this research topic

Candidates should demonstrate skills in environmental and social science. They should also be capable of using different methods and software for collecting and elaborating qualitative and quantitative data, dialoguing with local communities, and have interest in artificial intelligence methods.

Period of research abroad

For this scholarship it is mandatory a period of research abroad of 6 months.

Educational program of the National PhD on Sustainable Development and Climate change (SDC)

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General information for the PhD course

This Italian inter-university and multi-disciplinary Doctoral Program in Sustainable Development and Climate Change (PhD-SDC) offered for 4 doctoral cycles (from XXXVII to XL) and counts already on almost 400 PhD students, a network of more than 60 partner universities and research institutes and +400 PhD courses offered.

The PhD-SDC aims to produce a new generation of experts and decision makers able to handle the complex issue of sustainability under climate change. On one hand, it is crucial to know and adapt to recent and future climate changes, which impact the earth and the human life within it. There is increased demand for actions to address climate change impacts especially in terms of extreme events and floods, to innovate production processes, to replace fossil-fuels with alternative sources of energy, and to implement sources of green energy. On the other, there is a need to reorganize economic growth according to a new paradigm which includes sustainable lifestyles that minimize use of natural resources and promote circular economies. The changes required must take account of the UN sustainable development goals and the impact on communities: the transformation to a green, sustainable future must ensure that no one is excluded and must guarantee fairer access to energy and natural resources.

The complexity of the sustainability theme and the interconnections of the different aspects impacted by climate change implies the need for a re-thinking of the education frameworks and the skills that will be required of future generations. Thus, a multidisciplinary education approach is required to produce experts able to propose effective development strategies, which take into account of the interactions between economic and technological aspects as well as societal issues, such as justice and migration, health, pollution and climate change, and access to water and food.

The PhD program is a unique inter-university, multi-disciplinary doctoral course and considers all of these aspects. As in the previous cycles, this PhD-SDC program has sustainability and climate change as its two key cross-disciplinary themes. Differently from the previous cycles, the program structure has been reviewed and the themes are now investigated under three main prospectives, called curricula:

1. **One health: Earth system and human life (CUα).** This curriculum focuses on the Earth system and its interactions with the natural ecosystems as well as human life . The CU activities aim, for example, to understand how climate and global changes impact the Earth system components, human health and ecosystem sustainability, to develop methods to monitor and predict future changes, to identify novel sustainable development models, and to develop strategies to adapt and mitigate climate and global changes.

2. **Human society: socio-economic impacts, policies and institutions (CUβ).** This curriculum explores the complex interplay between climate change and socio-economic systems, the role of institutions and law, the ethical and philosophical dimensions of climate discourse,

and how language and neuro-cognitive processes affect climate narratives and decision-making. The CU activities aim, for example, to understand and communicate the societal risks and opportunities posed by the environmental crisis, and to inform governance and policy-making for sustainable and inclusive societies.

3. **Technology and Territory: sustainable strategies and solutions for the transition (CUγ)**.

This curriculum focuses on resilience, sustainable development paradigms, circularity, and actions against climate change to be implemented in territories, communities, production processes and the consumption of resources and energy. The CU activities aim, for example, to address the complex and interconnected challenges arising from social and technological innovation. Considering technical and regulatory dimensions, the CU promotes a critical assessment of sustainability across research and solution development, integrating multi-scale, cross-sectoral perspectives to support sustainable, resilient transitions.

The PhD degree course aims to equip candidates with in-depth knowledge and technical expertise in their chosen specialty, as well as at high-level and cross-disciplinary level in the other curricula.

The PhD will be immerse in a strong network formed by partner university, research centres and companies working for a sustainable development. This will provide to all candidates with the opportunity to choose among the expertise available, not only in their host university, but also within a wider network and to work in inter-disciplinary teams on 'hot topics' related to sustainability and climate change. Students will be able to design their education programmes, to learn how to solve problems from different angles, and how to engage in effective discussion with experts in other domains.

The reality is complex and requires highly trained individuals able to find solutions to multi-faceted problems. The PhD structure and educational program aim to expose the PhD candidates to a range of real-life challenges, and provide an education experiences that as much as possible mirrors real-life.

Programme structure

It is expected that the PhD-SDC community will include between 30 and 50 PhD candidates, enrolled in the partner universities, along with their 30+ academic supervisors and the even more numerous individuals involved in delivering the lectures and training. This community plans to meet together for around 2 weeks annually to discuss and work on sustainability and climate change issues.

Candidates will be assigned a scholarship in one of the areas within the three curricula and will follow an education roadmap that includes activities at three levels:

· the multi-disciplinary PhD level;

· the multi-disciplinary level within the student' specific curriculum;

· a more focused level related to the student specific disciplinary area.

The students' training will focus mainly on the own focal discipline, although about 50% of the training time is expected to be devoted to study in other disciplines.

To guarantee a multi-disciplinary and inter-university education experience, students will participate in three types of educational events (including seminars, courses, workshops):

· multi-disciplinary (MD) events, which will include all the PhD-SDC candidates;

· Curriculum (CU) events, which will include all PhD candidates enrolled in the curriculum;

· focused (mostly single-discipline) (FD) courses, to be agreed with supervisors, which will allow to deepen their knowledge on their specific field of research.

Table 1 summarizes the minimum hours devoted to MD, CU and FD events.

Apart from the final year multi-disciplinary workshop, all educational events and courses will engage students mainly at the beginning of the PhD course, so create a solid ground for the development of their doctoral research project.

Table 1: PhD-SDC education events at the three levels: multi-disciplinary, curriculum, and focused and mostly single-disciplinary and minimum number of hours.

Event		**Organiser**	**Minimum number of hours**
Multi-disciplinary (MD) events	MD-Workshop 1 (year 1)	PhD board	48 hours
	MD-Workshop 2 (year 3)		
Curriculum (CU) events	CU-Workshop (year 1)	Curriculum board	48 hours
	CU-Workshop (year 1)		
Focused and mostly single-disciplinary (FD) courses	Thematic courses	Supervisors	64 hours
Total			**160 hours over 3 years**

Multi-Disciplinary Events (MD)

The MD events aim to expose all PhD candidates to the full complexity of designing and implementing a transition towards a fairer, more sustainable, and zero net-emissions society to manage weather and climate-risks. These events will take the form of two MD workshops (MD-WS):

· Year 1 (MD-WS1): Complexity of sustainability and climate change: an overview

· Year 3 (MD-WS2): Complexity of sustainability and climate change: final report.

MD-WS1 will take place in the first months of the PhD course. It will include lectures delivered by academics and experts working in all curricular areas, which will provide candidates with high-level knowledge on the key themes of sustainability and climate change. This will add to their understanding of the multiple challenges faced, and will help to identify the most effective solutions. In MD-WS1, candidates will work in small multi-disciplinary teams on a research project, which will be completed and presented during the workshop.

MD-WS2 will include lectures delivered by academics working in the different areas and presentation of PhD research projects. Discussion, constructive criticism, comparison of methods, tools and ideas will help the students to conclude their doctoral research.

Curriculum events (CU)

The CU-events will include content and formats related to the relevant curriculum and will provide a broad overview of the curriculum research topics. The CU-events will be organized in two sessions:

· year-1 CU Seasonal School (CU-SS) will provide an opportunity for the PhD candidates to attend topical lectures on some of the themes related to their work;

· year-2 CU (CU-WS) will provide opportunities to attend topical lectures and present their doctoral research to colleagues to obtain feedback and trigger discussion.

Focused and disciplinary courses (FD)

These refer mostly to single-theme and single-disciplinary courses. FD courses will be selected by the PhD students, in agreement with their supervisors, according to their background and PhD research. They will involve a minimum of 64 hours to be completed ideally during the first 12 months of the PhD course. The courses can be chosen from all courses being offered by the universities contributing to the PhD-SDC program, thus including both courses provided by the CU of the students and by other CU courses.

Supporting inclusion and diversity

Inclusion and diversity are fundamental values required for education and scientific excellence. Scholars with diverse talents, backgrounds and perspectives will contribute insights and innovative approaches to tackle difficult scientific problems and societal challenges. Everyone involved in this PhD Program will promote and support inclusion and diversity, and foster an environment where the brightest, most creative minds from every segment of society and every part of the globe can achieve their full academic and professional potential.

PhD program language

All PhD candidates are expected to have a good knowledge of the English language. Note that all MU and CU events and most FD events will be conducted in English. The PhD thesis will also be in English.

CUα: One health: Earth system and human life

Education aims and method

The education plan for this curriculum aims to train the PhD candidates to deal with the challenges raised by climate change and sustainable development in the different fields included in this curriculum and to introduce them to the questions on which the scientific community is currently working. In particular, the focus will be on climate and global change impacts on the different earth components, on ecosystems health and biodiversity as well as on human activities, well-being and health.

CU teaching modules

The module will include lectures focusing on the different areas covered by the CU; they will provide general background information targeted at non-experts and also will explore some questions, specific to the curriculum areas, in great depth. The curriculum lectures will be mostly face-to-face. In addition, the students will be actively engaged in a range of activities including writing up notes from lectures not related to their chosen research theme and conducting team projects on some of the issues discussed in these lectures. The training module will foster interaction and collaboration among all participants, from lecturers to students, for building a common core of advanced knowledge.

Title	**Hours**	**Abstracts/Objectives**
Challenges and open questions on Earth system and environmental sciences	24	Introduction to open questions and directions currently being explored by the CU community to find concrete solutions to climate and global change and sustainable development issues. In-depth study on the climate and climate change drivers, numerical modelling and observations. The teaching methods will include lectures and open discussions.

Impact of climate and global change on one health	24	In-depth study on the impact of climate and global change on: ● earth components from land to forestry and from ocean to atmosphere ● on ecosystems health and biodiversity ● human activities, well-being and health

FD teaching courses

The specific CU course will span a wide range of topics on climate and climate change drivers, numerical modelling and observations, climate change impact on the different earth components, on ecosystems health and biodiversity as well as on human activities, well-being and health. Typical courses could be: climate dynamics and future projections, European directives overview, observation of radiatively active and species observations for modelling environmental processes, risk assessment and decision support system related to environmental impacts, environmental health engineering science, environmental and health system dynamics, health statistics and epidemiology, principles of ecology, ecology and marine environment monitoring, ecosystem conservation and management, animal biology, biodiversity analysis (including field and laboratory activities), zoocenosis and conservation of fauna, agricultural practice, forest management and climate change mitigation, sustainable animal production.

CUβ: Human society: socio-economic impacts, policies and institutions

Education aims and method

The overarching goal of this education plan is to provide the next generation of scholars with the tools to develop frontier research on issues that are at the crossroads for the sustainable development of the human society from different prospective, from economics to juridical regulations, and from social welfare to philosophical implications and linguistic evolution. The aim is to training scholars able to interact with academics from a range of other disciplines and develop sound scientific research that will inform practice and policy making. The PhD candidates' research projects should be aimed at current urgent sustainability and climate change issues.

CU teaching modules

The curriculum will adopt a transdisciplinary methodological approach based on knowledge sharing via: i) discussion of socio-economical sustainability from a cross-disciplinary and humanities and social sciences perspective; ii) analysis of specific topics in particular fields and using lenses from the other fields; iii) PhD candidates' presentations of their research projects to an interdisciplinary panel of their peers and experts in the field. The emphasis

will be on the assessment of environmental policies and analysis of public-private interactions in the social, economic and technological realms.

Teaching methods will include traditional and interactive lectures delivered by academics from the universities involved and external experts combined with individual and team activities, including essays, class discussion groups, laboratory-oriented activities and group data analysis.

Title	**Hours**	**Abstracts/Objectives**
Challenges and open questions on socio-economic sustainable development	24	Introduction to open questions and directions currently being explored by the CU community to find concrete solutions to Climate Change and Sustainable Development issues. In-depth study on the economical models, on the physical and transition risks and on the power of policies. The teaching methods will include lectures and open discussions.
Challenges and open questions on law, sociology, ethics, philosophy of language, aesthetics, epistemology and literature in a changing climate	24	In-depth study on the impact of climate change on the society, on the available law and regulatory tools as well as on philosophy and ethics. The teaching methods will include lectures and open discussions.

FD teaching courses

The thematic courses of CU will cover a range of climate change (e.g., Urban planning for climate change, Transport decision making and sustainability, Transport planning and climate change: challenges and solutions, Innovation economics), environmental management (e.g., Environmental economics and policy, Behavioural economics for the environment, Economic analysis of global environmental issues,) and sustainability more generally (e.g., Stakeholder theory, Business and society, Policies for sustainability and local development). The courses will include also methodological courses on issues such as Big data analysis, Risk management, Data analytics for science and society, Applied econometrics of health decisions and Machine learning for quantitative economics. Moreover, course more linked to the fields of law, literature, philosophy and sociology, e.g. Legal tools for sustainability, Sociological approaches to sustainability, Ecological humanities, ecocriticism and ecolinguistics for sustainable development.

CUγ: Technology and Territory: sustainable strategies and solutions for the transition

Education aims and methods

The training in this CU is based on a strong transdisciplinarity to develop exchanges among the various thematic and disciplinary approaches included in this curriculum. The focus being on resilience, sustainable development paradigms, circularity and actions against climate change to be implemented in territories, communities and production processes and in the consumption of resources and energy.

CU teaching modules

A bottom-up problem solving approach will be adopted to identify different analytical profiles and potential innovative methodologies. This will involve a recursive method of analysis of methodologies and the problems they raise, and the solutions proposed to address them. Teaching methods will include joint working sessions to examine real (technological/ territorial) problems and will include problem presentation, group work, comparison, collection and processing of common elements, transferability and exportability. The results of the training plan will be made explicit in the identification of the main themes of curricular training. The main themes chosen by the PhD students will be presented during the academic years of the programme and will be the topic of the final thesis.

Title	**Hours**	**Abstracts/Objectives**
Challenges and open questions in Cross-Sector Innovation for the Sustainable Transformation of Territories, Communities, and Production Systems	24	Introduction to open questions and directions currently being explored within the selected topic. Working groups, adopting a problem-solving approach, on the selected theme. Innovative methodological activities to identify problem solutions. Comparison, collection and elaboration of common elements. Assessment of transferability and potential for application to other areas (exportability).
From policies to pathways: a critical assessment of sustainability across research and solution	24	Introduction to open questions and directions currently being explored within the selected topic. Working groups, adopting a problem-solving approach, on the selected theme. Innovative

development through a multi-scale approach		methodological activities to identify problem solutions. Comparison, collection and elaboration of common elements. Assessment of transferability and potential for application to other areas (exportability).

FD teaching courses

The courses in this curriculum require an interdisciplinary perspective. Students can choose among the courses offered by the other universities involved. The synergies with the Technology and Territory curriculum will be highlighted on the PhD SSCC official website.