POLITECNICO DI MILANO

PhD in SCIENCE, TECHNOLOGY AND POLICY FOR SUSTAINABLE CHANGE - 39th cycle

PARTENARIATO PNRR Research Field: ECOLOGICAL INTERACTIONS WITHIN AND BETWEEN GREEN AREAS IN CITIES: SPATIOTEMPORAL MODELS OF URBAN METACOMMUNITIES

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	Within the newly founded National Biodiversity Future Centre (NBFC), the protection of urban biodiversity and the enhancement of the provided ecosystem services are key challenges to valorize the ecological value of cities for the incoming, crucial decades of change (Spoke 5 of NBFC). To operatively guide planning and management of green spaces and to identify which Nature Based Solutions in a set of alternatives may be best to serve the goal of protecting and enhancing biodiversity and ecosystem services in specific urban and periurban areas, there is a need to identify proper indicators and of designing spatially distributed models that permit (a) to quantify the effects of population connectivity vs isolation of patches in existing and to-be urban metacommunities of plants and animals, (b) to evaluate the consequences of various type of interactions, both of vertical (like predation or pollination) and horizontal kind (like competition or facilitation) for different populations (i.e., native vs synanthropic species), and (c) to project scenarios of change based on the ecological interactions and on human-caused alterations (e.g., land-use or climate change), so as to prioritize interventions in the city. The ultimate goal of elaborating such models and analyses is that of providing tools for the preservation and the reinforcement of functional diversity in urban ecosystems for both plants and animals, together with associated ecosystem services.

Methods and techniques that will be developed and used to carry out the research	The candidate will design, calibrate and use novel population and metacommunity models of dynamical nature (based on sets of coupled nonlinear ordinary differential equations, agent-based systems, complex networks). In doing so, the candidate will need to identify existing and develop new suitable indicators to evaluate the ecological health of urban ecosystems. In a first phase of the research, the models will be fed with (and will use) data regarding various species (from pollinators to alien birds) in various champion cities of Italy. These data are already available from collaborating partners within the Spoke 5 research team of the NBFC. In a second phase, while the project progresses, data that will be gathered within Spoke 5 activities will be used to calibrate the models and to elaborate indicators to (i) evaluate the performance of existing green areas with current management practices, and (ii) develop scenarios of change
Educational objectives	Being this PhD research developed within a multi-partner and multi-city project, the educational objectives span multiple, hierarchical levels. In terms of the doctorate program (sense stricto), the candidate will be offered the participation to PhD courses to deepen knowledge in Science, Policy, and Technology of Sustainable Change. Also, the candidate will develop the capacity to apply innovative monitoring and modelling techniques concerning the specific research field of ecology, by working in a multi-disciplinary research group that include theoretical and applied ecologists, zoologists, botanists, urban planners and decision-makers. The candidate will be invited to visit (whenever needed) the partners of the Italian network of research institutions onboard NBFC (specifically those involved in Activities 3, 5 and 7 of Spoke 5). The candidate will also be encouraged to spend a period of study in international Universities/centres where the research in this field is at the frontier, so as to learn, bring back and further elaborate the most up-to-date techniques and practices concerning urban biodiversity and ecosystem services.

Job opportunities	Upon completion of the PhD program, the graduate will be equipped with distinctive skills and advanced transdisciplinary knowledge that open up career opportunities as analyst, researcher or planner at universities, research centers, public and private institutions, R&D departments, regulatory authorities, policy institutions, and other public bodies. The successful candidate will also be able to take advantage of the job opportunities specifically offered by the National Recovery and Resilience Plan (NRRP).
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 3 PhD Students
Name of the research directors	Prof. Renato Casagrandi

Contacts
renato.casagrandi@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
The selected applicant will be enrolled within the STEP-CHANGE PhD program. The doctoral program offers advanced training organized in three pillars: basic research (methodological courses related to key aspects of theoretical and applied research in science, policy, and technology of sustainable change), specific research (designed to strengthen candidates' knowledge on specific topics aligned with their research interests), and doctoral thesis development (allowing candidates to produce leading-edge research, original scientific, and societal impact). Teaching assistantship opportunities will be available over the triennium; the PhD student will be encouraged to take part in teaching activities, within the limits allowed by the regulations. Suitable computational resources (e.g., laptop for individual use, access to shared servers) will be made available through funding by the School or the PhD advisor. A desk within the Department premises will be provided for the duration of the PhD programme.


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