POLITECNICO DI MILANO

PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 40th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

PNRR 630 Research Field: MODELLING TECHNIQUES FOR THE ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF ROAD TRAFFIC ON AIR QUALITY AND RELATED ISSUES IN URBAN AREAS

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0 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	The scholarship offered deals with the general topic of air pollution modelling, namely focusing on the development of modelling and assessment tools to support air quality remediation strategies related to the anthropogenic emission sectors that mostly influence the air quality in urban areas, with a particular focus on road transport. In Europe, the ambient air quality is regulated by Directive 2008/50/EC, soon to be replaced by a new Directive better aligned with the WHO guidelines for the protection of human health. The new directive establishes lower limits for the pollutants already regulated but raises attention also on other pollutants and impact indicators (e.g. Ultra Fine Particles, Black Carbon, Oxidative Potential). Additionally, it highlights and extends the role of air quality modeling as a tool to achieve better information on air quality, to improve personal exposure estimates, and for setting up air quality plans. In urban areas, air quality plans usually deal with road traffic as one of the main areas of intervention because it is the main emitter of NOx and one of the main contributor to particular matter, ultrafine particles and black carbon. Dedicated modelling

	chains are usually set up to explicitly treat traffic emissions and related contribution to ambient concentrations at the local scale. However, limiting the simulation to local scale impacts of road traffic leads to neglecting the role of secondary pollutants and larger scale transport that heavily impact the overall air quality conditions in urban contexts. Coupling an Eulerian and a Lagrangian component for large-scale and local urban scale assessment, "hybrid" modeling systems (HMS) are a particularly useful and suitable tool for studying the impact of intervention policies for air quality in urban areas because they consider all scales and processes that influence air quality. The HMS already developed by RSE is a starting point for the PhD activities. Given the need to improve the performance of the HMS components and the new pollutants introduced by the revision of the Air Quality Directive, the fellowship activities could focus on a selection of the following topics: - enhancement of the HMS to overcome its current limitations (i.e. better description of the urban meteorology by considering the built environment, computational efficiency, hybrid components design) - improvement of the pollutant exposure assessment at the local scale, as emphasized by the revised air quality directive. - further development of the modelling chain with additional modules dedicated to the assessment of economic impacts, to make model results more suitable for local and intra-urban scale cost-benefit analyses. - extension of the modeling chain to include emerging airborne pollutants and indicators. - assessment of air quality scenarios associated with sustainable mobility policies in urban and suburban areas.
Methods and techniques that will be developed and used to carry out the research	The research activity will be developed in cooperation with RSE S.p.A., where research on integrated modeling system able to reconstruct both air quality and meteorological conditions at urban level, as well as their related health impacts, have been and are currently ongoing.
Educational objectives	The main objective is to train professionals able to

	develop autonomous research and become experts on air quality issues and its implications, able not only to plan and design interventions, but also to assess the impacts of energy and mobility policies on the environment.
Job opportunities	Typical outlets in the labour market are: Universities, research centres, local and national environmental bodies and agencies, environmental consulting companies.
Composition of the research group	1 Full Professors 0 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Giovanni Lonati, Stefano Cernuschi

Contacts
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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	750.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	RICERCA SUL SISTEMA ENERGETICO - RSE S.P.A. (https://www.rse-web.it/)
By number of months at the company	12
Institution or company where the candidate will spend the period abroad (name and brief description)	To be defined
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (purchase of study books and material, funding for participation to courses,

summer schools, workshops and conferences): the Ph.D. programme supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year.

Teaching assistanship (availability of funding in recognition of support to teaching activities by the PhD student) :there are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability and desk availability: 1st year +2nd year +3rd year: individual use.