

**DIPARTIMENTO DI INGEGNERIA
CORSO DI DOTTORATO IN INGEGNERIA INDUSTRIALE E
DELL'INFORMAZIONE -
PHD COURSE IN INDUSTRIAL AND INFORMATION ENGINEERING -
37TH CYCLE**

Title of the research activity:	Urban catabolites monitoring and treatment for environmental protection and surveillance.
State of the Art:	<p>Modern cities can be considered as organisms that consumes for the needs of their population, foods, materials, resources and energy, returning metabolites (<i>e.g.</i> products, energy) and catabolites. These last are represented by the main rejects of this metabolic activity among which wastewater, waste, gaseous and air born particles. Furthermore, considering that: within the 2050 70% of the world population will live in cities (UN, 2015); that the rapidly growing 27 megacities currently consumes about 9% of world electricity, generates 13% of the waste and hosts the 7% of the global population (Kennedy et al., 2015); the monitoring the health condition in these areas will be of paramount importance for preventing any future pandemic disease; in effect cities represents also a relevant source of rejected energies and materials that can needs to be properly reused, recycled and recovered for increasing the global environmental sustainability.</p> <p>For all these complex aims several research activities are going on focusing the attention of the use of urban catabolites as important means for environmental surveillance (Urban Catabolites Surveillance – UCS) for preventing future pandemic disease and on the development of new technologies and techniques for it's successful reuse, recycling and recovery.</p> <p>Some results concerning UCS have already been achieved with particular focus on the recent SARC-CoV-2 disease. In fact, wastewater, aerosols and also solid waste have been successfully analyzed and exploited for the early detection of the virus in given communities and areas. By the way, more work is also necessary for a better development and implementation of such methodologies.</p>

<p>Short description and objectives of the research activity:</p>	<p>The research activity will be focused on the analysis of new approaches and methodologies for the reuse, recycling and recovery of wastewater and solid waste generated in urban environments. Furthermore, these catabolites will be also further investigated for its exploitation for early detection of present and future diseases but also for monitoring the health conditions of given communities and areas.</p> <p>The research activity will be carried out by literature review, mathematical model development and experimental analysis performed in collaboration with other research entities.</p>
<p>Bibliography:</p>	<p>Di Maria F, Beccaloni E, Bonadonna L, Cini C, Confalonieri E, La Rosa G, Milana MR, Testai E, Scaini F. 2020. Minimization of spreading of SARS-CoV-2 via household waste produced by subjects affected by COVID-19 or in quarantine. <i>Science of the Total Environment</i> 743,140803</p> <p>Di Maria F, Mastrantonio M, Uccelli R. 2021. The life cycle approach for assessing the impact of municipal solid waste incineration on the environment and on human health. <i>Science of the Total Environment</i> 776,145785.</p> <p>Pivato, A., Amoruso, I., Formenton, G., Di Maria, F., Bonato, T., Vanin, S., Marion, A., Baldovin, T. Evaluating the presence of SARS-CoV-2 RNA in the particulate matters during the peak of COVID-19 in Padua, northern Italy. <i>Science of the Total Environment</i> 784,147129</p> <p>Sisani F, Maalouf A, Di Maria F. 2021. Environmental and energy performances of the Italian municipal solid waste incineration system in a life cycle perspective. <i>Waste Management and Research</i> doi.org/10.1177/0734242X211003946</p> <p>Uttpal Anand, Bashir Adelodun, Alberto Pivato, S. Suresh, Omkar Indari, Shweta Jakhmola, Hem Chandra Jha, Pawan Kumar Jha, Vijay Tripathi Francesco Di Maria. 2021. A review of the presence of SARS-CoV-2 RNA in wastewater and airborne particulates and its use for virus spreading surveillance. <i>Environmental Research</i> 196,110929.</p>
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