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## **COoL-AMmetropolis : towards establishing virtuous greenhouse gas emission mitigation scenarios for 2035 in the Aix-Marseille metropolis area (France) through atmospheric top-down technics and social sciences methods in interaction with local stakeholders.**

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Most of the global population lives in cities, expected to expand rapidly in the next decades. Cities and their industrial facilities are estimated to release more than 70% of fossil fuel CO<sub>2</sub>, although these estimates need to be verified at the city scale. Furthermore, cities are undergoing higher temperatures than their surrounding rural areas due to the Urban Heat Island (UHI) which also directly influence some CO<sub>2</sub> fluxes (for example from buildings domestic heating, car air-conditioning, urban and rural vegetation uptake). Cities are thus strategic places where actions on mitigating CO<sub>2</sub> emissions and also on lowering down atmospheric temperature elevation should be undertaken in priority.

The ANR COoL-AMmetropolis project focuses on characterizing and mitigating CO<sub>2</sub> emissions and UHI in the Aix-Marseille metropolis (AMm), of which the new governance entity is the "Metropole Aix-Marseille-Provence" (noted AMPM). AMm is the second most populated area of France (1.8 M inhabitants), is much industrialized, and is located in the PACA region strongly exposed to the risks of Climate Change. The objectives of the project are : (1) verifying and improving the spatio-temporal distribution of the AMm FFCO<sub>2</sub> emissions estimates and quantifying their current

contribution against natural fluxes, (2) characterizing the variability of the UHI and atmospheric CO<sub>2</sub> at the diurnal, synoptic and seasonal scales in the AMm area, and modeling UHI and CO<sub>2</sub> sources and sinks interactions at the local to the AMm scale; and (3) defining and evaluating the benefits of development scenarios of the AMm urban ecosystem to the horizon 2035 for mitigating both CO<sub>2</sub> emissions and UHI, at the different scales, and find the most effective way to integrate the virtuous scenarios, defined in interaction with stakeholders, into legal and urban planning schemes, tools, charters or practices.

To reach these objectives, a multidisciplinary Consortium made of 5 main partners (IMBE, CNRM, LIEU, AtmoSud, UMS Pytheas) and 6 non-funded partners (LSCE, INRA/URM, ESPACE, MIO, DTN, GNZ New-Zeeland) is proposed, ensuring complementarity between atmospheric physicists, urbanists, territorial jurists, emission stockcounters and AMm socio-economic actors with privileged links with local/regional stakeholders. Through its expertise and the organisation of annual seminars, GREC-SUD (sub-contract.) will reinforce these interactions.

The project is organized in 4 workpackages. WP0 is dedicated to the project coordination. WP1 is assigned to the collection and analyzes of CO<sub>2</sub> and UHI observations, and WP2 to the development and assessment of the CO<sub>2</sub> and UHI modelling framework. WP1 and WP2 will feed WP3, dedicated to the role of the several levels in the AMPM in the governance for the urban adaptation strategies on the UHI and CO<sub>2</sub> issues. It relies on legal documents analyses, multi-indicators evaluation of scenarios, and a strategy of ensuring regular interactions between the research community, local stakeholders & civil society throughout the full project duration.

The ANR COoL-AMmetropolis is funded for 4 years, starting on January 2020.