UNIVERSITY OF HELSINKI

LOMONOSOV MOSCOW STATE UNIVERSITY

# FIRST WORKSHOP: KICK-OFF MEETING

## General information aims and goals;
## Structure of MegaGrant and key responsibilities;
## Working packages

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# General information

**Megapolis - heat and pollution island: interdisciplinary hydroclimatic, geochemical and ecological analysis**

Project goal:

- Develop novel approach of integrated hydrometeorological, geochemical and environmental analyses of megacities to provide state-of-the art in observation and modeling of urban air-soil-water exchanges
- Establishing of new laboratory in MSU (faculty of geography)

# Project duration and budget

3 years

90 MRub = 1 MEuro

# Project participants

**Faculty of Geography at Lomonosov Moscow State University**

- Department of Meteorology and Climatology
- Department of Landscape Geochemistry and Soil Geography
- Department of Land Hydrology
- Department of Biogeography
- Department of Cartography and Geoinformation

**Skobeltsyn Institute of Nuclear Physics (SINP MSU)**

**MSU Computer Center**

**University of Helsinki (Helsinki, Finland)**

# Project structure

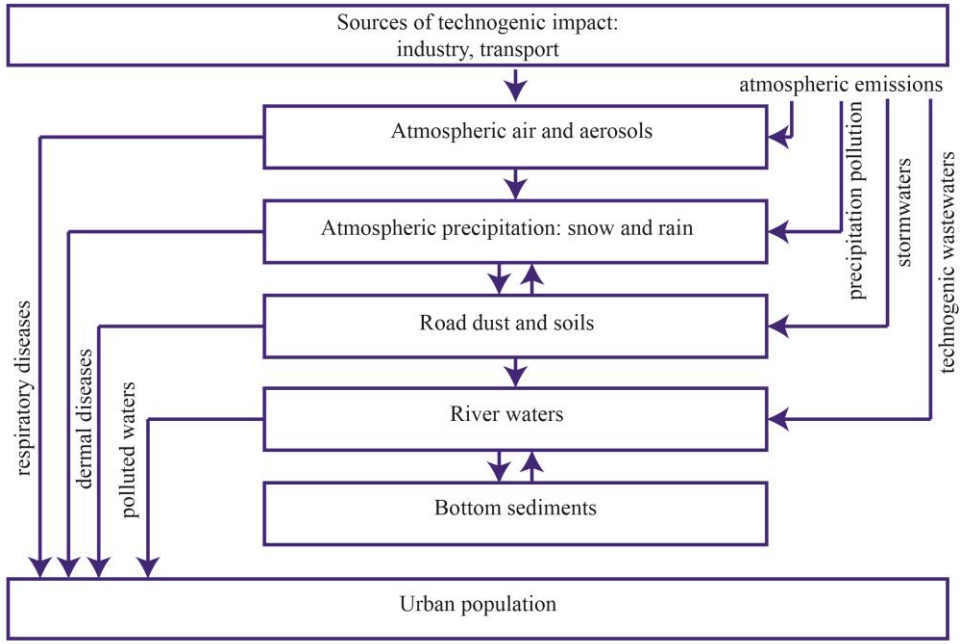
- 7 objectives – 7 work packages – 7 groups of expected results
- Each working package – 2-3 tasks

Laboratory of Urban Environment and Climate umbrella, which will be organized at the Faculty of Geography of MSU, will combine the advantages of high-level interdisciplinary research in the Earth sciences with integral approaches to the assessment and analysis of pollution accumulation and distribution processes in urbanized areas of special climate

# The first-priority unsolved problems of observation, analysis and comprehension of environments inherent in megapolis

- Task 1.1 Training, technology transfer, and know-how on integrated urban environmental observations

- Task 1.2 Upgrading existing stations and updating software and instrumentation for interdisciplinary hydroclimatic, geochemical and ecological observations in Moscow urban environment




Interactions of urban environment components as a fundamentals for the new integrated technology of hydrometeorological, geochemical and ecological assessment of megacity

# Daily and seasonal aerosol dynamics in urban air

- Task 2.1 Measurement of the physical-chemical properties of urban aerosols
- Task 2.2 Study of aerosols formation and transport in urban boundary layer based on hydrodynamic turbulence-resolving models

At the Meteorological Observatory of Moscow State University, a *Supersite of a continuous system for analyzing of the urban environment* will be created

# The interaction of atmospheric aerosol with solar radiation and heat island in the urban environment and the synergy of the influence of heat waves and air pollution on population mortality

- Task 3.1 The analysis of long-term variability of atmospheric aerosol and its dynamics during the COVID-19 pandemic and their relationship with heat island.
- Task 3.2. Atmospheric urban aerosols in the city environment with account of its morphology, and their relationship with solar radiation and the urban heat island.
- Task 3.3. Synergistic effects of heat waves and air pollution on urban mortality.

# Creation of concept and methods of calculation of the mega-urban planetary boundary layer (PBL) serving as physical object framing the climate-biosphere/technosphere system inherent in megapolis

- Task 4.1: Creation and empirical validation of the concept and methods of calculation of the unstable atmospheric surface layer inherent in megapolis, instead of the Monin-Obukhov similarity theory disregarding self-organisation of convective turbulence
- Task 4.2: Creation and empirical validation of the concept and methods of calculation of the stable atmospheric surface layer inherent in megapolis, instead of the Monin-Obukhov similarity theory
- Task 4.3 Further development of the concept of mega-urban PBLs as physical objects framing and essentially affecting the air, water and soil pollution, heat islands and other phenomena of interdisciplinary nature inherent in the climate-megapolis system

# Chemical composition of atmospheric precipitation, soil, dust and surface water

- Task 5.1 Component-based geochemical assessment of various environments

- Task 5.2 Water surface geochemistry observational network to study daily and seasonal chemical flux variability in Moscow

Study pollution resulting from industrial and transport emissions and their migration in the atmosphere (macro-regional transport), and partly accumulated in road dust, snow cover, soils and surface waters

# Interrelations and chemical (microparticles) transfer between urban atmosphere, soils and surface water

6.1 Supradisciplinary (i.e. simultaneous multi-, inter- and transdisciplinary) and multidisciplinary (physics, chemistry, biology, meteorology, etc.) scientific framework

- Task 6.2 Conceptual and integrated analysis of urban atmospheric and environmental pollution formation, effects and feedback

Holistic concept which can integrate knowledge on various processes and phenomena in urban atmosphere and environment, their interactions and feedbacks

# Design and management of new Laboratory of Urban Environment and Climate

- Task 7.1 Results dissemination

- Task 7.2 Establishment of a continuous, comprehensive measurements network under Laboratory of Urban Environment and Climate for urban Moscow observations

Creation of new **Laboratory of Urban Environment and Climate** on the basis of Faculty of Geography MSU

The head of the Laboratory – foreign member of RAS prof. Markku Kulmala

# Key performance indicators of the scientific research project

Number of articles by the leading scientist in the scientific journals (Web of Science: Q1, Q2) in collaboration with the academic staff members or written independently by the academic staff members in the selected field of studies:

**2 – in 2021;**

**6 – in 2022;**

**7 – in 2023**

# Format of kick-off meeting:

1. 10-15 minutes per presentation

2. Speakers introduce themselves (and their group) before presentation

3. All questions to speakers are in the Discussion at the end of meeting