

# Klimapolis

## Kick-off Meeting Report

19 – 21 February 2018

National Institute for Space Research (INPE)

São José dos Campos – SP – Brazil

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## 1. Welcome and introduction to Klimapolis

The list of participants of the Klimapolis kick-off meeting can be found in Annex A. The meeting agenda can be found in Annex B.

**Guy Brasseur**, Klimapolis coordinator, welcomed participants and gave a brief overview of the project. Klimapolis is a 5-year collaborative project between Germany and Brazil, and funded by the German Federal Ministry of Education and Research (BMBWF). The project will operate in diverse urban environments across Brazil, focusing on the major sources of air pollution, and feedbacks to climate change. With the use of a network of observations and state-of-the-art modelling tools, Klimapolis partners will work towards the reinforcement of the Brazilian climate and air quality research networks, which will be linked with research activities conducted in Germany.

The project is coordinated by the Max Planck Institute for Meteorology, and collaborating partners include the University of Hamburg (CEN), the Germany Climate Service Center (GERICS), the University of Cologne (RIU), and five research institutions and universities in Brazil. The project aims to establish and develop a long-term cooperative research and service structure composed of prominent research and service institutions in Germany and Brazil. It also aims to develop new ideas with city officials in Brazil, and assess win-win solutions that will lead to the development of smart cities, resilient to climate change and air pollution.

There are two parallel projects that have similar objectives and are focused on similar topics, and have recently been funded. The Papila (Prediction of Air Pollution in Latin America and the Caribbean) project, funded by the European Union, aims to establish a sustained network of partners with complementary expertise that develops and implements an analysis and forecast system for air quality with downscaling capability for Latin America and the Caribbean region (LAC region), and to assess the impact of air pollution (background and peaks) on health and on the economy. The second project is the “São Paulo City Lab: Towards a Joint Research Laboratory for Integrated Environmental and Climatic Assessment of São Paulo”, funded jointly by DFG and FAPESP, with the objective to assemble an interdisciplinary team that establishes the scientific basis, conceives and develops an integrated prediction capability for better forecasting adverse environmental events that will put populations at risks in and around the Metropolitan Area of São Paulo (MASP).

The charge for the kick-off meeting is to clearly define activities (workshop themes and dates, training visits, summer school), to define science questions that will drive joint research activities, to identify opportunities in Brazil and Germany for research funding, and to brainstorm joint proposals and papers, and agree on timelines.

## 2. Work Packages discussions

### 2.1 Work Package 1 (Lead: UHH and USP/IEA)

**Pedro Jacobi**, from the Institute of Advanced Studies of the University of São Paulo, gave an overview of the activities developed by his group. Most of the activities are linked to governance issues related to water in the MASP. Some aspects of water governance are transferrable to issues related to air quality: need to implement effective structural measures, it is important to show transparency related to data available, need to emphasise sustainable practices, need to include society in discussions, and public also need to be accountable for. It is also important to find a way so that scientists and policymakers can co-design solutions.

**Anita Engels** from University of Hamburg, presented the activities developed in her group that are related to Klimapolis activities. A new cluster proposal, as continuation of Clisap, is being submitted to DFG on the topics of climate, climate change and society. Also, a project funded by BMBF on climate mitigation and urban development in Lokstedt, Germany, and a PhD project on “Non-state actors and the diffusion of the 2030 agenda in Brazil”. Some of the stakeholder mapping processes that have been used in these projects could be also be used in Klimapolis. She also mentioned that the Sustainable Development Goal (SDG) 11, which focus on cities, needs to be highlighted in Klimapolis.

**Renato Anelli** from the University of São Paulo talked about issues related to public transportation and mobility in the MASP. The main urban public policy in São Paulo is the city’s Master Plan. It summarizes all our fields of knowledge in instruments to transform the cities in mid and long term. São Paulo Master Plan was prepared recently and gather the most advanced proposals in several fields of our project, like environmental policy to avoid heat islands, increase of public transportation to reduce air pollution and measures to face the most intense floods. The set of laws related to this Master Plan are the battlefield between different political positions now, and our science contribution will be very welcome to push best practices and promote specific projects. There is urgent need to optimize mobility in the city. There is a slow growth of public transportation to the east of the city, and that reduces mobility. In order to increase mobility, a new model for urban design is necessary, with green protection buffers, areas for housing, and bus corridors out of the flooding risk area. As mentioned before, it is important to have data transparency. In São Paulo, data on air pollution exist but World Health Organisation standards are not followed. Klimapolis can contribute significantly by producing a short document assessing air quality, describing and quantifying the issues. This document could be the start to inform policy makers about solutions. But it is necessary to include stakeholders in the discussion and understand differences among them.

#### Discussion:

The first Klimapolis workshop, to be organised jointly with City Lab around July/August in São Paulo, will focus on governance aspects. This will be an excellent opportunity to involve stakeholders in the discussion. However, the workshop will need to link science and stakeholders, perhaps by identifying 3-4 problems, make concrete proposals to study them, and then identify potential solutions.

**ACTION:** Include main stakeholders in discussions and activities organised by Klimapolis

## 2.2 Work Package 2 (Lead: MPI-M, RIU, INPE)

**Hendrik Elbern**, from the Rhenish Institute for Environmental Research at the University of Cologne (RIU), presented activities from his group and introduced activities that may be developed as part of Work Package (WP) 2 in Klimapolis. His group works with regionals modelling, observations, and data assimilation, and have had long term collaborations with some Brazilian partners. Activities that are planned and will contribute to the project are (i) adapt to Brazilian target regions the results of the Research Project of the German Federal Environmental Protection Agency (Umweltbundesamt UBA); (ii) improved reliability of the national emission inventory by advanced inverse modelling; and, (iii) investigate the potential and limits of regional observation networks to allow for emission corrections on a SNAP (Selected Nomenclature for sources of Air Pollution) basis.

**Judith Hoelzemann**, from the Federal University of Rio Grande do Norte (UFRN), highlighted the activities of her group, which is a long term partner of the RIU group. A couple of PhD projects will be developed using modelling and statistical techniques for air quality in the MASP.

**Sin Chan Chou**, from the Brazilian National Institute for Space Research (INPE), gave an overview of the regional Climate Model Development done by her group, with coupling with MOZART chemistry model. INPE has adopted the Eta model, as it gives a better description of some of the atmospheric circulation over South America, in addition to be computational efficient. The group has plans to use the FMS (coupler) with Eta (Regional Climate Model), MOM (ocean model) and MOZART (chemistry model). Most of the activities of her group that are related to urban air quality is done in the Rio de Janeiro Metropolitan area, but these techniques are transferrable to other areas in Brazil.

**Maria de Fatima Andrade**, from the Institute of Agronomy, Geophysics and Atmospheric Sciences of the University of São Paulo, presented some results of inventories and evolution of air pollutants concentration in the MASP. The largest contributor of air pollution in the MASP is transportation. Figure 1 gives a breakdown of transport use, and fuel for light-duty vehicles (LDVs), and Figure 2 showing a source inventory for the year of 2015. Concentrations of NO<sub>x</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> have all reduced since 2000, mainly due to emission control in vehicles. O<sub>3</sub> has slightly increased in concentration. Particulate matter (PM) is the one that causes most health issues, and also NO<sub>x</sub>, with an increasing impact on health.

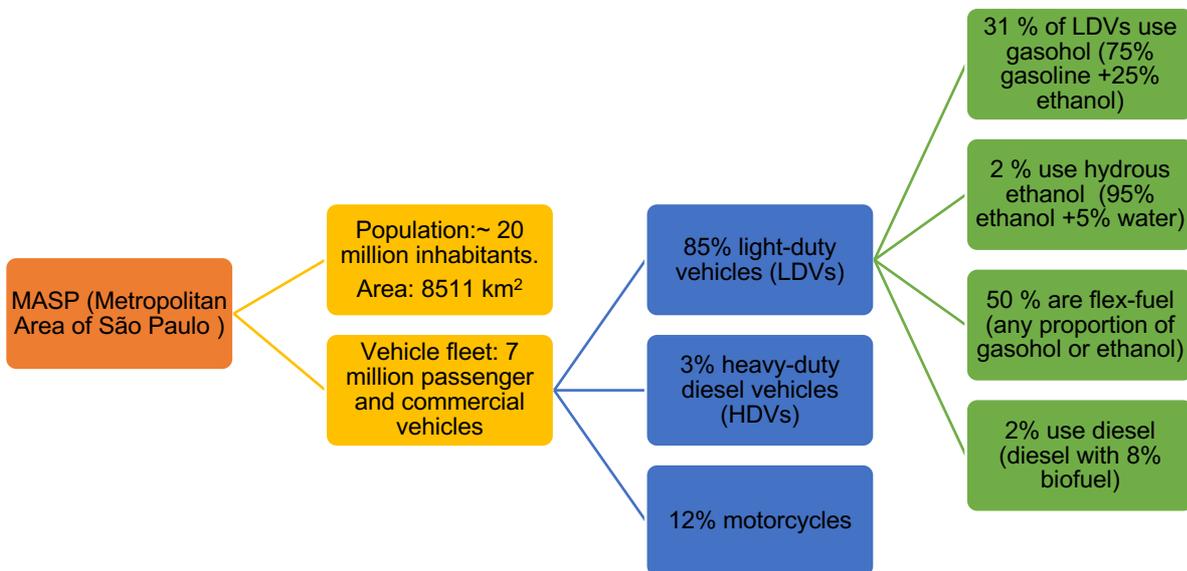


Fig 1 – Breakdown of transport and fuel used in the Metropolitan Area of São Paulo (Source: CETESB, 2015))

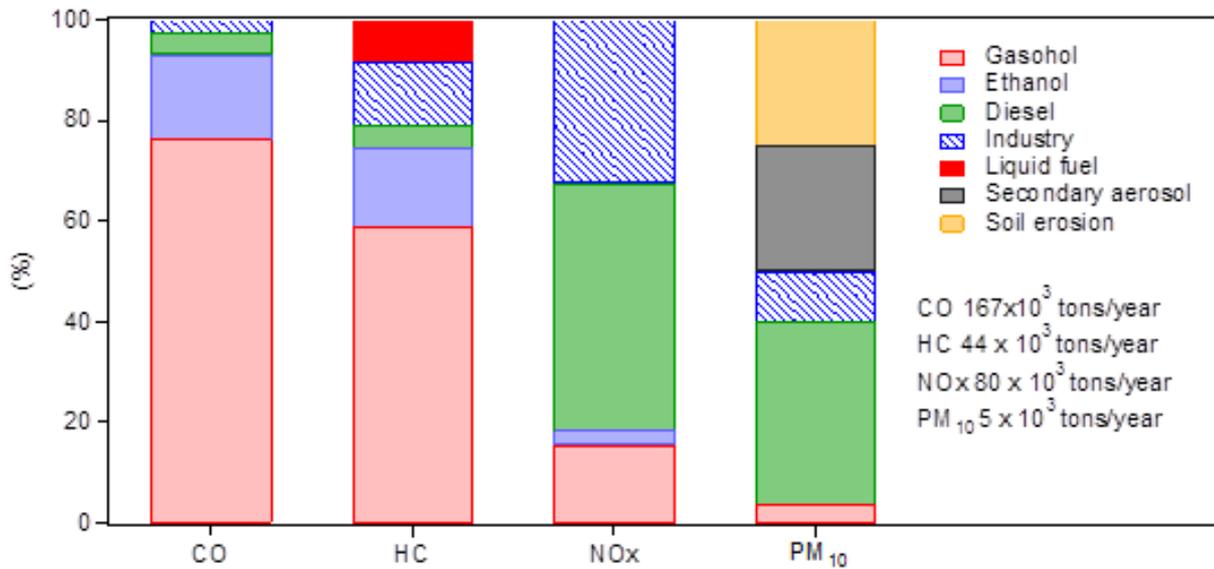


Fig. 2 - Source inventory for the year of 2015, in the Metropolitan Area of São Paulo, in tons/year (Andrade et al. 2017)

**Ali Goshyaripour**, from the Karlsruhe Institute of Technology (KIT), showed that the aim of the institute is to develop and deploy measurements and models to understand processes like turbulence, convection, cloud formation, precipitation and Aerosols. His

**Willian Lemker Andreão**, from Federal University of Minas Gerais (UFMG), gave an overview of the group's activities. They have worked on air pollution monitoring, with observations and modelling, using a variety of tools, and also working on inventories particularly for the State of Minas Gerais.

Discussion:

Modelling concentration of pollutants a need a large number of observational data, which needs to be observed at the right locations. Observing System Simulation Experiments (OSSE) could be done but need to be performed with care because of the different needs depending on the stakeholders.

Standards for emission inventories are done for Europe so they do not work well for cities in South America. Klimapolis can make a contribution by defining standards that would be better suited for cities in Brazil.

The science and activities that will be developed in Klimapolis will attract a very diverse community of scientists and stakeholders, from natural and social scientists to policymakers. It will be important to define and agree on terms that will be used throughout the lifetime of the project. Klimapolis can develop a glossary of terms related to air quality and climate change, in both English and Portuguese, that will be used by all partners.

**ACTION:** Develop a glossary of terms related to air quality and climate change, in both English and Portuguese (Nico Caltabiano)

2.3 Work Package 3 (Lead: GERICS, Funceme)

**Lola Kotova** and **Gaby Langendijk**, from the Climate Service Center Germany (GERICS), introduced activities of the Center, and potential activities for WP3. GERICS main tasks are assessment of needs and options for climate services and products, and analysis of business models for climate service institutes.

One of the activities that could be done for cities in Klimapolis, is the production of “Climate fact sheets”, which would contain concise information on projected climate changes for those cities or regions. GERICS could lead the production of those, involving other Klimapolis partners.

Climate simulations will be essential for activities related to Klimapolis. However, since the project looks at urban areas, high resolution simulations will be necessary. For the MASP, grid should be 20km. The Coordinated Regional Climate Downscaling Experiment (CORDEX) will soon make available products with 25km resolution for Brazil and South America. These data have the potential to guide decision making on a city scale through development of regional-to-local climate information.

GERICS has also developed an adaptation toolkit for cities, which provides information for urban development, taking into account climate projections. This could also be developed for cities in Brazil.

#### Discussion:

A methodology for analysis of regional climate model data has been developed by GERICS. But in order to assess impacts, it is important to know what information is available, and what information is required. The same about regional vulnerabilities and risks. In Brazil, a comprehensive study was made in 2010 on the vulnerabilities of the MASP, and could be used as a baseline for any activity developed in Klimapolis. Also, many of the activities developed by WP3 will have information coming from activities developed in WP1 and WP2.

### 3. Plan for action

Klimapolis starting phase will focus on assessing the needs of researchers and stakeholders, framing the problem related to air quality in the MASP, and training.

It is essential that specific activities start to be planned. It was suggested that some working groups (WG) are setup to work on specific topics. These groups should start some preparation for the first Klimapolis workshop.

- Air pollution (Hendrik Elbern, Maria de Fatima Andrade, Judith Hoelzemann)
- Regional climate change (Lola Kotova, Sin Chan Chou, Judith Hoelzemann)
- Governance and stakeholders (Anita Engels , Pedro Jacobi, Ana Paula Koury)
- Develop methods to provide information

The WG on air pollution should work initially on inventories. For São Paulo, it should look at inventories in high resolution, and involve data providers. It is also necessary to involve at early stage Recife, Natal and Fortaleza. For those cities in the Northeast region, it may be difficult to have contacts. UFRN is a Klimapolis partner so Natal will not be a problem. Pedro Jacobi is the Director President for the South America ICLEI Committee. ICLEI - Local Governments for Sustainability is global network of more than 1,500 cities, towns and regions committed to building a sustainable future. Jacobi can identify some partners in Recife, Natal, Fortaleza so we can involve those cities.

Also, a review paper on air pollution in São Paulo can be prepared, with talks given at the first Klimapolis workshop as a baseline for such paper.

**ACTION:** Identify partners in Recife, Natal, Fortaleza via ICLEI contacts (Pedro Jacobi)

Several models are being used by partners in Klimapolis. For numerical weather models the main models used are the EUROpean Air Pollution Dispersion (EURAD) model and the Weather Research and Forecasting (WRF) model. Regional climate models used are Eta and REMO. GERICS use ensemble of regional climate models and global climate models. For climate models, besides all the CMIP-class models available, it is important to note that the EU-funded PRIMAVERA project will have their high resolution data available in about 2020. The WG on regional climate change could prepare an article on climate change in Brazil, with a focus on climate models, and scenarios on air pollution. A potential option to publish such article could be the Climate Services journal from Elsevier.

**ACTION:** Develop ideas for article on climate change in Brazil, with a focus on climate models, and scenarios on air pollution (WG on air pollution)

The WG on governance and stakeholder should proceed with a stakeholder mapping exercise. Initially, a survey for Klimapolis partners about their idea of stakeholder engagements (Anita Engels offered to prepare this initial survey), and then develop a full list of stakeholders around the theme of air pollution. After list is developed, define 3-5 key stakeholders, which would work during the whole project.

**ACTION:** Map main stakeholders involved in air pollution issues in the Metropolitan Area of São Paulo (WG on governance and stakeholders)

For a better understanding of the issues related to air pollution in the MASP, it would be preferable to start at analysing only a few districts. So it is important to identify initially 3-4 districts, and narrow it down to 2 districts during the first workshop

**ACTION:** Identify 3-4 districts for a better understanding of the issues related to air pollution (Renato Anelli, Pedro Jacobi, Maria de Fatima Andrade, Tercio Ambrizzi, Ana Paula Koury)

## 4. Management

### 4.1 Funding calls opportunities

It will also be important to identify potential sources of financial support for research, in both Brazil and Germany. The Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) is a Brazilian federal government agency, under the Ministry of Education ministry is likely to have funding calls for international collaboration. Another opportunity can be FAPESP's programme SPRINT (São Paulo Researchers in International Collaboration)

**ACTION:** Investigate funding calls from CAPES that could fund some of the Klimapolis research (Ana Paula Koury)

### 4.2 Workshops and meetings

The first Klimapolis workshop will take place in São Paulo, hosted by IAG, and jointly with the City Lab project, on 20-24 August 2018.

The second Klimapolis workshop will take place in Hamburg, also jointly with City Lab. Potential dates are 19-23 November or 17-21 December. A doodle poll will be circulated to Klimapolis and City Lab partners in order to identify the best date.

**ACTION:** Prepare and circulate a doodle poll for second Klimapolis workshop (Ali Goshyaripour)

Judith Hoelzemann offered to host the integration meeting of phase 1 or modelling workshop in 2019 at UFRN.

## ANNEX A – Meeting participants

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## ANNEX B – Meeting agenda

### KLIMAPOLIS Kick-off meeting

19 – 21 February 2018

**Brazilian National Institute for Space Research (INPE)**  
**Av. dos Astronautas, 1758 - Jardim da Granja**  
**São José dos Campos – SP - Brazil**

Final agenda

#### **Monday, 19<sup>th</sup> February**

09:00 – Welcome and introduction of participants

09:15 – Overview of KLIMAPOLIS

09:30 – KLIMAPOLIS related activities by partners (**NOTE: 1 slide/3 minutes**)

MPI-M

UHH

RIU

GERICS

KIT

INPE

USP/IAG

USP/IEA

UFMG

UFRN

10:00 – WP1 (Lead: UHH and USP/IEA)

#### **10:30 – Coffee Break**

11:00 – WP1 (continued)

#### **12:30 – Lunch**

13:30 – WP2 (Lead: MPI-M, RIU, INPE)

#### **15:30 – Coffee break**

16:00 – WP3 (Lead: GERICS, Funceme)

18:00 – End of day 1

## **Tuesday, 20<sup>th</sup> February**

### **Science talks**

09:00 – Multiperspectivity in transdisciplinary projects on climate governance (*Anita Engels – University of Hamburg*)

09:30 – Governance aspects of the hydrological crisis in the Metropolitan area of SP (*Pedro Jacobi – IEA/USP*)

10:00 – Regional emission source estimation for pollution precursors by inverse modelling (*Hendrik Elbern – RIU*)

### **10:30 – Coffee Break**

11:00 – Eta Regional Climate Model developments for local scale climate change impact studies (*Chou Sin Chan – INPE*)

11:30 – Next generation of climate-weather-chemistry models (*Ali Hoshyaripour - Karlsruhe Institute of Technology*)

12:00 – GERICS activities (*Lola Kotova - GERICS*)

### **12:30 – Lunch**

14:00 - Technical visit to CEMADEN

### **15:00 – Coffee break**

15:30 - Technical visit to CEMADEN

### **16:30 – End of visit**

**19:30 – Meeting Dinner (Restaurant Amicci)**

## **Wednesday, 21<sup>st</sup> February**

09:00 – Plan for action

**10:30 – Coffee Break**

11:00 – Funding calls opportunities

11:30 – KLIMAPOLIS Workshops

12:00 – Management

**12:30 – Lunch**

13:30 – Finances

14:00 – Outreach

14:30 – Wrap-up

**15:00 – Coffee and end of meeting**