
# WHAT LURKS BENEATH?

## SMART CITIES CAN ALSO BE HEALTHIER CITIES. ANDREA KOVAC REPORTS ON THE METASUB PROJECT TO DIGITALLY MAP THE DISEASES HIDING IN THE WORLD'S PUBLIC TRANSPORT SYSTEMS

The emergence of Smart Cities is deeply intertwined with systems that handle Big Data. With the goal of stimulating growth and creating a more sustainable future, the idea of Smart Cities draws on a large amount of information accumulated throughout the years and on transforming it into usable data, leading to better decisions, more efficient public services and a better, safer daily life for citizens.

In terms of public transport, health and infrastructure, a lot of this data pertains to a specific location. This is the reason why we often talk about location-based solutions in the context of Smart Cities.

Cloud-based GIS and web mapping are a trend that goes hand in hand with smart decision-making. They are vital for communities that need to respond and act fast to the many threats brought about by highly globalised and accelerated urban environments. One possible application in creating a Smart City and a more responsive and sustainable environment is public health. Increasing urbanisation and the unprecedented growth in the international transport of people and goods brings unique challenges for the control and prevention of disease in urban areas.

Cloud technologies are just beginning to show their potential applications in various projects that are driven by the incentive to create more sustainable future for the urban population all around the world. One such example is the Metagenomics and Metadesign of the Subways and Urban Biomes (MetaSUB) project.

MetaSUB was launched by Mason Lab at Cornell Weill Medical College in New York City in the US. It is an interdisciplinary initiative the goal of which is to integrate microbial ecosystems into the design of cities. Guided by the conceptual framework of Smart City initiatives, researchers want to open a new chapter in city design, planning and public health by acknowledging the rich and complex microbiome lying on the surface of public transit systems around the world.

The initiative started with a pilot project called PathoMap, which was launched in 2013 in subways across New York City. Three years later, it has expanded into the global MetaSUB project and on June 21 this year, researchers from more than 58 cities were swabbing public transit surfaces such as emergency exits, ticket kiosks, benches, stairwell handrails, garbage cans and elevators, as well as inside of trains, buses, and mass-transit hubs.

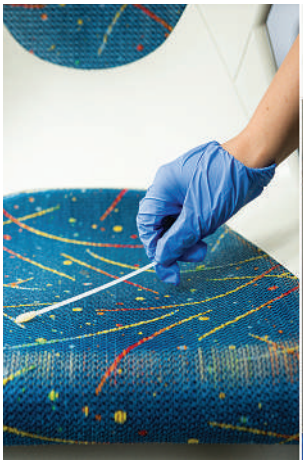
The main goals were to create metagenetic and forensic maps that will help in discovering new species and biosynthetic gene clusters, together with mapping pathogens in public transits. Sample research results will include tracking of anti-microbial resistance markers. Finally, deepening our knowledge about microbiome in the public transit system should lead to building and designing the healthier environment and smarter cities.

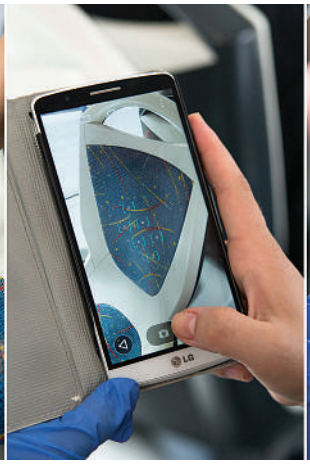
### Challenges

When collecting data, it was important to have a digital methodology. Old paper-based methods of collecting data would be an impractical solution for more than 100 locations across the cities. To create a Smart City, we need to handle everything digitally, including data collection.

Moreover, a proper data quality standard had to be satisfied. Paper-based forms bring unpredictable results because it is not easy to control if all the necessary data is there. Written forms aren't precise enough to capture the exact GPS location and time when data was collected. Paper data can also be lost and isn't the most convenient way of adding an extensive amount of information to a map.

One common problem in mapping projects operating globally is coordination with and between the field crews. To get a complete picture of different transit spots in the cities, it is important to have a good overview of transit routes and to be able to make on-site





decisions if something unpredictable happens. Ensuring efficiency in teamwork is a challenge many local governments are yet to solve in building a more responsive environment for its citizens.

An alternative approach to data collection that overcomes these challenges is to use mobile applications. However, these bring different kinds of challenges, such as the lack of internet connectivity in some areas and training data collectors who do not have previous mapping experience to use new methods.

## Methodology

The researchers decided to collect the necessary sample data using smartphones and tablets. They chose a cloud-based mapping system that would allow them to collect data in rea- time and have it instantly visible on a map in a web browser by different people from any location in the world. This also avoided having to add the data and media manually, which would require a significant amount of time.

To begin, surfaces inside the vehicles and train stations of each transit system were swabbed. After swabbing, relevant data such as location and time stamps (collected automatically), sample ID, surface, traffic level, notes and pictures were added using the forms in the Mobile Data Collection app. This information was visible on a dedicated point layer of a web map showing the swabbing process in real-time. Different form sets were available for other public surfaces such as buses, taxis, parks, and airports.

To avoid missing data, all fields had to be filled in before sending the information to be included on the map. All collectors, wherever they were in the world, used the same collection forms, to obtain a complete picture of the environmental factors relevant for understanding sample results.

The forms were easy to use for anybody who knew how to operate a smartphone or a tablet. This meant that there was no need for additional staff training, thus saving time and money, which was especially important on such a large-scale project.

Having all this data available in the cloud solved the challenge of coordination and decision-making. For example, in Zagreb in Croatia, routes were planned taking into consideration the local temperatures at particular train stations.

After the sample data is processed, it will be added to a map using the Map Editor app so that anyone who is interested in finding out which pathogens are lurking in the public traffic systems in his or her city could find out in a few seconds. This is an important aspect of engaging communities in urban environments – opening data to the public and ensuring transparency are important factors contributing to smart city projects worldwide. Regardless of the type of the project or activity, communities can benefit from these types of solutions.

## A healthier, smarter future

Building a healthier urban environment through smart city systems is one of the key long-term goals and challenges for building a sustainable future.

The geospatial component brings together different aspects, important for daily life in urban environments: transport and traffic, emergency response, disease control and prevention, smart architecture, and design. Using location as a central point of organizing Big Data has great cognitive value, providing an understandable overview visualised in an interactive map.

Mapping our urban environments, bringing departments, citizens and companies to a cloud collaborating with real-time location data accessible on all devices increases efficiency and responsiveness of urban environments. When dealing complex challenges of the contemporary world, geolocation tools can be an essential part of solutions for Smart Cities.

GEOLOCATION TOOLS CAN BE AN ESSENTIAL PART OF SOLUTIONS FOR SMART CITIES

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