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Editorial: OpenStreetMap research in the COVID-19 era

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2020 will be remembered for a long time as the year of the coronavirus pandemic (COVID-19) caused by the SARS-CoV-2 virus [1], which so far (end of June 2020) has infected almost 10 million people and killed about 500 thousand people worldwide [2]. The pandemic, which is still ongoing around the world, has deeply affected our everyday lives and forced us to change, amongst others, the way we work and communicate. In this context, switching from physical to online conferences, as in the case of State of the Map 2020, has become an established practice. In parallel, digital technologies have shown their potential to assist societies in addressing this unexpected emergency in a variety of ways, not only limited to understanding the epidemiology of COVID-19, but also extended to the delivery of other health and public services, provision of livelihood opportunities and assurance of business continuity. Geospatial information clearly has a central role in all these processes. Its use in the COVID-19 era – powered by disruptive technologies like artificial intelligence, big data analytics and telecommunication networks – has on the one hand highlighted the potential to improve human life, but on the other hand has brought a number of issues into the spotlight, e.g. the protection of personal data, the need to still bridge the digital divide and the evidence of how the overabundance of information may contribute to the 'infodemic' [3].

There is evidence that OpenStreetMap (OSM) has been used in various ways related to the global COVID-19 pandemic during the first few months, however, exactly how still needs to be thoroughly reviewed and analysed. As always, OSM data has been contributed and used by a multitude of actors for a variety of applications [4]. The contribution of new data in OSM to address COVID-19 followed different patterns which offer fruitful ground for future research. While the Humanitarian OpenStreetMap Team (HOT) Tasking Manager (TM)

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currently lists more than 150 projects aimed at adding baseline data, such as roads, buildings and placenames in some South-American, African and Asian countries [5], a number of specific initiatives emerged (primarily in Europe) to add or import into OSM highly localized data, such as opening hours of pharmacies or delivery/takeaway services for shops during the pandemic. The use of OSM data during the COVID-19 crisis also deserves attention from the research community. Many of the web-based dashboards produced to quantify the spread and the evolution of the pandemic use an OSM map as background, while specific OSM objects have been exploited by governments, companies, local communities and a number of other organizations to fight the pandemic, e.g. the location of pharmacies and health sites to know where people infected with COVID-19 can be treated, the road network to perform routing and the locations of pit latrines in informal settlements to map locations at risk of COVID-19 transmissions.

State of the Map 2020 features the third edition of the Academic Track, dedicated to scientific and research applications of OSM. The ten abstracts included in these proceedings have been selected by the Academic Track Scientific Committee – formed by the authors of this editorial – among all those submitted to the Academic Track call for abstracts. These ten abstracts do not directly address COVID-19-related topics as they were submitted only a few weeks after COVID-19 had been declared a pandemic. However, they cover a range of topics that are very relevant to the pandemic and at the same time provide an impression of current and future trends in OSM research.

An understanding of the quality of OSM data is essential for assessing how the data can be used. Several abstracts in this proceedings focus on methods to assess OSM quality. The first two propose a method for assessing building completeness that does not rely on local reference data, which is often not available, or ground truthing, which is expensive, and both rely on cloud computing. Biljecki and Ang [6] compare building density derived from imagery and indicators, such as the normalised difference built-up index (NDBI) and the normalised difference vegetation index (NDVI), to building density in OSM. The research aims at understanding potential coverage of 3D city models across the world. Orden et al. [7] compare OSM building completeness to Facebook's High Resolution Settlement Layer. Such quality assessment methods with global coverage can contribute to understanding the availability of geospatial data in response to a global crisis, such as the pandemic.

Looking into the future, the third abstract on quality contributes to the application of machine learning to geospatial data, e.g. for intrinsic quality assessment. Training samples and semantic information are required for such applications and are currently lacking. OSM is a freely accessible source of massive geospatial data for which comprehensive lineage information is available. Wu et al. [8] propose a flexible framework for labeling customized geospatial objects based on OSM historical data. This can be used to generate training samples and apply machine learning technologies for intrinsic assessments of data quality.

Madubedube et al. [9] employed an intrinsic quality assessment method by analysing OSM contributors and their contributions in Mozambique, a country in Southern Africa. Very few studies of OSM data on the African continent have been conducted. Similar to the first two abstracts [6, 7], the method adopted for intrinsic quality assessment is an alternative to ground truthing and to comparing OSM to local reference data. While this method does not allow absolute statements about OSM data quality, the results provide insight into the quality and can inform efforts to further improve the quality. The abstract once again demonstrates the benefits of contributing OSM data remotely, e.g. when local travel is not possible due to physical destruction of the infrastructure or prohibited to avoid risks during an epidemic or pandemic. Related to this, Schröder-Bergen [10] turns to evaluate the “localness” of OSM data as a measure of data quality, analyzing separately and on a global scale mappers’ tendency to contribute within their local environment and the amount of local knowledge captured in OSM, as well as the correlation between the two.

Herforth et al. [11] present the results of an analysis of almost ten years of mapping contributions by the humanitarian mapping community using the HOT TM. These results show the impact of major mapping disaster response initiatives on OSM contributions, and how the scope widened to include other initiatives, such as disaster preparedness. These findings can inform future strategies for engaging OSM mappers. Continuing on the topic of analysing OSM contributions and contributors, Anderson and Sarkar [12] focus instead on the role of corporations in adding map data. They present a thorough analysis of the activity of three corporations within OSM – Grab, Digital Egypt, and Tesla – each producing a unique effect in terms of data contributions and the addition of new mappers to the community, in accordance with the corporations’ focus on specific geographic regions and semantic themes. The OSM ecosystem developed and expanded, mainly through contributions from humanitarian and community or research initiatives. This abstract shows that the interest in contributing to OSM also originates from other reasons and that the OSM data ecosystem is suitable to address many other needs and purposes, including business-related ones.

Finally, a set of contributions to the Academic Track focus on OSM data in informal settlements or slum areas, highly relevant during the COVID-19 pandemic, as these areas are often at high risk of community infections and without proper disaster preparedness and response in place. Yeboah et al. [13] perform an OSM-based data collection for assessing spatial access to health care facilities. In the absence of detailed quality geospatial data, their approach combines field validated OSM data with the results of a health care facility survey for Sasa, an informal urban slum area in Nigeria. Results contribute knowledge on spatial proximity to health care facilities in slums through the combination of participatory remote mapping, local mapping and survey data for calculating the relations between proximity measures based on Euclidean distance and those based on network-distance. In an effort to increase the resilience of local communities to floods, Chinguwo and Mphalo [14] report the results of training local stakeholders in Malawi to produce exposure maps through the use of GPS, JOSM and secondary exposure data, showing that little work is done on the ground for mitigating flood-related hazards. This type of work could be equally useful for producing COVID-19 risk maps. Finally, Soman et al. [15] use OSM data to assess the level of spatial accessibility in 120 Low and Middle Income Countries (LIMCs) in the Global South. Based on the results, they developed a global index of under-serviced neighborhoods, which identifies the world’s most spatially inaccessible communities, enabling prioritisation of infrastructure investment and, in the case of the COVID-19 pandemic, health support.

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