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## NoiseCap: a citizen science experiment to raise awareness of noise environments with cell phones

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The NoiseCap experiment was an unfunded follow up of the Energic-OD project (European NETwork for Redistributing Geospatial Information to user Communities - Open Data), which had started in October 2014 and ended in September 2017 and had been supported by the European Union under the Competitiveness and Innovation framework Programme (CIP).

The project built on one of Energic-OD outcomes, the NoiseCapture Android app, allowing cell phone users to measure their outdoor noise environment and optionally share their measurements on the free and open-source Noise-Planet platform and scientific toolset for environmental noise assessment. Each noise measurement is annotated with its location and can be displayed in interactive noise maps, within the app and on the Noise-Planet portal.

In NoiseCap, we were primarily interested in extending the NoiseCapture use case to indoor settings, hence we chose to focus on air traffic noise (namely landing events), which is well characterized and identifiable by citizens living in airport surroundings. Our experiment targeted the neighbourhood of the airport of Florence, Italy, but may be easily reproduced in any similar community. We were also interested in assessing the reliability of commercial cell phone in measuring indoor noise, by comparing collected data with appropriate reference measurement.

User participation in NoiseCap was on a completely voluntary basis, e.g. volunteers were free to choose whether to measure any given landing event, during the period of the campaign, which lasted for several weeks. Participants were mainly enrolled through the local network of environmental activists and were asked to follow a simple protocol, to ensure their individual measurements would be taken in nearly identical conditions, in particular from the same spot, specified by the volunteer during registration.

From a technological viewpoint, the implementation of NoiseCap has highlighted a substantial lack of open Event-Driven standards and solutions in contemporary Spatial Data Infrastructures, e.g. for processing spatial time series, identify events and apply event pattern matching. We have developed a customized architectural approach, including a notification service based on raw ADS-B Mode S data processing and a proprietary solution (Telegram-based push messages), to alert the volunteers with individual time-before-overflight estimations.

In conclusion, the NoiseCap experiment has provided useful insights on Event-Driven

Architectures, as well as on the application of citizen science to sensitive issues in local communities.