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Learning of spatial correlation between urban solid-waste and stray dog population with participatory mapping

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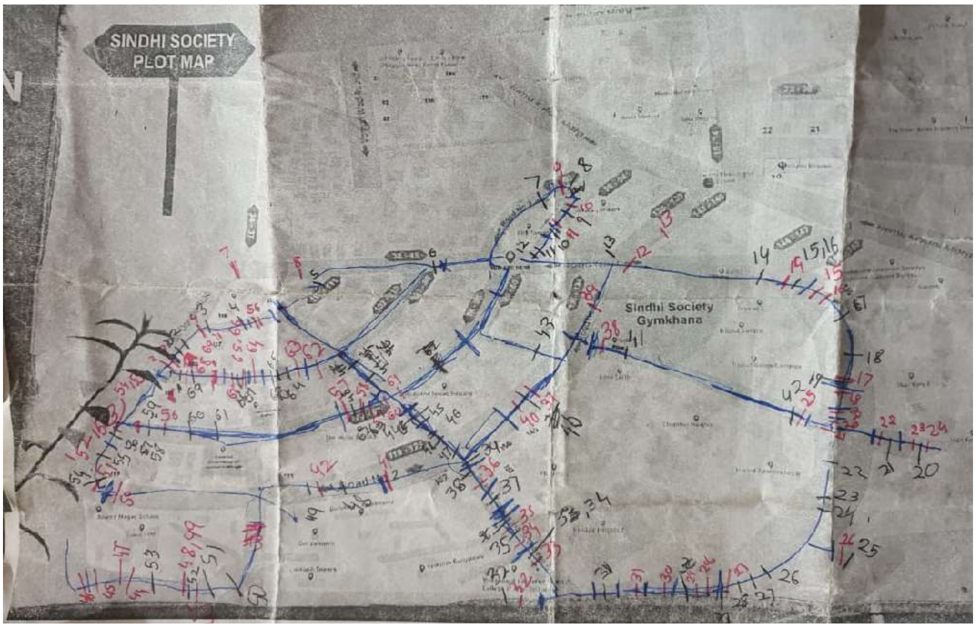
Abstract:

Garbage dumps are breeding areas of stray dogs, and if they are no longer around, dogs will migrate to other places. This is reflected by the variance in the stray to domestic dog ratio in areas that have solid-wate disposal problems and in urban settings across the world (Wright et al 2021). While poor urban solid-waste management is a community problem that can be remedied with collective action that begins with learning of implications of community practices. In recent years, the developing world has been experiencing unprecedented increases in urbanization, with a correspondingly massive increase in municipal solid waste generation, among other things. Inefficient and inadequate waste collection and management, due to lack of resources and planning, led to significant increases in the volumes of waste on the streets and in open dumps, where it serves as food sources for free-roaming dogs (Chandran et al 2016). Participatory mapping of unattended solid-waste in a neighbourhood in conjunction with mapping of stray dog population on the streets provides an understanding of the causal relationships between the two.



In this project, 4 students of a secondary school in suburban Mumbai, participated in an exercise to map all open solid-waste accumulation in their school neighbourhood. Geotagged photos using smartphones were gathered in an area roughly 0.24 sq km with a population of roughly six thousand. While solid waste is regularly collected and transported out of the neighbourhood, there are multiple instances of open or uncollected garbage which was observed over several days using a hand marked map of the neighbourhood (Figure 1). The geotagged pictures taken on phones on different days at different times of the day were imported into QGIS desktop mapping software to create a point map of garbage and stray dog population as shown in Figure 2. After filtering for spatial outliers and noise, all points were analysed to understand correlation.

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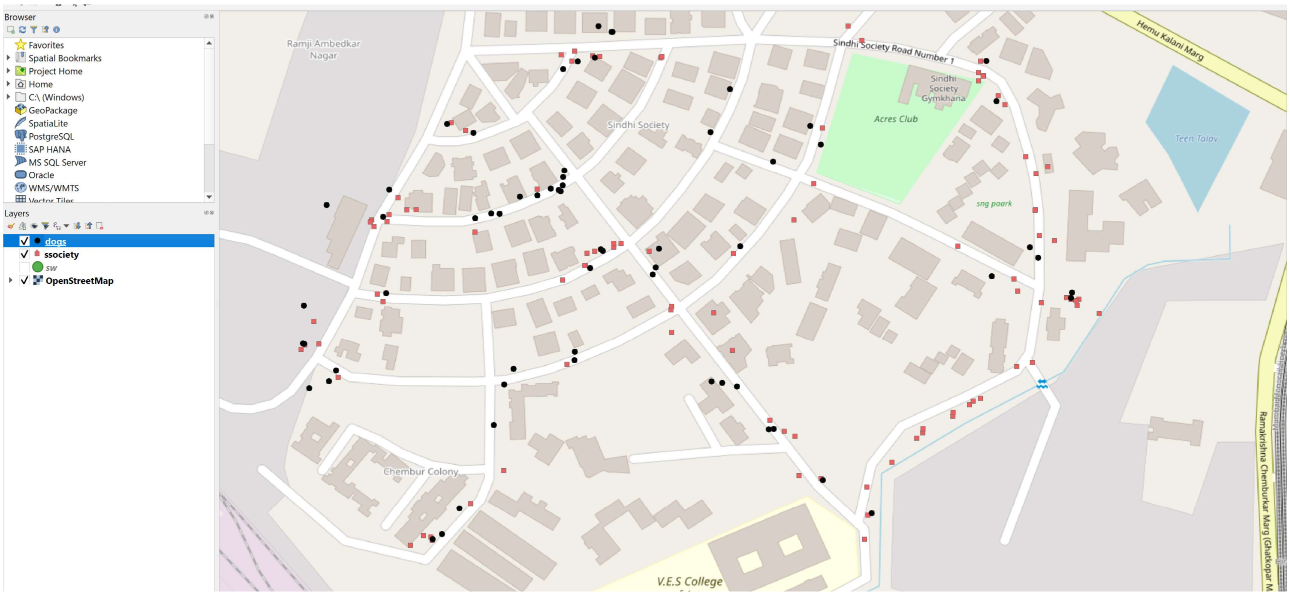

Figure 2. Mapping of Stray dog population and SW clutters on QGIS

QGIS and statistical tools were used to explore correlation (Ray et al 2010). 10-metre buffers of all location with SW clutters were seen to intersect with 10 metre buffers of location of stray dogs in 94% cases whereas all location buffers of stray dog locations were found to be within a 10 metre buffer of open garbage locations.

	SolidWaste	Stray Dogs
Number of clusters	247	232
Overlapping clusters	232	232
Average distance to nearest cluster (m) of other	2.1	1.8

Table 1. Correlation of SW sites with stray dog locations

The entire exercise was completed in one month and while affording the learning of concepts such as spatial relationships, statistics and desktop mapping. More importantly they observed spatial relationships between community practices and their implications in spatial terms. The long-term implications of such learning have been emphasised in the context of overall attitudes of a community (Gaillard et al 2010). Such surveys are also important for effectively implement both rabies control interventions through mass vaccination of FRD, and dog population control programmes (Tiwari et al 2019)

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