

# Ontological Plurality in the Age of OpenStreetMap

## 1 Introduction

Topography displays no favourites; North's as near as West.  
More delicate than the historians' are the map-makers'  
colours.

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*The Map*  
Elizabeth Bishop

On its surface, the purpose of a map appears clear: to present an empirically-based and materially sound representation of the world – its topography, and the physical impressions made upon it by human industry. This model of cartography, *cartographer as amanuensis*, would bear the twin yoke of all empirical measurement, that of *precision* and *accuracy*, and strive towards the ideal of *completeness*. The definition of accuracy in this case is *correctness*, while precision can be thought of *level of detail*, and completeness refers to land coverage. Even this apparently straightforward definition is fraught with subtlety, as highlighted by Carroll's characteristic absurdity in *Sylvie and Bruno Concluded*: "we very soon got to six yards to the mile. Then we tried a hundred yards to the mile. And then came the grandest idea of all! We actually made a map of the country, on the scale of a mile to the mile!" – what Borges characterised as '*Exactitude in Science*'. However, the intricacy of cartography is not in this alone.

The description of those multifarious human impressions, their nomenclature, the partitioning of space in concession to (or assertion of) power, further convolute the map-maker's craft. Cultural sensitivities will cause contention, from within and without, as will the decision of which structures (and people within them) merit special notice. Already, cartography is a political act.

Though a map must take some basis in reality, its relationship with that reality is dual in nature. Maps as a tool convey predicates of action, be they the course of a thoroughfare, the bounds of foreign sovereignty, or the location of a municipal hospital. An action taken based on a map gives that map agency within the

world it depicts. While an accurate map facilitates, an inaccurate one may mislead, and through presenting an unreality to a wide audience, may reify it; throughout history, maps have been used as a tool to demark and reify power (we will see an example in § 2).

Hence, cartography presents an ontological imposition on its readers; asserting the map-maker's understanding of the world as ground truth. Given the difficulty and expertise required by map-making, cartography has often been performed at the behest of the state; this has led to the formation of the British Ordnance Survey, amongst similar institutions worldwide, hence cultivating a profusion of state-imposed ontologies. These ontologies may diverge on details such as names of settlements, existence or non-existence of (clandestine, humanitarian) facilities, or, perhaps catastrophically, the extent of national borders. Many states providing their own cultural and political lenses onto the world gives clear manifestation to ontological pluralism in cartography.

Even were these issues to be resolved (through absolute accuracy, precision and cultural hegemony), there is an insoluble mathematical conundrum placed on any contiguous two dimensional representation of a sphere's surface. Simply, it is not possible to preserve angles, directions and scales at once in such a representation of the world. The familiar map of the world, the Mercator's projection, is a cylindrical projection of the sphere in which angles are locally preserved at the expense of scales. The reason for preferring this projection to the infinite of other options is its navigational utility, with straight lines on the map matching the bearings of a compass (For examples of these projections, see figures 1 to 4). However, in recent years, its status as the default representation of the world has been challenged by those who feel that navigation is of less importance to accurate geopolitical understanding in the modern age. Indeed, its unfortunate misrepresentation of the size of Africa and exaggeration of Europe has led to people accusing it of being an explicitly racist and imperialist construction – such uproar indicates the inherently political nature even of the projection used to model the world.

In recent years, advancement in satellite imagery and internet technologies have upended the cartographic landscape, if not its underlying nature. Drastic improvements in topographic accuracy and precision, along with reliable and effortless depiction of human dwellings, would seem to reduce their burden, while the ability of a service like Google Maps to provide localised labels would allow a shared topographic and geopolitical ontology attenuate disputes over names. Google Maps, one might claim, presents the pinnacle of ontological materialism, and approaches some 'objective truth'.

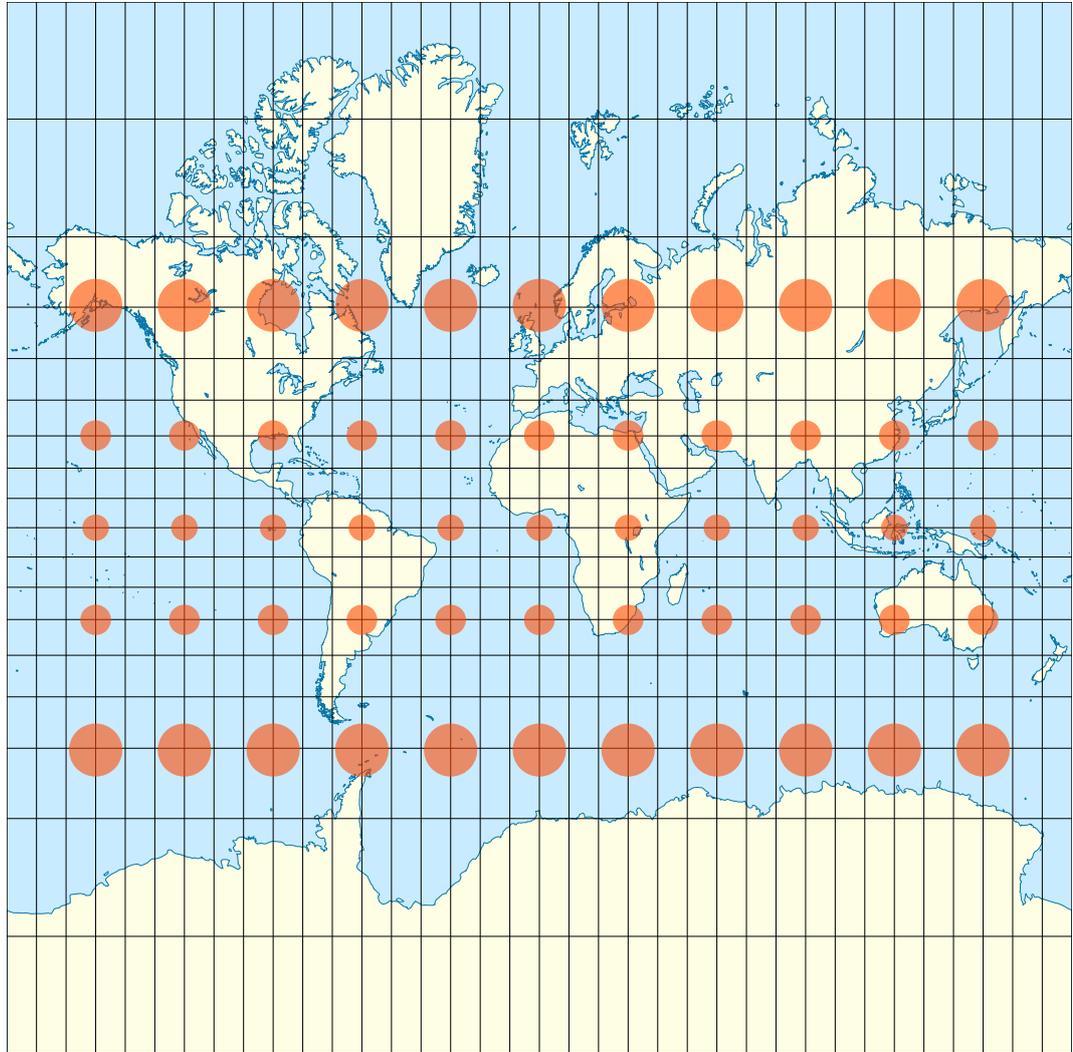


Figure 1: The familiar Mercator projection of the globe. Mercator's projection is locally angle-preserving, but scale decreases with the logarithmic distance from the poles (hence, the scale at the poles is infinite). The distorted circles are Tissot's Indicatrix [1]. Retrieved from [2].

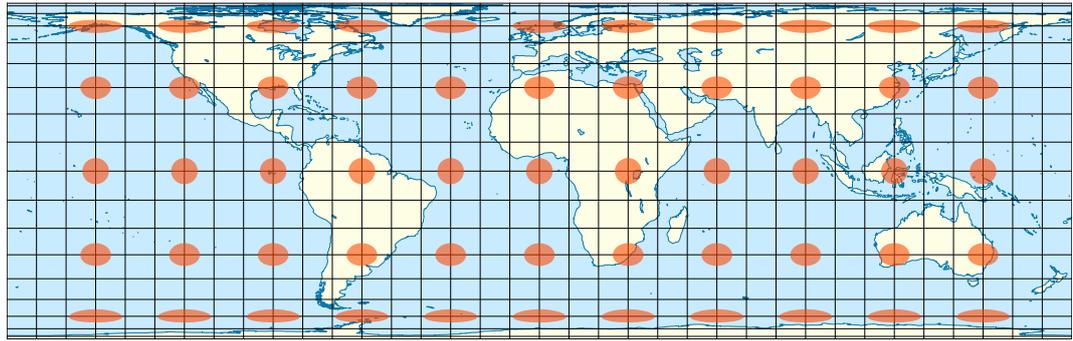


Figure 2: The Lambert projection, which is an equal-area cylindrical projection. The Lambert projection results in heavy distortion but gives an accurate depiction of relative size. The Indicatrix are ovals of equal area, with axes depending on latitude. Retrieved from [3].

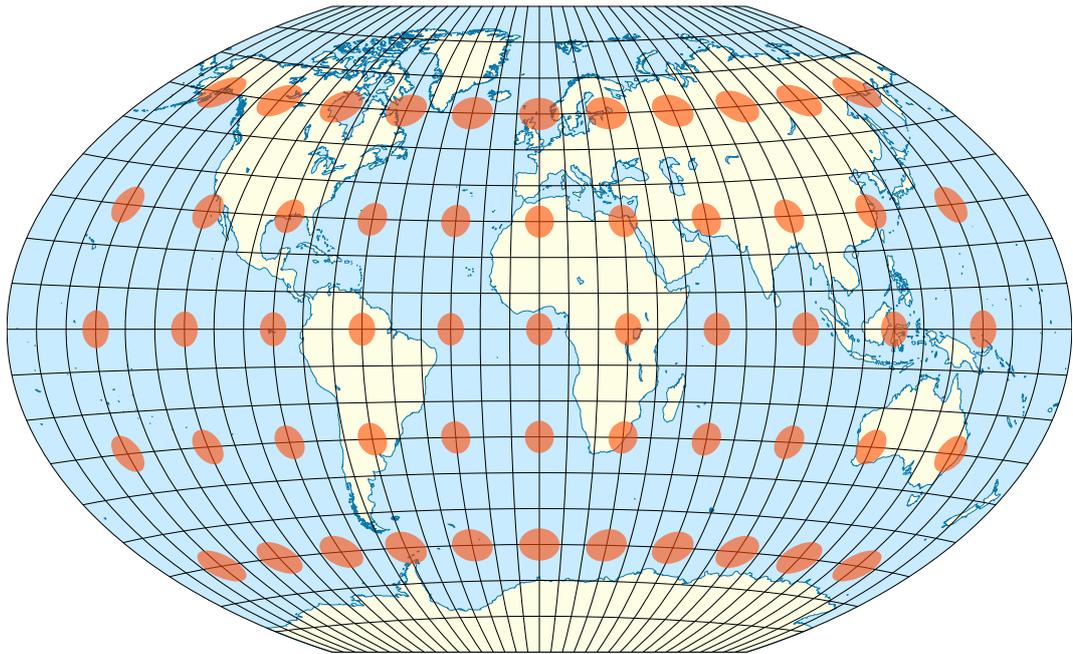


Figure 3: The Winkel Tripel projection, intended to minimise the 'triple' of distortion: area, direction and distance. The distorted circles are Tissot's Indicatrix [1]. Retrieved from [4].

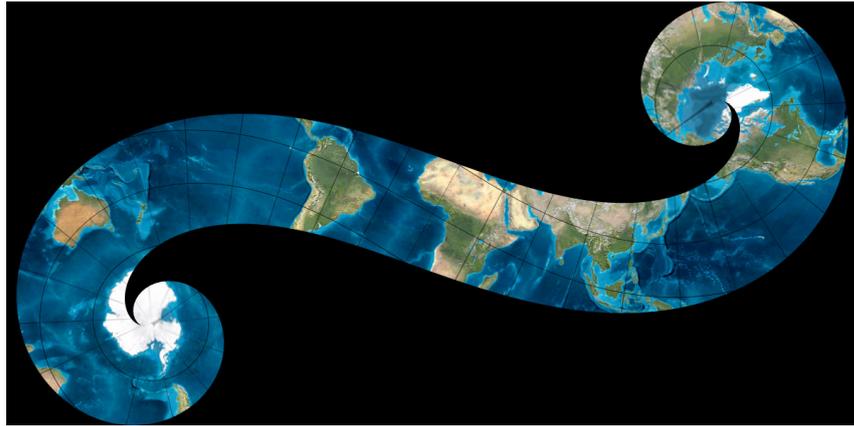


Figure 4: The “Orange Rind” projection, notable for its near-uniform Indicatrix, illustrating the folly of relying on any one projection. Retrieved from [5].

However, despite Google’s completeness through satellite imagery, it still fails to label points of interest uniformly across the globe, and some areas even go without the roads necessary for Google’s otherwise ubiquitous route-planning services.

Another modern approach to mapping is enshrined in OpenStreetMap, a project promoting and facilitating the collaborative mapping of each region of the world, ideally by those inhabitants who intend to use it, ensuring the resulting data remain free and modifiable to all. OpenStreetMap can be seen on one front to be an attempt to decentralise and democratise ontology, and on another to remove the imperialist, colonialist bias still visible in any map built from a Western perspective. While it cannot be said to be everywhere successful in this aim, it has had some successes, which will be discussed later.

The rest of this essay shall briefly examine the way the historical ontologies of cartography have impacted the geopolitical evolution of Africa, and how modern cartography still fails to address that and then go on to look at examples where OpenStreetMap has allowed these failings to be addressed, and examine the more interesting manifestations of ontological plurality in the OpenStreetMap ecosystem, and how these could themselves be useful.

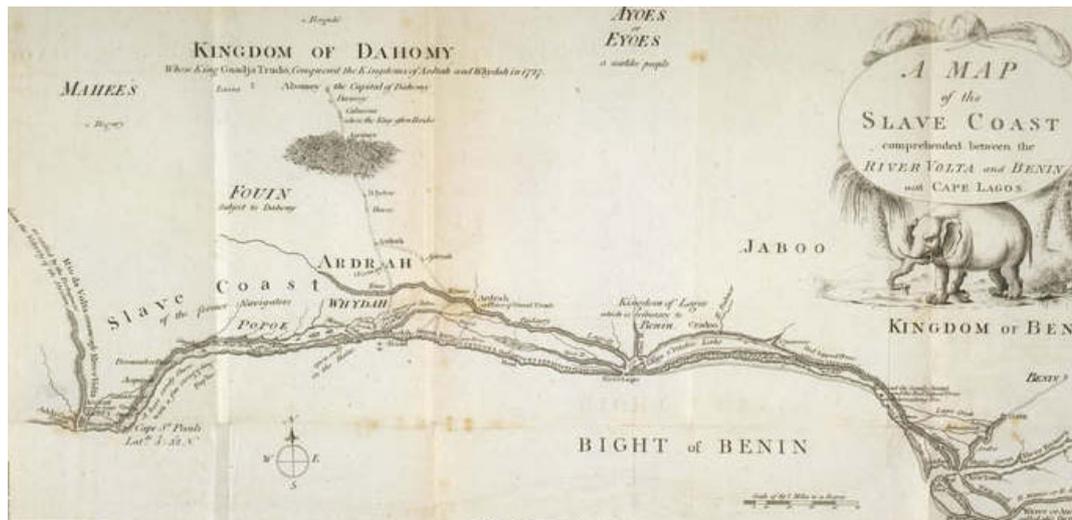


Figure 5: The “Slave Coast” of Africa, 1789, a map of the coast around the Kingdom of Dahomy, which sold prisoners of war to foreign slavers. Retrieved from [7].

## 2 Maps and Ideology: Africa

So geographers in Afric maps  
with savage pictures fill their gaps.

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*On Poetry: A Rhapsody*  
Jonathan Swift

No continent has been so maligned by cartography as Africa.

The cartography of Africa was first and foremost a capitalist and colonialist project. As such, the first maps showed great detail along the shores, abounding with slave-trafficking trade ports, but held sparse detail of the mainland. Little attempt was made to understand or indicate the diverse ethnic makeup of the besieged continent, or to venture inland, instead content indicating features of material worth. Indeed, the nomenclature and illustration of the maps of this time tell of a fundamentally racist, acquisitive venture: naming the coast of a slave-trading kingdom the “Slave Coast” (figure 5), and drawing intricate pictures of animals (figure 6) in the absence of information – or simply scrawling “cannibals” [6].

In 1884, at the Berlin Conference, the colonial European powers bluntly dismembered Africa in their "Scramble for Africa" [9] (figure 7). With an ignorant and apathetic approach to existing ethnic boundaries, the clumsiness of the division was manifest in its artificially straight lines and the civil wars which they still

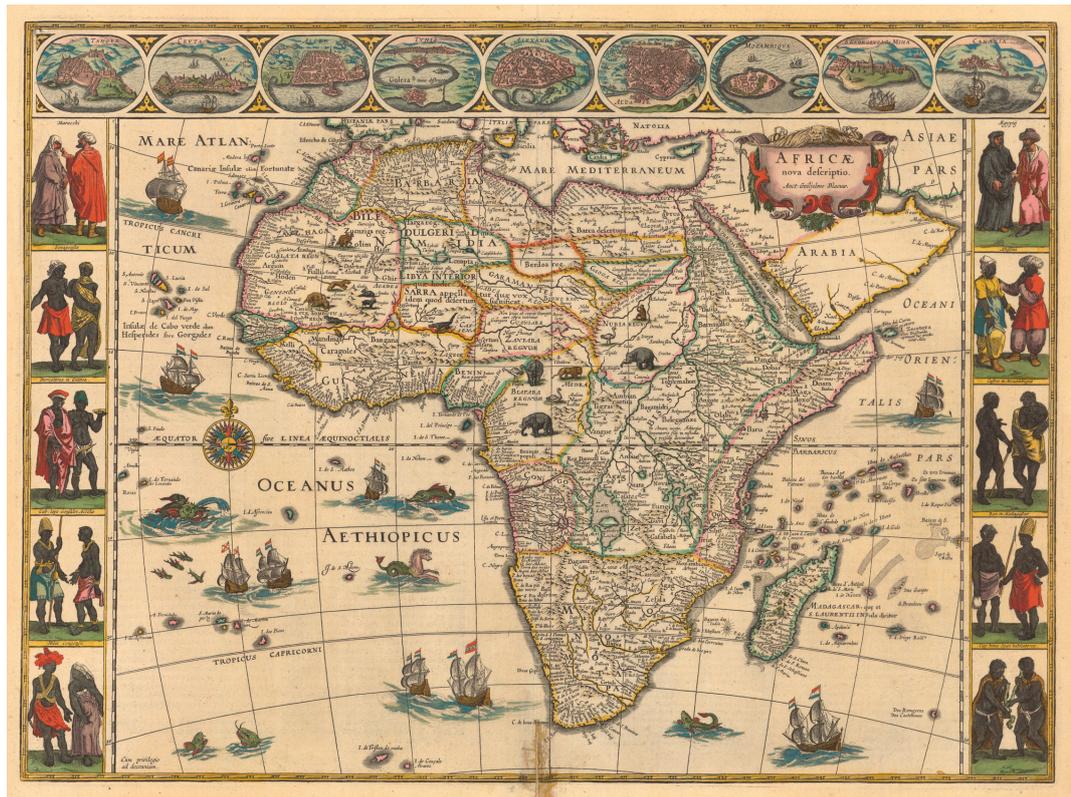


Figure 6: Willem Janszoon Blaeu's 1644 map of Africa, in which uncharted regions are obscured by illustrations of African fauna. Retrieved from [8].

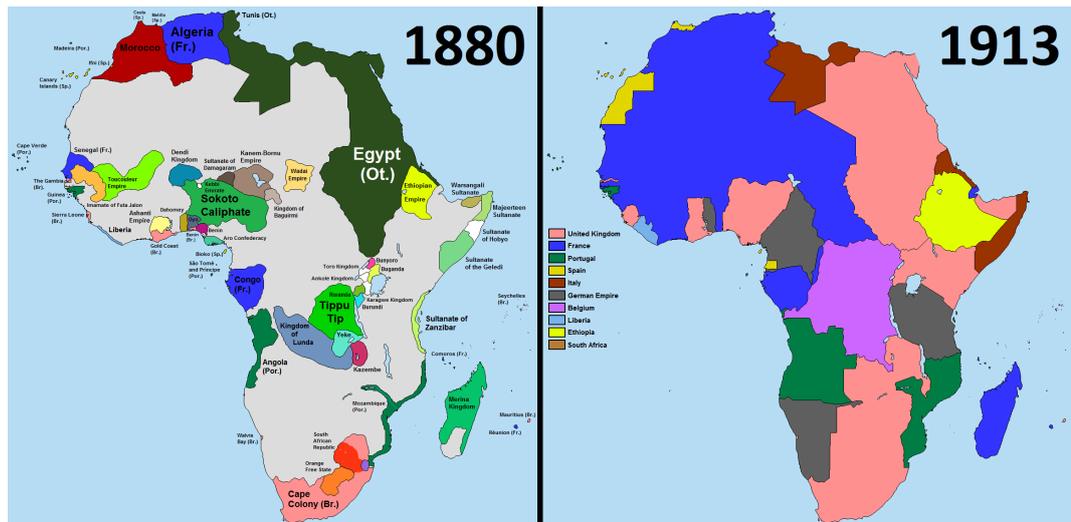


Figure 7: National sovereignty in Africa following the colonial claims made during the Berlin Conference of 1884-85 [11].

foment in the present day: the recession of the colonial powers did not suture the continent; instead states were established along much the same lines, leading to irredentism between borders and tension within them [10].

As Google Maps becomes the de facto map of the world, it becomes the arbiter of the world's shape. As such, it becomes more problematic for Africa that it uses the popular Mercator projection [12] (figure 1). The Mercator projection is particularly misrepresentative of Africa, which straddles the equator and hence appears relatively much smaller than it should. This has led to several graphic designers and data journalists creating infographics to correct the misconception, such as that in figure 8. The ideal, perhaps, is to default to Google Earth's three dimensional globe, but limitations in access to fast mobile processors will prevent such a change for several years, were it planned.

The advent of Google Maps offered a possible reconciliation for Africa's strained relationship with cartography. Finally, a complete and precise map might be maintained. However, whether due to Western bias, monetary incentive or simply the difficulty of the task, Maps has not yet achieved full road coverage [13], [14], still lacks a great many features [15], and is missing important landmarks such as hospitals or even whole towns [16]. In 2008 Google Maps took inspiration from OpenStreetMap's collaborative to allow users to submit geometry, crowd-sourcing its data acquisition, but this remains an ongoing project.

This lack of completeness is an inconvenience, but can have dramatic consequences in the context of humanitarian crises.



Figure 8: An infographic indicating the true sizes of various countries relative to Africa (contrary to the Mercator projection). Retrieved from [17].

### 3 OpenStreetMap

"So we now use the country itself, as its own map, and I assure you it does nearly as well."

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*Sylvie and Bruno Concluded*  
Lewis Carroll

The OpenStreetMap (OSM) [18] project was started in 2004 with the ambition of independently matching such data sources as Ordnance Survey, Google Maps and other governmental and private mapping projects, relying only on user contributions to an originally blank canvas. All data on OpenStreetMap is owned by its creators and free from any copyright restrictions or terms of use. In a sense, OSM represents the democratisation cartography, and puts people in direct control of the maps they use for the first time.

While there are places in the world where OSM does not compete in utility with Google Maps – at least from the perspective of a non-expert – OSM has extra capabilities targeting Geographic Information Systems (GIS) and other fields of expertise. OSM's strength is found in places otherwise begotten by commercial interest, such as many parts of Africa, where the population can map their own surroundings.

Another unique capability of OSM is to present temporary representations of the world in response to crises or special events, which has led to the formation of the Humanitarian OpenStreetMap Team (HOT) [19] which is, as of writing, involved in mapping the areas affected by the Ecuador earthquake of 16th April 2016, both performing detailed mapping and indicating disaster-specific information such as blocked roads and temporary aid centres. While this is an undoubtedly positive initiative, there have been observations that the mostly Western HOT members impose Western priorities on the newly created maps which, while useful at the time, obstruct local communities' best use of the service in the aftermath of disasters.

Several other interesting phenomena have cropped up in the OpenStreetMap world. For example, language barriers and national self-interest have led to communities forming independently within each country, each with their own styles, methodologies and standards, but curating different sections of the same map. Another interesting ontological aspect can be found in the OSM Disputes wiki page [21] – where disputes over placenames and map features mirror historic strife (e.g. Derry *versus* Londonderry in Northern Ireland, Greek names *versus* Turkish

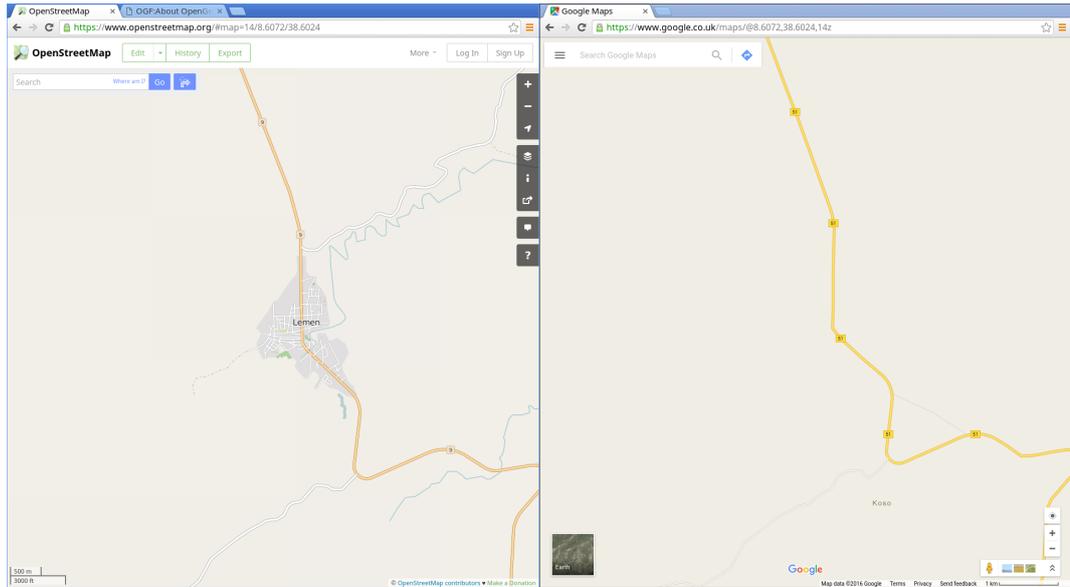


Figure 9: The town of Lemen in Ethiopia, absent from Google Maps, but complete with street mapping in OpenStreetMap. Retrieved from [18], [20].

names in Cyprus). One can imagine that, with wider public engagement, OSM's disputes may present an early warning and geospatial indicator of rising regional tensions and conflict. Finally, OpenGeofiction [22], those less interested in a poor reflection of the real world have found the potential in OSM to create a new one entirely of their own.

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