



(RESEARCH ARTICLE)



STREET ADDRESSING AND STREET RENAMING IN YANTALA (NIAMEY, NIGER): A GIS TO INVENTORY PUBLIC GREEN SPACES AND TRACK RENAMED STREETS

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ABSTRACT

Since 2023, Niamey has been renaming some of its streets and squares, while its addressing system still relies on a 2004 plan. This study examines how a geographic information system can, at the neighbourhood level, both inventory public green spaces and track street renaming. A database of six feature classes, designed in ArcGIS, stores for each street its 2004 code, former name, and new name. It is shared in KML format. The September 2026 survey in Yantala covered the 21 segments of named streets, 11 new names, the neighbourhood's 3 public green spaces and 15 control points; seven municipal officers tested the tool. No street-name sign has ever been installed, and no new name is displayed. Six of the 11 new names relate to arts and culture; 2 refer to women. Green spaces cover 3,436 m², about 0.04 m² per inhabitant, and the Château I garden has lost 82% of its area to a restaurant. The positional error (RMSE) is 0.19 m. With the tool, the officers completed all 21 tasks; with the current method, only 9. The mean usability score is 92.9/100. The GIS is currently the only medium in which codes, former names, and new names coexist; it can serve as a common reference for municipal services.

Keywords: GIS; Street Addressing; Street Naming; Urban Green Spaces; Niamey

1 INTRODUCTION

Street addressing is “an operation that makes it possible to locate a plot or a dwelling on the ground, that is, to ‘define its address’, using a system of maps and signs” [1, p. 2; our translation]. For a municipality, it helps locate and register taxpayers, plan technical services and guide emergency services [1, p. 3].

In Niamey, addressing was built in stages. The first street-naming operation was carried out in 1982 by the city, in collaboration with the Institute for Research in Human Sciences (IRSH) [2]. An addressing operation was then conducted in 2002 with the support of the International Association of Francophone Mayors [1, p. 15]. The resulting plan, dated 2004, divides the city into addressing zones; each street receives a code made of the zone's initials and a serial number, for example GM 36 for the 36th street of the Grand Marché zone [3].

This system is now being revised. A commission set up by the Ministry of Youth, Culture, Arts and Sports proposed new names for boulevards, avenues, streets, roundabouts and squares [4]. On 15 October 2024, Avenue Charles de Gaulle was thus renamed Avenue Djibo Bakary, and Place de la Francophonie was renamed Place de l'Alliance des États du Sahel [2]. The movement extends beyond Niger: in Dakar, name changes since independence have left some colonial principles intact, such as the street hierarchy and the numbering of some neighbourhoods [5].

Geography analyses place names as political acts that reveal power relations and competing representations of space. Giraut *et al.* distinguish three naming contexts: revolution, which erases previous names; restitution, which gives names back to formerly dominated groups; and the construction of new territories [6]. Work on African cities highlights the colonial legacies and entangled histories embedded in street names [7]. A name, however, only exists in the city if it is inscribed: on a sign, on a map, in a database [8].

This inscription raises a practical problem. After renaming, three systems coexist: the 2004 code, the new official name and the name in everyday use. If signs, maps and databases are not updated together, wayfinding becomes harder. Public green spaces raise a comparable knowledge problem: Niamey has only 6.04 m² of green space per inhabitant, and 58.46% of respondents cannot reach one within a 15-minute walk [9]. The city's green belt is under pressure from urbanisation [10], and 38.64% of the green spaces surveyed in four Sahelian cities of Niger are not maintained [11]. Yet the municipal department responsible for these spaces maintains only a list of sites, without geometry or a visualisation tool (interview with the Director of the Environment, City of Niamey, 2024).

This article asks: how can a GIS serve, at neighbourhood level, both to inventory public green spaces and to track street renaming? The hypothesis is that a single reference database that stores codes, former names, and new names makes this information faster for municipal officers to access than the current media.

2 MATERIAL AND METHODS

2.1 Study area



Figure 1: Addressing zones and street-numbering direction in the Niamey addressing plan

Source: City of Niamey, 2004 [3].

Niamey had 1,026,848 inhabitants at the 2012 census [12]. The Yantala neighbourhood belongs to the Niamey I district, on the left bank of the Niger River, in the north-west of the city. It comprises Yantala Haut and Yantala Bas. Its streets belong to two addressing zones of the 2004 plan, Yantala (YN) and Yantala Ancien (YA) (Figure 1). In each zone, even-numbered streets are numbered from the river outwards, and odd-numbered streets from either side of a vertical axis outwards [3]. At the 2012 census, Yantala had 50,981 inhabitants, including 33,691 in Yantala Haut and 17,290 in

Yantala Bas [13], over an area of 1.74 km² (Niamey I district council), i.e. about 29,300 inhabitants per km². Using the annual growth rate of 3.69% adopted by the National Institute of Statistics [14], its population is estimated at about 84,700 inhabitants in 2026. Yantala was chosen because several of its streets and roundabouts are among those proposed in 2024, and because it hosts green spaces of various types.

2.2 Data and database design

Data came from municipal services (list of green spaces, 2004 addressing plan), the National Geographic Institute of Niger (district boundaries), the 2024 commission report and a field survey. Streets were digitised on Google Earth satellite imagery.

The database was designed using the Merise method in six feature classes (Table 1) and stored in a file geodatabase in ArcGIS 10.8, using the WGS 84 / UTM zone 31N system (EPSG:32631). Each green space and each roundabout belongs to a single district; since a street may cross several districts, the street–district relationship is many-to-many. To track renaming, each street keeps its 2004 code, its former name and its new name, with a reference to the document that establishes it: no identifier is overwritten (Figure 2).

Table 1: Feature classes of the database

Feature class	Geometry	Main attributes
District (arrondissement communal)	Polygon	Code, name
Public green space	Polygon	Code, name, type, area (m ²), condition score (1–5), layout, facilities
Boulevard, Avenue, Street (3 classes)	Line	2004 code, former name, new name, reference document, name sign, house numbers, surface type
Roundabout	Polygon	Former name, new name, connected streets, layout

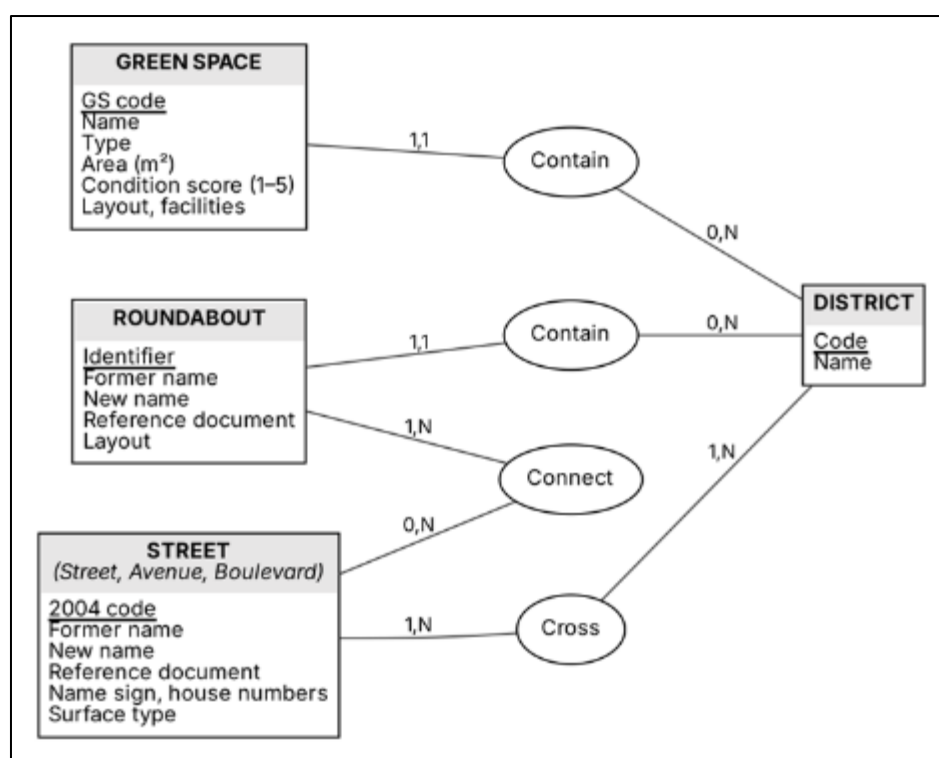


Figure 2: Conceptual data model (Merise notation)

To allow officers to consult the database without GIS software, the layers were converted to KML and published in Google Earth Pro and Google Maps. Each object displays its attributes, including the former and new names of roundabouts (Figure 3). This allows consultation on computers and smartphones, but not updating of the database.

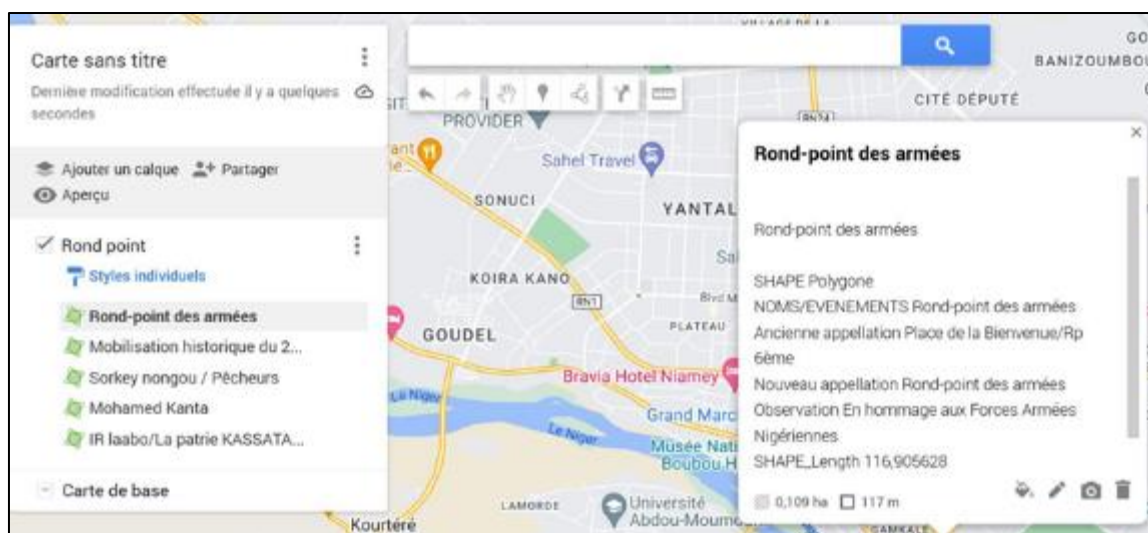


Figure 3: A renamed roundabout as displayed in the Google Maps database layer

Source: interface in French (2024)

2.3 Field survey

The survey took place from 8 to 14 September 2026 using five standardised forms. Form A described the 21 segments of named streets in the neighbourhood (name sign, house numbers, surface type, renaming); the other streets of Yantala carry only a code. Form B described the neighbourhood's three public green spaces, the only ones that exist, and recorded their vertices; their condition was scored from 1 (very degraded) to 5 (very good) using the same grid for all sites. Form E listed the new names in Yantala, based on the commission's list [4], and classified them by category; the five roundabouts in question were located via GPS. Positions were recorded with an Android smartphone running the Mobile Topographer application, with a displayed accuracy of 0.40–0.70 m.

2.4 Accuracy and usability assessment

Positional accuracy was assessed at 15 well-identified points (roundabouts, crossroads, buildings) across Yantala. For each point, the distance between the position stored in the GIS database and the position surveyed in the field is $d = \sqrt{(\Delta X^2 + \Delta Y^2)}$; the root-mean-square error (RMSE) is the square root of the mean of d^2 .

Usability was assessed with municipal officers. Each officer performed three tasks with the tool and with the current method (list and paper map): find a street by its new name (T1), find a green space and its area (T2), and list the green spaces in poor condition (T3). Time and success were recorded. All officers started with the tool and then used the current method. A task not completed within 5 minutes was recorded as a failure. The officers then completed the validated French version of the System Usability Scale (F-SUS), which yields a score from 0 to 100 [15].

3 RESULTS AND DISCUSSION

3.1 No street signs: the GIS as the only medium for names

Table 2: Addressing status of the street segments surveyed in Yantala (Form A, 8 September 2026)

Indicator	Streets	Avenues	Boulevards	Total
Segments described	5	12	4	21
With a legible name sign	0	0	0	0 (0%)
With house numbers	0	0	0	0 (0%)
Laterite surface	5	12	1	18 (86%)
Renamed in 2024	5	1	0	6 (29%)

The 21 segments described comprise 5 streets, 12 avenues and 4 boulevard segments (Table 2). Code YN 70 designates a single road made of two segments bearing two names, Boulevard Mali Béro and Boulevard Mali Béro Ouest. The

clearest result is the complete absence of signage: none of the 21 segments has a street-name sign, and none shows house numbers. Eighteen of the 21 segments (86%) are laterite; only the two segments of Boulevard Mali Béro and Boulevard des Sy et Mamar are paved.

This finding changes the scope of the tool. The 2004 plan provided for street-name signs and house numbers [3]; according to a city official, no sign has ever been installed in Yantala (interview, 16 September 2026). Before 2024, the five renamed streets were identified only by their codes (YN 12, YN 80, YN 132, YN 221, YA 62), as was Avenue de Tillabéri (YN 42); these codes are displayed nowhere on site. Under these conditions, an address exists only in city documents. In the sense of Rose-Redwood *et al.* [8], the inscription of names is therefore first cartographic and digital: the GIS is not a complement to signage; it stands in for it until signs are installed.

3.2 New names: a cultural restitution not yet visible on site

Across Niamey, the commission's list assigns 100 new names to existing streets and squares: 58 streets, 31 roundabouts and squares, 7 avenues and 4 boulevards [4]. Eleven of these assignments concern Yantala: 5 roundabouts, 5 streets and 1 avenue. Boulevard de la Jeunesse (YA 23) and the Château I, Château 8 and Gadafawa squares keep their names. Table 3 classifies the 11 new names by category.

Table 3: Categories of the 11 new names recorded in Yantala (Form E; commission's list [4])

Category	Number	Examples
Arts and culture	6	Rue Tinguizi Mabo, Rond-point Inoussa Ousseini, Rond-point Gadafawa
Historical event	2	Rond-point Sar-Sar, Rond-point de l'Honneur
Pre-colonial historical figure	1	Rond-point Mohamed Kanta
Economic and social life	1	Rue Hamidou Sâley dit Elh. Tchana
Other	1	Avenue de Tillabéri
Total	11	including 2 women (18%); no sign installed

Six of the 11 new names relate to arts and culture. Five honour Nigerien artists, such as the songwriter Tinguizi Mabo, the musician Chaibou Ayerou and the cultural animator Aïchatou Tahirou known as Dalweyzé; the sixth, Gadafawa, is the name of a fossil site in the Agadez region [4]. This predominance is not specific to the neighbourhood: across the city, all 58 renamed streets take names from the list's "men of culture and sportsmen" category [4]. In Giraut *et al.*'s typology [6], this naming falls mainly under restitution: it inscribes in public space people previously absent from official toponymy. Two names fall under revolution. Rond-point Sar-Sar, which replaces "Rond-point Cimetière", recalls the massacre committed by the Voulet-Chanoine mission in Niamey [4]. Rond-point de l'Honneur, formerly the "roundabout between the Libyan and French embassies", marks the end point of the 28 July 2023 mobilisation [4]: it inscribes a very recent political event in urban space.

The share of women remains small: 2 of 11 names in Yantala (Aïchatou Tahirou known as Dalweyzé and Ramatou Doudou known as Bouli Kakassi), and 8 of 100 across the city [4]. As in Dakar [5], the change concerns names but neither the street hierarchy nor the coding, which remains that of 2004. Above all, none of the 11 new names was displayed on site at the time of the survey, in September 2026. The renaming exists in the commission's list and in the GIS database, but not yet for people moving through the neighbourhood.

3.3 Inventory of green spaces

Table 4: Characteristics of the public green spaces surveyed in Yantala (Form B, 12 September 2026)

Site	Area (m ²)	Area in city list (m ²)	Trees	Ground cover	Condition score	Uses
Gadafawa	2,563	2,403.5	0	25–50%	3 (fair)	Leisure
Château 8 (roundabout)	508	462	1–10	50–75%	4 (good)	Leisure, trade
Château I	365	1,983	1–10	> 75%	5 (very good)	Leisure

Yantala has three public green spaces, all public gardens, landscaped, managed by the city and freely accessible (Table 4). Gadafawa and Château 8 have benches, lighting and litter bins; no encroachment or damage was observed at any of the three sites.

The 2024 database offers a first point of comparison: Gadafawa was then classified as “degrading”, and Château 8 and Château I as “very good”. As the two grids differ, the comparison remains qualitative; it nevertheless suggests that Gadafawa has not deteriorated further (score 3, “fair”, in 2026), that Château 8 remains in good condition (score 4) and that Château I remains very well maintained (score 5). For Gadafawa and Château 8, the recomputed areas are close to those in the municipal list (+6.6% and +10.0%), and the new survey corrects an error in the original database, where the first vertex of Gadafawa lay almost 1.5 km from the site.

Château I is a different case: although well maintained, the garden has lost most of its area. The city list gives it 1,983 m²; only 365 m² remain, a loss of 82%, because the city converted part of the garden into a restaurant (field observation, 16 September 2026). In total, Yantala’s public green spaces cover 3,436 m², i.e. 0.07 m² per inhabitant in 2012 and about 0.04 m² in 2026. Even though the study by Moussa *et al.* uses a broader definition of green spaces, the gap with the mean of 6.04 m² per inhabitant measured in Niamey [9] is two orders of magnitude. The partial disappearance of Château I also shows that, without a georeferenced inventory, the loss of a public green space can go unnoticed in city documents.

3.4 Positional accuracy

Over the 15 control points, the mean deviation is 0.14 m, the RMSE 0.19 m and the maximum deviation 0.45 m (point CP8, Baclini). Only two points exceed 0.30 m (CP7 and CP8). These values remain below the accuracy displayed by the device (0.40–0.70 m) and are largely sufficient for neighbourhood-level use: locating a roundabout, a street or a green space.

3.5 Usability of the tool

Seven city officers took part in the assessment from 13 to 17 September 2026 (Table 5): two from the technical services, three from the Department of the Environment and Landscaping, and two from other services. Three had never used a GIS. With the tool, all seven officers completed the three tasks, i.e. 21 tasks out of 21. With the current method, they completed only 9 out of 21 within the 5-minute limit, and none completed task T3, which requires comparing several sites (Figure 4).

Table 5: Officers’ profiles and assessment results (Form D, 13–17 September 2026)

Officer	Service	GIS use	Tool: total time	Tool: tasks completed	Current method: tasks completed	F-SUS score
AG1	Technical services	Often	2 min 10 s	3/3	2/3	95
AG2	Technical services	Often	1 min 35 s	3/3	2/3	87.5
AG3	Environment	Never	5 min	3/3	1/3	97.5
AG4	Environment	Sometimes	3 min 30 s	3/3	2/3	90
AG5	Environment	Never	4 min	3/3	0/3	95
AG6	Other service	Never	8 min	3/3	0/3	90
AG7	Other service	Sometimes	3 min 30 s	3/3	2/3	95
All			4 min (mean)	21/21	9/21	92.9

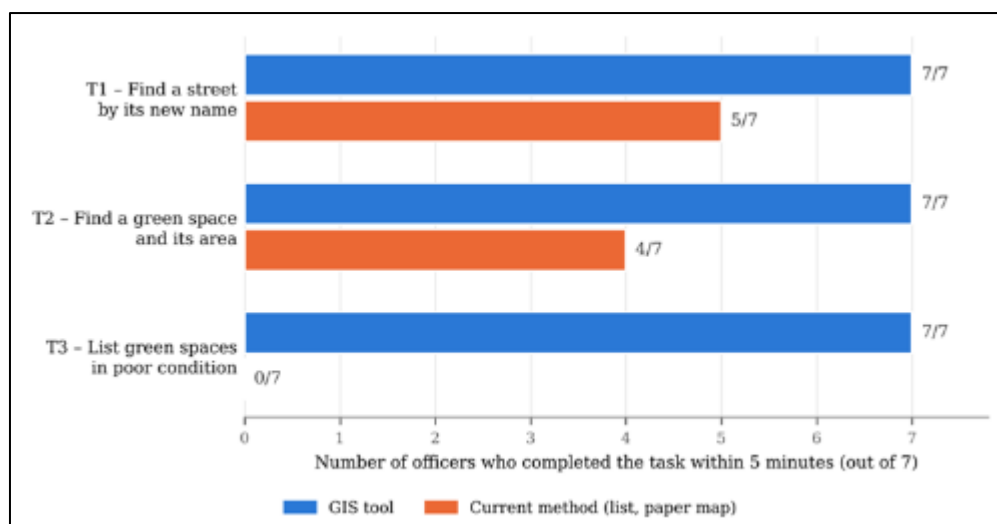


Figure 4: Number of officers who completed each task within 5 minutes, with the GIS tool and with the current method (n = 7)

With the tool, the mean time is 61 s for T1, 63 s for T2 and 1 min 54 s for T3. Officers who had never used a GIS were slower (5 min 40 s on average for the three tasks) but all finished; two of them completed no task with the current method. When the current method succeeds, it takes on average 3 min 24 s for T1 and 3 min 15 s for T2.

F-SUS scores range from 87.5 to 97.5, with a mean of 92.9. They are of the same order in the three groups: 94.2 for the Department of the Environment, 91.3 for the technical services and 92.5 for the other services. The officers mention as main benefits the “quick location of sites”, the “time saving”, the possibility to “plan a development mission” and a “working tool”.

4 CONCLUSION

This article shows that a simple GIS, built with common tools, can serve both to inventory public green spaces and to track street renaming at neighbourhood level. In Yantala, no street-name sign has ever been installed and none of the 11 new names is displayed yet: the GIS database is currently the only place where 2004 codes, former names and new names coexist. The inventory also reveals the scarcity of green space in the neighbourhood, about 0.04 m² per inhabitant, and the loss of 82% of the area of the Château I garden. Tested by seven officers, three of whom had never used a GIS, the tool enabled them to complete all the tasks, against fewer than half with the current media, and was rated highly usable; a broader assessment should confirm these results. For the city, the challenge is now to move these names from the database to the street, by installing signs, and to make the GIS the common reference for the services in charge of addressing and green spaces.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

All officers who took part in the assessment of the tool gave their oral consent; their answers were collected anonymously.

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