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Questioning participatory approaches and the digital shift in southern cities

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Mapping a slum: learning from participatory mapping and digital innovation in Cotonou (Benin)

Questioning participatory approaches and the digital shift in southern cities

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EDITOR'S NOTE

This article is the translation of: Mettre un quartier sur la carte : Cartographie participative et innovation numérique à Cotonou (Bénin)

The « Map & Jerry » project was supported by the French National Research Institute for Sustainable Development (IRD) thanks to the « coup de Pouce » grant. We would like to warmly thank the IRD representation in Benin, the IRD Innovation division and the UMR8586 PRODIG. We are grateful to our partners for this fantastic collaboration: Médard Agbayazon (Blolab manager) and Sam Agbadonou (OpenStreet Map Bénin President), geographer colleagues from the Université d'Abomey Calavi. Grateful thanks are extended to M. George Gnonlonfon, the chief of Awansouri-Ladji neighbourhood, to the inhabitants of Ladji for their enthusiastic and warm welcome at all stages in this project, and to our friends Marie-Auxiliatrice, Edmond, Aimé, Jonas et Mathias : "We are together !"

- 1 "When I leave the university campus and tell the motorcycle taxi to take me to Ladji, he asks me: where is Ladji?", explains Edmond, 25, a young resident of Cotonou, Benin's economic capital. It's important to point out that his district, Awansouri-Ladji, does not exist on the official map of the city. At best, in the collective imagination, Ladji refers to a poor neighbourhood depicted in depreciative terms: the area is perceived as a dump where Cotonou's waste is stored. The district is regularly subjected to floods and suffers from a lack of infrastructure and basic services (electricity, drinking water, health, waste

management, etc.). The inhabitants are also described pejoratively: they are said to be "squatters who have occupied this area anarchically for two centuries" (Vigninou et al., 2013), living on the water in huts on stilts or on garbage, which they use to fill in the shallows and banks. Their absence on the official map of the city is all the more problematic and surprising since these inhabitants are historically the first occupants of the city: their presence is attested since the end of the 17th century (Ciavolella, Choplin, 2018). Today, more than 7,000 people live in the area, half of whom are under 18 years of age (Insaë, 2016). In addition, this district is centrally located in the heart of the city, just a stone's throw from the Dantokpa market, the largest market in West Africa. At the interface between Lake Nokoué, the channel and the central districts, it constitutes a strategic location for the authorities, who see this "lagoon front" as an area with strong capitalist potential. In its Government Action Plan unveiled in November 2016, the Beninese government made the development and sanitation of the riverbanks a priority. Future road infrastructure to relieve congestion in the city centre is expected to pass through the area. The word "eviction" is in every mouth and mind.

- 2 It is in this context of both invisibility and emerging interest in these marginal spaces that the Map & Jerry project was carried out. Funded by the 'Institut de recherche pour le développement' (IRD)¹, this action-research project conducted in 2018 was conducted by IRD Benin in partnership with a FabLab of Benin², the BloLab and the OpenStreetMap Benin community (OSM)³. Its initial aim is to produce a map of the Ladji district with its inhabitants in order to show it on the Cotonou map, drawing on work on the collective production of cartographic knowledge (Hirt, Roche, 2013; Joliveau et al., 2013; Lefebvre et al., 2017), including participatory geographical information systems (PGIS) (McCall 2015; Rambaldi 2015)⁴. It is also about familiarizing residents with digital technology, by inviting them to make computers from recycled electronic components. The project is therefore part of a "frugal" innovation approach which, in the spirit of the Indian concept "Jugaad", aims to meet the needs of the poorest in the simplest and most efficient way possible (Radjou et al., 2013; Haudeville, Le Bas, 2016). This is particularly suited to contexts of precariousness and vulnerability, which favour DIY and access to new technologies with low investment costs.
- 3 This paper proposes to report on this experience of participatory mapping, in its potentialities and limitations. If the Map & Jerry project has made it possible to put the Awansouri-Ladji district on the map, we wonder about the production of this map and its impacts, particularly social and political, on residents and local authorities who are unfamiliar with mapping tools. The reflection also focuses on "digital innovation", while the smart city model is spreading on both sides of the planet (Picon, 2015; Douay, 2018). The article analyses the discrepancies that can exist between the digital injunction, sometimes presented as the solution to problems in the Global South, and the obstacles encountered in poor neighbourhoods of southern cities, where connection to the "grid" (electricity) or the "network" (internet) is a daily challenge. The question of the sustainability of this type of project is also raised, particularly with regard to the skills truly acquired by the population, in a district whose very existence is threatened by future urban transformations.

Participatory mapping

From top down to bottom up: empowerment and democratization

- 4 Recent work focuses on the impacts of interactive and collaborative mapping made possible by the development of web 2.0. This new "*cartographic factory*" (Joliveau et al., 2013) is challenging since it sometimes competes with these institutions, particularly the State which, until recently, mastered cartographic tools and trained its experts who had the authority and legitimacy to produce knowledge on the territory. The proliferation of "*small web maps*" (Noucher, 2017) raises many questions, first of all about their uses and authors (Mericskay, Roche, 2011). These maps can be produced by private groups (Google Maps since 2005), but also open data communities, such as OpenStreetMap, which has more than 4.3 million members worldwide, including 1.18 million contributors⁵, or ordinary individuals. In a few years, the production of maps, until then exclusively top down since it was an attribute of power, has thus also become a bottom up process, widening the spectrum of its possible uses, but also of its possible abuses. The "*power of maps*", to quote Brian Harley (1988, 1989), has long been concentrated in the sole hands of the rulers, and one thinks in particular of the colonial maps that participated in European imperialism in the African case under consideration (Blais et al., 2011). This power and knowledge is reportedly being shared through these communities of mapping agents, as illustrated by the various participatory urban mapping (or PGIS) experiments identified by Mr. McCall (2015). By moving from a "*consultation internet*" to a "*contribution internet*" (Joliveau et al., 2013), participatory mapping could be presented as a factor of democratization and empowerment of local communities in the face of existing powers (Amelot, 2013; Mericskay, Roche, 2011 ; Fox et al., 2005 ; Rundstrom, 1991). It would allow land claims to be defended and alternative representations to official maps to be produced. The map would then become an empowerment tool for minorities or marginalized groups, as has been the case for the Mapuche in Chile who used these maps to assert their indigenous rights (Hirt, 2009; Hirt, Roche, 2013). It would be a language of social protest, a tool for territorial negotiation, a militant object (Nonjon, Liagre, 2012) to support struggles, especially urban ones.
- 5 It is with this in mind that several international communities, including the highly influential Slum Dwellers International (or Shack dweller International, also commonly known as SDI), have emphasized in recent years the importance of collaborative mapping for the recognition of poor urban populations⁶. Since 1996, this international network has aimed to give voice to the World's urban poor and thus enable them to fight against the evictions of which they are frequently victims. The method used to have the right to the city recognised for these communities (Community Based Organisation -COB-) is based on three major components: the census of inhabitants (enumeration), the diagnosis of the precarious neighbourhood (profiling) and its mapping, all carried out by the inhabitants themselves (Patel, Baptist, 2012)⁷. Through the "*Know your city*" program, the SDI network assumes that residents are more able to resist eviction policies once they have been able to document their existence themselves. The objective of the Map & Jerry project was not initially to describe the neighbourhood using the grid used by SDI. But, knowing this network and how it works, we were inspired by this community-driven data collection and participatory mapping method, produced in a bottom up manner, i.e. by the

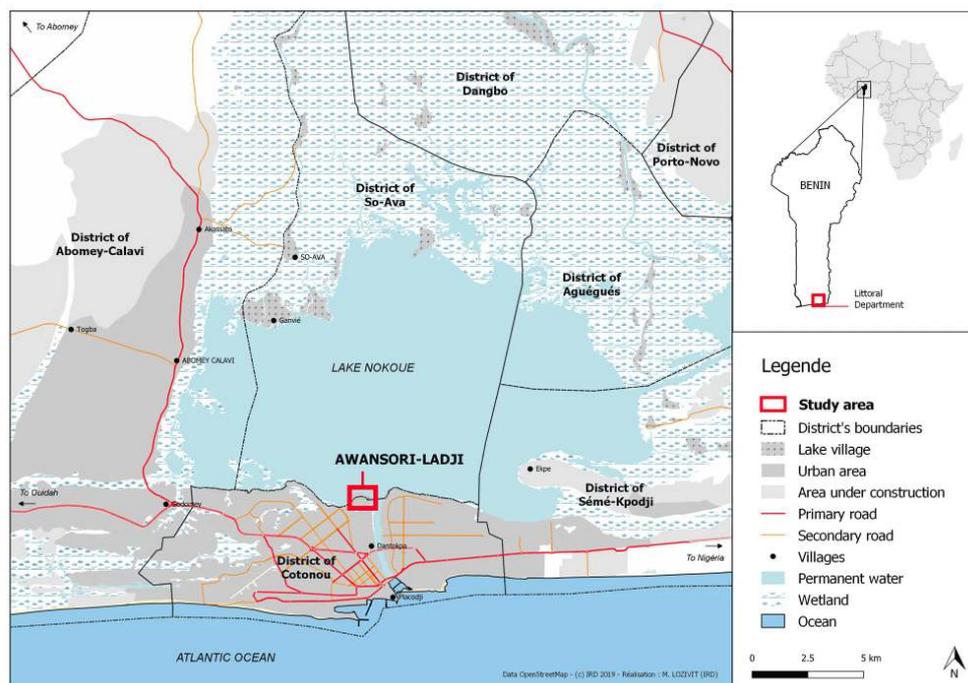
inhabitants themselves who are best placed to remind the world of their existence. A few months after the start of our project in Ladji, we learned, without much surprise, that a delegation of SDI, from Nigeria, was preparing to train people in the neighbourhood, to "empower" them to face the announced evictions⁸. It is therefore inspired by all these examples of participatory mapping, their successes and failures, and with the expertise and skills of our two partners, BloLab and the OpenStreetMap community, very active in Benin, that we launched the Map & Jerry project in January 2018.

Map & Jerry, a participatory mapping project

An "off the map" neighbourhood

- 6 Awansouri-Ladji, or more commonly known as "Ladji", is a district located north of Cotonou on the lagoon banks at the interface between the channel and Lake Nokoué (map 1). Built both on land and on water, it is one of the city's historic districts, founded at the end of the 17th century by people fleeing the slave raids of the Kingdom of Dahomey (Ciavolella, Choplin, 2018)⁹. Since then, in this refuge area, the populations have made a living from fishing and river trade, the main resources of the lake. But their incomes and living conditions deteriorated from the 1970s onwards, with the decline in fish stocks. Fishing is no longer a sufficient economic opportunity; there is a lack of work and activities, especially for young people, even graduates. Many make a living from resourcefulness, earning some subsidies through handicrafts, small-scale trade (the Dantokpa market, the largest in West Africa, is only 2 kilometres away), or trade with Nigeria (including gasoline smuggling - Lagos is 130 km as the crow flies and 5 hours by pirogue through the lagoon).

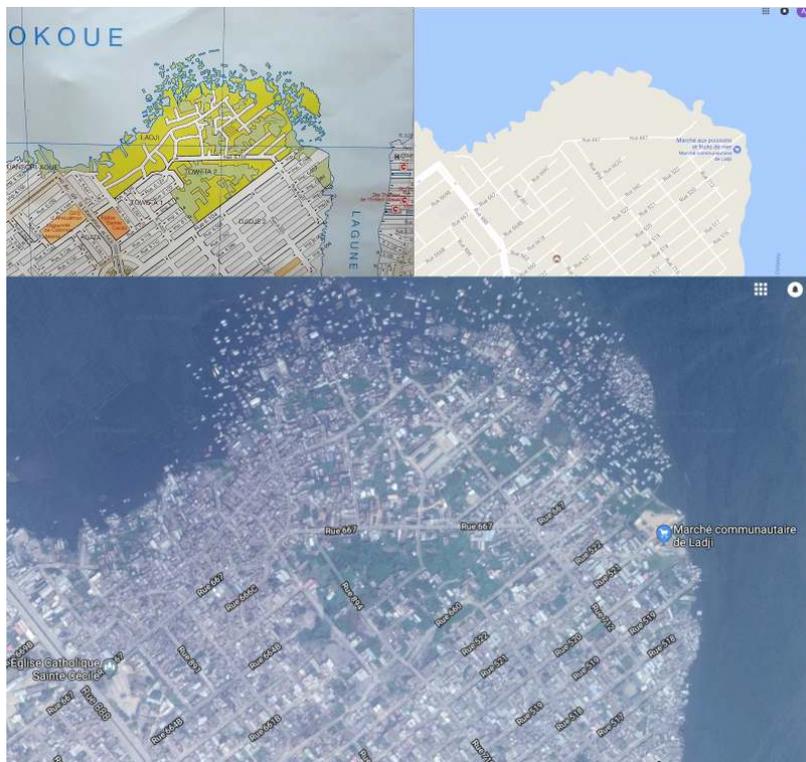
Figure 1: Location of Ladji district, Cotonou, Benin



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- 7 This district, although a historic core, does not appear on the maps of Cotonou. In the Cotonou Address Plan (ed. 2015), Ladji appears "in green", like an unoccupied swamp. In the legend, the area would be "urbanized, under development or in need of restructuring". Similarly, on the Google map, the area shown is empty, with no tracks, infrastructure or buildings. Ladji doesn't exist, and neither do its inhabitants. The latter are in an irregular situation in the eyes of the law: the 2013 Land and State Code stipulates that the lagoon banks are non aedificandi and their occupation is illegal. This area is declared State property. This text does not take into account the indigenous presence of more than three centuries. It does not recognize any land transactions, although they are numerous in practice, since on land and water, each parcel has its owner, indigenous or an outside "acquirer", recognized by customary law. These inhabitants, owners or tenants, are not considered legitimate in the eyes of the authorities. They do not exist, neither in the minds nor on the map....

Figure 2: Top left: Ladji district on the Cotonou Address Plan (ed. 2015). On the right, the Ladji district on the Google map (2017). Below, the Ladji photo-aerial, a semi-lacustrine district (2017).



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Figure 3: Awansouri-Ladji, semi-lake district of Cotonou, Benin



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The Map & Jerry project: a map and computers

- 8 Putting the neighbourhood on the maps was the aim of the Map & Jerry project. The objectives are of a social, political and development nature: (i) to create a map with the inhabitants in order to make them visible and give a voice to those without a voice (and without a map), (ii) to democratize access to digital technology for populations who are far from it, due to a lack of both technical and financial resources; (iii) to identify problems and needs in terms of urban development, particularly on the issue of waste, in order to alert the authorities and encourage them to intervene. Three specific and integrated actions are carried out, focusing on learning by doing and empowering participants:
- 9 1. Jerry phase: the first step is to introduce the inhabitants to digital technology and provide the neighbourhood with computer equipment, both for the rest of the project and for future daily needs (office automation, administration, apprenticeship...). To do this, we used the Jerry DIT (Do It Together) model, which promotes the collective manufacture of computers based on recycled components and assembled in a plastic container (Jerry comes from the term jerrycan). These computers are equipped with free operating systems (Emmabuntus, Ubuntu), which require little energy and RAM. In Africa, this principle is presented as a low-cost solution to deal with the lack of computer equipment, its high cost, and the accumulation of electronic waste. This first workshop for the manufacture of jerrys lasted 8 days, gathering 40 people, from 18 to 55 years old, and with various profiles: fishermen, students, unemployed people, traders. Women accounted for a quarter of the participants. At the end of the workshop, 17 jerrys were assembled.

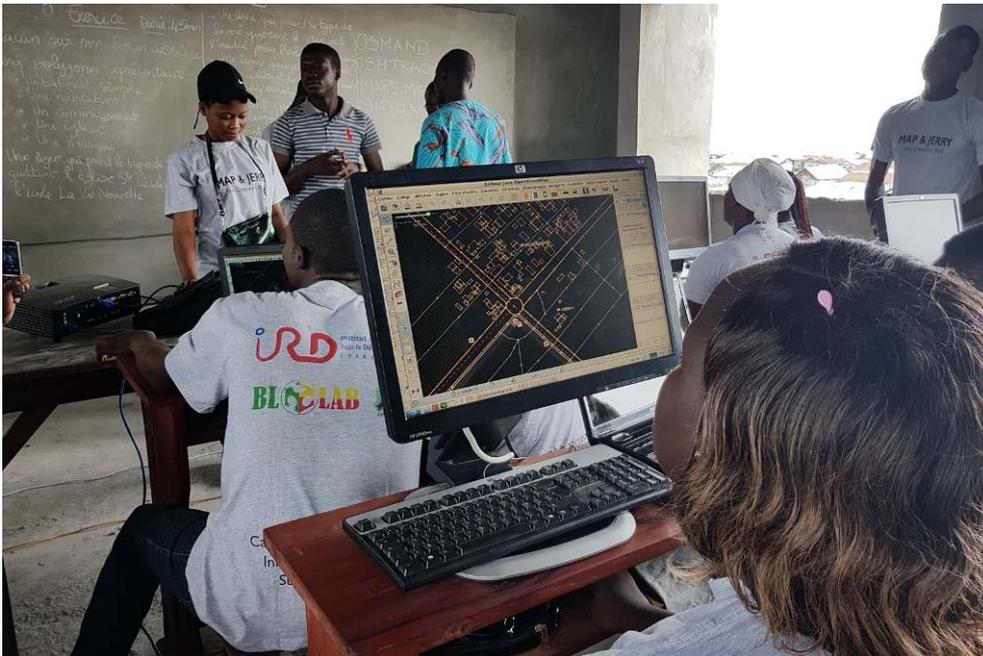
Figure 4: Introduction to the Linux interface on *jerrys* assembled in the plastic cans



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- 10 2. Mapping phase: it is then a question of using computers equipped with free software to map the neighbourhood with the inhabitants, using the OpenStreetMap methodology. Now initiated in NICTs¹⁰ and equipped with computer equipment, the 36 participants of this second workshop discovered the reading of a geo-referenced map and were trained in the knowledge and mastery of cartographic editing tools (JOSM) or free mobile applications (OSMand, OSMTTracker, Mapillary) used to create cartographic content (lines, points, photographs...). Mental maps were produced at the beginning of the workshop in order to compare each person's individual representations of the district and their position in the city with the final collective production. After this essential part to acquire the basics of mapping, they went to collect the points of interest of the district in order to give it life on the map. Using smartphones, they located existing infrastructure (power poles, water points, schools, dispensaries, religious buildings, latrines, etc.) as well as businesses and wild dumpsites. They then collected some common names of streets, squares, opinions on neighbourhood boundaries, or stories of past developments from resource people. Finally, they represented the area through geolocated photos via the Mapillary mobile application¹¹. Accessible for free on the Internet, these images make it possible to offer visibility at a moment's notice on the urban reality of a district that is not easily accessible for google services, especially in its lake area. Finally, they provide an opportunity to monitor its evolution in a context where major urban developments are to come. After cleaning and formatting, the map was presented in June 2018 to representatives and influential people from Ladji and the surrounding areas who were interested in the process.

Figure 5: Introduction to Java OpenStreetMap Editor (JOSM) on a jerry



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- 11 3. Track your Trash phase: the third part finally aims to follow the path of solid household waste through the district in order to better understand their management, highlight structural problems, uses, but also existing recovery channels. After the wild dumpsites have been located on the neighbourhood map, GPS chips have been installed on certain waste products (cans, scrap metal, bottles, etc.) and residents have been able to follow them live via an innovative mobile application developed by BloLab. The results, which are currently being processed, will be shared with the public authorities to help improve their management¹².

Looking inside the map

- 12 The map factory uncovered interesting and unexpected links between the participants, the mapping tool and the digital world. The progress of the project invites a critical reflection on the contributions and limits of this participatory mapping 2.0 approach.

Technological thresholds

- 13 On an individual level, the project can be seen as a success because it has improved everyone's digital skills: from computer literacy to identifying and repairing certain failures, to manipulating mobile applications to create geographic data. Some have learned to orient themselves better throughout the city when they have access to a smartphone, the Internet, and electricity. But these results hide a very variable relationship to the map and technology from one participant to another. Many of them could not imagine space in two dimensions, locate themselves on a map, and had never touched a mouse, keyboard or smartphone, especially a few women who had to be given specific support to discover digital tools. Very quickly, we were confronted with what

Gilles Palsky calls the "technological threshold" (2013). Despite the desire to involve participants as much as possible in all the steps of creating a 2.0 map through the OSM methodology, the necessary high technical skills limited the involvement of "amateur" participants, who were far from digital on a daily basis. It should be recalled that the illiteracy rate is 33% in Ladj (INSAE, 2016).

- 14 In this work, the inhabitants were mainly involved in the collection of points of interest (POIs) in the neighbourhood through the OSMand mobile application. This app, being very intuitive and easy to learn, allowed the geolocation and characterization of nearly 200 points of interest (street names, types of roads, shops etc.) that appear today on the "OSM" map of Ladj. Some groups have also used the Mapillary application to represent their neighbourhood themselves in images and share them for free online. However, even if a period of training in the JOSM editing software was provided, this did not give them the ability to create and edit map data autonomously on the OpenStreetMap database. The digitization of buildings and streets, the cleaning of information acquired during the field phase, and their integration into the database were thus carried out by OSM Benin staff, before and after the training. Due to a lack of required skills, participants remained confined to the role of contributors, unlike OSM mappers who have the ability to edit information, change colors or even create new symbology on the database. This high level of expertise required was impossible to achieve within the time frame of the project. This would have required more training and participation time, which would have been difficult for people (mothers of families, businesswomen, unemployed young people or students), whose resources depend on daily activities.

Frugal innovation, can we do better with nothing?

- 15 These contrasting results remind us how much the digital divide is a reality in this part of the world, and even more so in these precarious neighbourhoods. While young people are well connected to Facebook, Whatsapp and Instagram, they are nevertheless subject to deep inequalities. Connecting is a constant struggle. The costs remain prohibitive with a mobile Internet connection of 100 MB costing 500 FCFA for seven days¹³, in a country where the connection speed is one of the lowest in the world. Regarding the General Census of Population and Housing, in Ladj, only 53% of the households have electricity, 2% a computer, 1% an internet connection). And 9% of the households do not have a mobile phone (INSAE, 2016).
- 16 In this context, the jerry model and the ease of access to free and open source tools used in participatory mapping invite us to consider the possibilities of overcoming the "digital divide" through frugal innovation. The project developed highlights frugal innovation (FI) in the sense that it requires few resources, both technical or technological (Haudeville, Le Bas, 2016). The definition given by Basu et al (2013) recalls that the FI's objective is to develop appropriate, adaptable, affordable and accessible services and products for emerging markets. "It's not just a low-cost concept. It offers three other dimensions to be optimized: simplicity (accessible to all), sustainability (important for the environment), and quality" (Eagar et al., 2011, p. 9). Thus, it aims to serve the poorest populations, without lowering the quality of the tools manufactured. Finally, the concept of FI is sometimes understood as that of *jugaad* innovation, i.e. specific engineering aimed at doing more with less to meet the needs of the poorest, while minimizing the use of scarce natural resources (Radjou et al., 2013)¹⁴. It leads to a technological construction

that is not very sophisticated, but which responds directly and more to a need without simplifying it. In this respect, it is sometimes likened to DIY, the D system, and resourcefulness. In this spirit, our jerry workshop, or "computer tinkering" workshop, seeks to provide the Ladjé district with functional computer equipment at a low cost in order to make the digital tool accessible. This model is based on the recovery of e-waste that accumulates in African countries, often without any specific treatment and recycling circuits being set up. However, the difficulty of recovering computer equipment for recycling was a first limiting factor.

- 17 In Cotonou, there is no specialized landfill or electronic waste sorting centers as they have in Kinshasa, Lagos or Accra where one can obtain supplies (Baldé et al., 2017; Grant, Oteng-Ababio, 2012). The recovery process is still informal. To acquire this equipment free of charge and in quantity, universities, cooperation agencies present in Benin, and some public administrations and large companies were solicited. Most of them let us know that they had nothing to give. Even "broken" machines still have value and are not thrown away. They are sold to collectors, who themselves resell the materials (plastic, electronic chips, rare earths, etc.) and spare parts that are still in working order, at a very high price, too high if you want to build your jerry only with recycling. It is still better to buy fully built machines "Venues de France" (from France).
- 18 Thus, only one of IRD's partners in Benin, the University of Abomey-Calavi (UAC), donated about 40 CPUs, monitors and about ten keyboards, mice and cables that were collecting dust in the back room of an amphitheatre. This made it possible to assemble 17 jerrys in eight days of training, of which only six were used later. Some machines have not been able to withstand tropical storage conditions between the two workshops, in a space where heat, humidity, dust and salt are omnipresent. Others, made up of components (CPU, RAM, motherboard, etc.) that are too old or too weak, have not been able to run the mapping software used, which raises the question of the durability and quality of the equipment obtained, two criteria that are essential to the FI (Eagar et al., 2011). The lack of access to electricity is one of the first signs of this digital divide. Only a few people are connected to the conventional network and sublet their meters, resulting in the well-known phenomenon of spider webs. So, we had to "pull the wire", in other words, settle for a sublease of electricity. This caused significant variations in electrical current intensities: a computer and several power sockets were fried under their effect.
- 19 In addition, of the 36 participants in the second phase, only five had a smartphone, which is an essential tool for data collection. We therefore provided them with 10 devices for the duration of the training to allow everyone to participate in the collection of GPS points in the field. But without a personal smartphone, how can we continue to feed the neighbourhood map on a daily basis after the project? For residents of a precarious neighbourhood, without financial resources, how can we ensure the maintenance of computers afterwards, or rent a space to make jerrys available to all, and pay for Internet access at a prohibitive cost? If frugal innovation is to be the way to do better with less (Radjou, Prabhu, 2015), it is difficult to "do better with nothing". In our context, the jerry model but also the OpenStreetMap methodology, which is supposed to be open to all, faces several limitations. For G. Palsky (2013), "free access to online tools for all is a fiction, which ignores the digital divide" between people living in precarious neighbourhoods and young graduates who form the community of "OSM mappers".

Making the map talk

For a subjective map

- 20 An unreadable map. This is what emerged from the first map produced at the end of the two weeks of training, data collection and mapping. The resulting map was not false in itself: axes draw the tracks, surfaces represent buildings and points locate activities. But, at this stage, the map is only an agglomeration of non-hierarchical points and vectors. The petty traders on the corner of the street stands out at the same level as the primary schools. The Health Centre “La Vie Nouvelle”, a major centrality in the district, looks like a simple bamboo building. Unreadable, difficult for the inhabitants to appropriate, but also static.
- 21 The first map produced was poor in information (limited to localization) and ultimately not very representative of this densely populated and vibrant district. Soon, the need to make the map speak and live was felt. We proposed to organize another two-day workshop that would make more use of the participants’ “feelings”. All were invited but only about twenty of the initial forty participants attended, a majority of whom were young men. They were able to express themselves on their lived, practiced and represented spaces, but also more generally on the prospects of their neighbourhood in the face of the planned developments. To do this, we used techniques used in participatory debates: oral and written expression to allow everyone to express themselves (especially people in a dominated position such as women and young people), group work around hand-drawn drawings on background maps of the neighbourhood. This moment made it possible to discuss the neighbourhood (positive points, negative points) and to locate their impressions on the maps. Discussions were held on health problems (omnipresence of waste), access difficulties (particularly in rainy periods), deficiencies in basic services (health, water, electricity, education, etc.). The participants then listed the places of sociability in their neighbourhood and considered possible actions to improve daily life in the more or less long term. They were thus able to locate possible projects on the map: develop the lowlands and rehabilitate the market, which is very popular with young people, with access to free wi-fi...

Mapping and Naming

- 22 Mapping also means naming. Soon, the question of toponyms arose. Since addressing has not yet been carried out in the district (a sign that it has not yet been included in the city), most denominations are popular and are “bottom-up”, i.e. directly from the inhabitants. Recent work has focused on toponymic production as an arena in which economic and geopolitical issues of different scales are expressed (Giraut, Houssay-Holzschuch, 2016), between official and vernacular names, and on the strong colonial legacy from which it emerged in Africa (Bigon, 2016; Njoh, 2017). The Map & Jerry experience questions its legitimacy to map first and then give names. Very lively discussions focused on the choice of “important people” who could give their names to certain areas or routes. There was indeed a consensus on some names, such as “Gandonou”, a very old family in the district and owner of one of the only two-story buildings that serves as a landmark, or even on “the former delegate’s path”, the latter

having given his name to a central axis. Other place names were the subject of lively discussions, such as "Sister Mary", named after one of the participants, or Dante, named after an influential contraband gasoline trader, proposed to name two streets in the neighbourhood. In the eyes of some, this young woman and this merchant are not well enough known and recognized by all the inhabitants to do them this honour. "Dante is not totally recognized in the neighborhood," one hears on the fly among the many reactions. "Why don't you put my father's name on it while you're at it," one of the participants laughed. In the end the Dante house will be on the map, but not Sister Mary's.

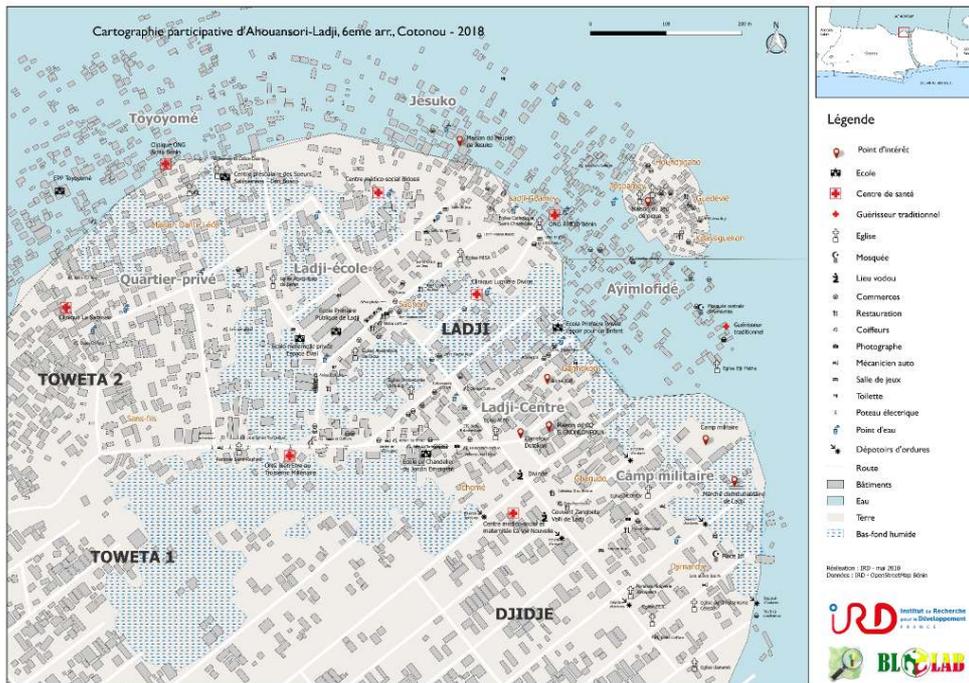
- 23 The validity and legitimacy of this map also depends on the population, traditional chiefs and local authorities. The official presentation ceremony, a few days after the workshop, was a highlight, as the neighbourhood chief invited the authorities and "crowned heads" of the area. A map in A0 format was also given to the soldiers of the local military base. After the ceremony, the chiefs of the neighbouring districts underlined the imprecision of the administrative boundaries. This imprecision, or rather the absence of limits, was intended. Indeed, during the field surveys, we had received calls from neighbouring neighbourhood leaders saying that some participants had entered their neighbourhood boundaries without asking for permission. At that time, we measured the sensitivity of these blurred administrative boundaries. For this reason, we have decided not to include any limits, a contested choice when the map is issued, as well as the mention (or absence) of certain names of families or existing persons as benchmarks. Even today, the neighbourhood chief who hung the map in the room where he receives his fellow citizens, regularly receives requests from the residents to have it corrected. Some families that are not represented wish to have their names appear on it.
- 24 These requests, negotiations and disputes raise questions about the legitimacy of these forty or so inhabitants, chosen by the neighbourhood chief and his advisors, to map and name a neighbourhood. They also reflect the social and political importance of the name of the place and give an underlying reading of the relationships of domination between certain groups and individuals.
- 25 Finally, a reflection must be made on the categories and graphic choices made by OpenStreetMap. A certain semiology is used, relatively codified on a global scale and not very modifiable. It is a "Western" and standardized graphic language, which leaves little room for the expression of local culture, as G. Rambaldi (2005) pointed out in his article "Who owns the map legend?" This semiology may have appeared to be a limitation because it did not correspond to the realities of the district. This was particularly the case for locating places of worship and in particular those related to voodoo. How do you represent convents and identify the different Vodoun deities (fetishes in particular) present in space? The OSM community chose to use the figurative "place of worship" which represents a kneeling individual. However, the Voodoo cult does not imply prostrating oneself before a god. It values the links with the natural elements (fire, earth, wind, water). Therefore, it is not suitable for this type of figurative. The use of this semiology requires caution. It is regrettable that due to lack of time, budget and technical expertise, we were unable to involve the participants more in the layout of the map and graphic semiology, including the choice of colours and symbols.

Figure 6: Debate on the toponyms to appear on the Ladji map



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Figure 7: Detailed final map of Ladji district



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Being on the map, a step towards the right to the city?

Appearing on the maps only to better disappear?

- 26 "Before, I was the leader of a neighborhood that didn't exist. Now, my district exists on the map, so I am a real district chief", these were the words of Mr. Georges, local authority, when he discovered the map. This testimony says a lot about the symbolic and political significance of the map. Neighbouring neighbourhood leaders regularly ask us to benefit from the Map & Jerry project and in turn obtain a map, a sign of its political importance.
- 27 At the end of the project in August 2018, Ladji presents itself as one of the most detailed districts in Cotonou on the OpenStreetMap map. In free access, the work carried out by OSM and the inhabitants was subsequently transferred to Google Map for its own database. This precarious neighbourhood is therefore temporarily put in the spotlight on Google and OSM, even though a few months earlier, there was no official map. We designed the project against the backdrop of the principles of the "right to the city", as defined by Henri Lefebvre (1968). We assumed that being on the map means being part of the city, and therefore being recognized first as a city dweller, and then claiming certain rights as citizens. The first results seem to be along these lines: the neighbourhood chief says he wants to go to the mayor of Cotonou, Mr. Isidore Gnonlonfon, himself from the area, to ask for things. "If you're a real neighborhood on the maps, you have to have water, electricity like anywhere else." He also intends to use this map to assert the rights of his constituents, particularly with regard to major projects to come in the neighbourhood. It is indeed in Ladji that a new road is supposed to pass through in order to relieve urban traffic and redirect it to the outskirts. The road, known as the Cotonou North Bypass Road (VOCONO), is already marked on the Ministry map. In Ladji, no one saw this map, not even elected officials. But, the word "eviction" is on everyone's lips. "People came to mark the houses, but we don't know why..." said one woman. Some houses are now covered with yellow numbers and letters, seals of the State suggesting impending destruction. These buildings are located on the right-of-way of the future track and interchange, which is supposed to be built in the middle of the district. The future evacuees are hoping for compensation. While district representatives are kept informed of deadlines, residents are slow to receive information. For the latter, the map is a resource. She reminds us that these populations are not squatters but citizens who legally occupy the city. They are there, visible and therefore more difficult to deny and to make leave without compensation. "The State must compensate. It has to pay" explains one of the neighbourhood counsellors.
- 28 In parallel with this future road junction, another project is announced: that of the "lagoon banks". It is supposed to free the space of the banks and thus evict the populations that occupy the "Fifty Steps of the King", an area of about a hundred meters by the waterfront that officially falls under the domain of the State. Unlike the first case, there can be no question of financial compensation since the inhabitants are squatters in the eyes of the law. Here again, the inhabitants intend to use the map to prove their existence. The same is true for the 3000 individuals who live directly on the water, after having acquired lake land title from customary chiefs and indigenous populations. The map would therefore have the power to give visibility to these inhabitants and thus to assert a "right to the city" (Lefebvre, 1968), if only to be able to stay there.

- 29 The irony of the story is that this historic and indigenous district of Cotonou, whose historicity has been denied until now, appears simultaneously on the open access maps of Cotonou, through its inhabitants, and those of the ministries that are beginning to recognize the district to better condemn its existence. At the same time, in March 2018, while we were collecting the data to show the district on the OSM background, the municipality began its addressing policy in the area, numbering streets and houses, some of which had to be razed to the ground because they were located on the right-of-way of the future road. The district would now exist on the maps to better disappear... We then better understand the arrival in 2018 of Slum Dwellers International in Ladj to "empower" the populations before the announced evictions. We also understand the reservations of the managers who are aware of the Map & Jerry project. During an informal presentation to the Ministry of Urban planning and Sustainable Development, one of the executives exclaimed: *"Your map should not make these people want to stay and make them believe that they have the right to do so"*.

Figure 8: Inscription on a house "to be destroyed" as part of the Cotonou North bypass road project



© Choplin, 2018

"Map doesn't boil the pot"

- 30 The reactions of local and central authorities, as well as some residents, suggest that the map could become a resource for mobilizing and claiming a right to the city. However, if "mapping" can empower, the power of this map should not be overestimated. We would have liked to conclude this article by saying that the map changed the lives of our interlocutors. Unfortunately, this is not the case. First of all, let us remember that this project does not come from a local demand and that we have, in a way, imposed it on the neighbourhood. The very legitimacy of the map is at stake, as is that of those who produced it. What can be the impact of the voice of ordinary residents in relation to state, city and neighbourhood authorities? Why should these map-producing inhabitants be more legitimate to make them than others? Because, if the production process is intended

to be more open than the official one reserved for a few "experts", new biases appear in Ladji as elsewhere, these new producers of geographical information are mainly young men, because they have better access to new technologies than other inhabitants.

- 31 It must be recognized that at this stage, the impacts are limited: living conditions remain very difficult and the map "*does not boil the pot*" as the locals say, which is, it should be recalled, the main concern of heads of households. The emancipatory dimension must therefore be qualified in the case of Map & Jerry, as has also been noted for other projects (Amelot, 2013; Nonjon, Liagre, 2014). With or without a map, young people remain in a position of domination over their elders. The map has not yet been really appropriated by the inhabitants and it also raises the issue that it could turn against them. Because to show this neighbourhood is to make people aware of its problems. The inhabitants and local authorities hope that the State will support its inclusion in the rest of the city, but they fear that this will be at their expense, by brutally driving them out to upgrade a district that now appears unsuitable to the image of "urban modernity".
- 32 Modestly, therefore, we can say that the participants are proud to have participated in this experience: "*I will be able to tell my grandchildren that I was the one who made the map of our neighbourhood,*" says Chantal. "*Now we exist, and that's important. I am proud of my neighbourhood,*" adds Jocelyne. "*It's more convenient: now I can show the motorcycle taxi driver how to get here,*" explains Marie-Auxiliatrice. At best, participants, and youth in particular, acknowledge that they have a better knowledge of their neighbourhood, as they have had to walk the various corners of it to collect data. Some say they have regained their self-confidence and acquired skills, which they have used to develop individual (computer maintenance) or collective personal projects. The participants also supported an approach that recognizes their learning autonomy, their capacity for innovation and their creativity. For Mesmer, one of the participants, beyond the results, "*the important thing is actually to bring these young people together around the same project, and that's not easy. There are very few activities that bring them together. Now they will think about the development of their locality*".

Conclusion: an innovative but sustainable project?

- 33 Today, the question arises as to the continuation of the project. "*When are you coming back?*" these young people regularly ask. Once the computers have been manufactured, the maps drawn up, the waste tracking carried out¹⁵, what should we do with these trained and motivated young people, these jerry-computers that are gathering dust in a school room which is completely open? This "initial boost" funding from the IRD aimed to start activities that could lead to partnerships with NGOs, donors and associations. Some of them have expressed interest. But the question of financing remains an obstacle: fablabs do not have the means to continue training free of charge since they are themselves in a very precarious situation, perpetually in search of recovery equipment and financing capable of perpetuating their economic model. Moreover, even if donors are generally enthusiastic about these innovative digital projects, they do not always have the appropriate lines and means to finance these small projects¹⁶. However, some young people wanted to make these jerrys available and benefit the population by opening a digital centre in the heart of the district. To do this, it was necessary to find premises, and to cover the expenses related to the launch of the project: rent, deposit, furniture, printers, monthly internet connection as well as the cost of creating the

management association. To continue the adventure once the IRD financial envelope was spent in the workshops, we used money acquired through other expertise to finance an "after Map & Jerry". Thanks to this initial investment (about 400,000 FCFA or €610), which was impossible for these unemployed young people to raise on their own, the Ladji Digital Centre was set up in September 2018. It is managed on a voluntary basis by the founding members of "LADJI'B", the Association of Young Innovators of Benin, a symbol of their hope in improving their living conditions through access to new technologies.

- 34 However, to date, despite initial investments and material support from BloLab, the centre is still not economically viable. The sale of mobile credit and printing do not cover all expenses such as: rent, water, electricity, internet, maintenance... which represent nearly 50 000 FCFA per month in fixed charges. They have to disconnect the computers as soon as they can to avoid additional electricity costs. Older, jerrys consume more energy than newer machines, and require regular maintenance. After one month of operation, they have already had to replace four motherboards at their own expense for a total of 40,000 FCFA, which is an average monthly income in Benin. It is difficult under these conditions to make jerrys accessible to the people and most importantly young people of the neighbourhood without charging them a high fee to use the equipment. The sustainability of the centre is therefore essential. The experience of participatory mapping has been episodic, as is unfortunately often the case (Amelot, 2013). The process could be extended through the "mapping" project launched by SDI, with which we regularly exchange views.
- 35 Thus, while participatory mapping 2.0 based on the use of open access digital tools can be an opportunity for technological democratization in these precarious neighbourhoods, it faces existing infrastructure problems and the lack of resources of many inhabitants who cannot participate alone in this type of project. This requires funding to ensure sustainable support for the dynamics, capacity building for citizens, and their participation in public debate. The question of digital technology and the intelligent and connected city, which is also very popular in the South and among the funding priorities of donors in the North, must not overshadow the many basic problems faced by the inhabitants of poor neighbourhoods. Digital technology can provide tools for development but cannot be a sustainable solution in itself to address political, social and economic problems.

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NOTES

1. IRD's 2017 Coup de Pouce funding aimed to develop innovative partnerships in the South. The project, led by Armelle Choplin (IRD host in Benin from 2016 to 2018), with Martin Lozivit as coordinator (IRD International Volunteer), was funded to the tune of €12,000.
2. The concept of FabLab (a term derived from the contraction "fabrication laboratory") appeared at MIT in Boston in the late 1990s. A FabLab is a space for digital innovation and technological democratization ensuring promotion and training on innovative technologies. A FabLab is generally equipped with open-source software, hardware, such as a 3D printer, to manufacture objects and conduct projects (hence also the term makerspace to designate these spaces in the English-speaking world). Blolab is the first FabLab in Benin.
3. The OpenStreetMap (OSM) project is a mapping project that aims to build a free geographic database of the world. It relies on volunteers organized in groups around the world, as here in Benin (see WikiProjet Benin).
4. See in particular the electronic forum on participatory technologies and information systems. For more information, see the valuable bibliographies prepared by McCall (2015) and Rambaldi (2015) that identify these projects.
5. Total number of OSM members in January 2018 (<https://wiki.openstreetmap.org/wiki/Stats>).
6. The international SDI network, present in Africa, Asia and Latin America in more than 32 countries and about 100 cities, was born from the meeting of an Indian association that appeared in the slum in Mumbai and South African partners. See the SDI website and its campaign "Know your city" and "I am an urban poverty fighter". To date, 7,712 slum profiles have been identified worldwide.
7. This approach is clearly illustrated and analysed by S. Patel and C. Baptist (2012) in the special issue of Environment and Urbanization magazine entitled "Documenting by the undocumented" devoted to this issue, which provides interesting experiences in India, Uganda, Ghana, South Africa.
8. This is the "jei - Justice, empowerment, Initiatives" community, a member of the SDI federation in Nigeria (www.justempower.org). They work in the Makoko district of Lagos, where a large part of the inhabitants originate from Lake Nokoué and have family members in Ladjì and in the nearby lake city of Ganvié.
9. See the catalogue of the exhibition *Cotonou(s) exhibition, Histoire d'une ville sans histoire* (Ciavolella, Choplin, 2018) and the time lapse which traces the evolution of these districts in the history of the city.
10. New information and communication technologies
11. This application is the free and open source equivalent of the Google Street View platform. The images are accessible on the Mapillary database.
12. The results will be the subject of another article. For more information, see the website of the Observatory of Coastal Urban Dynamics in West Africa (URBACOT) project: <https://urbacot.hypotheses.org>. See also the media coverage of the project: participation in two radio programmes, a report by RFI, two press articles in national newspapers, as well as the video report of the project (Map & Jerry on youtube).
13. In Benin, the average monthly income is 38,000 FCFA, or 58 € according to the national statistics institute in 2016. The cost of an unlimited internet connection is at least 15 000 FCFA / month (23 €). The internet router alone costs nearly 50,000 FCFA (76 €).
14. The six guiding principles of frugal innovation for Radjou et al (2013) are: seeking opportunities in adversity, doing more with less, thinking and acting flexibly, aiming for simplicity, integrating the marginalized and excluded, following your heart.

15. We can already say that the results are mixed. We had to face important technical constraints: the size and weight of RFID trackers being too large to place them on simple waste, GPS data of the pre-collection cart routes being only partially transmitted... These results justified the need to complete this monitoring with a more qualitative approach based on interviews and field observation, to trace the existing waste recovery channels in Cotonou.

16. In July 2018, we presented the project at AFD headquarters in Paris, in the presence of project managers from the VIL (urban development), research and digital innovation divisions. A reflection is under way with AFD, which initiates projects of this type, called "uépinières urbaines" ("urban incubators"), mobilizing residents and potentially having immediate effects on the intervention sites.

ABSTRACTS

This paper aims to analyse an experience of participatory mapping and digital innovation launched in 2018 in a slum in Cotonou (economic capital-city of the Benin Republic). Carried out with a Beninese FabLab and the OpenStreetMap Benin community, the Map & Jerry project made it possible to map a precarious neighbourhood that had hitherto been missing from the official map of the city. The paper focuses on the production of this map, its legitimacy and its impacts, primarily social and political, on inhabitants and local authorities unfamiliar with cartographic tools. Moreover, it sheds light on the digital innovation process, and its implementation in a city located in the Global South. Finally, it offers a critical reflection on the sustainability aspects of the project and the potential empowerment of urban poor and their recognition for the right to the city.

cartography, citizen participation, digital innovation, digital divide, Subsaharian Africa

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