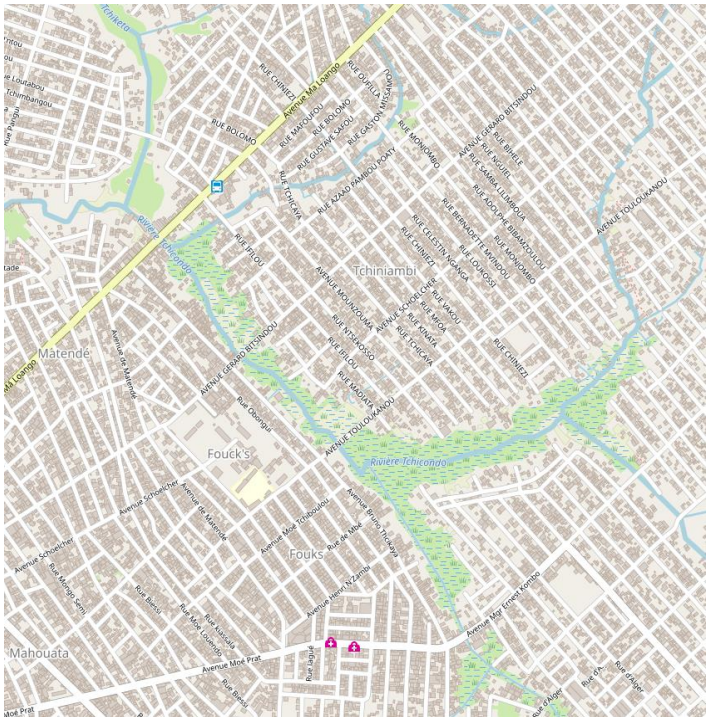
OPEN CITIES

FINAL REPORT



OPEN DATA FOR RESILIENCE INITIATIVE

OPEN CITIES AFRICA - POINTE-NOIRE, REPUBLIC OF CONGO

OPEN DRI Open Data for Resilience Initiative

Contact : Dr Julien Cour
Mail. jcour@immergis.fr
Tel. +237 698 658 444
Version V.1
Date : June 2019

IMMERGIS CAMEROUN
Immeuble Consulat du Danemark
BP12789, Yaounde, Cameroon
info@immergis.fr www.immergis.fr

WORLD BANK GROUP

GFDRR Global Facility for Disaster Reduction and Recovery

Table of content

Introduction 3

PART 1: Project Overview 3

- Problem Statement 3
- Project overview 4

PART 2: Data Collection Process 5

2.1: Field Data Collection 5

- Data Capture Methodology 5
- Areas of Interests 12

2.2: Data QA/QC 13

2.3: Geospatial Data Overview 16

Here is an overall view of the OSM contribution during the project from the Open DRI web site (source) : 16

PART 3: Project Results 18

3.1: Monitoring and Evaluation 18

3.2: Gender 22

3.4: Final Product 28

PART 4: The Open Cities Africa Experience 37

4.3 Lessons learned 38

4.4 Recommendations 38

PART 5: SUSTAINABILITY 39

Appendices 43

Training support Manual used for the training 43

Introduction

The city of Pointe Noire faces recurring challenges due to its fast-growing population and lack of effective urban planning. As a result, more than half of the urban area is covered by unplanned settlements where the population live in flood and erosion-prone areas. The Open Cities Pointe-Noire project aims to contribute to reduce the population's vulnerability to climate related hazards. The Open Cities project in Pointe-Noire complemented existing projects - especially the DURQuAP project - and initiatives conducted by the World Bank and their partners to improve urban planning through GIS-based planning and Governance and provide decision makers with risk management tools.

The consortium composed of Immergis Cameroon and the Ucac-Icam Institute of Pointe Noire, with their local partners was selected to provide the required expertise and resources to fully update and complement the Open Street Map data for Pointe Noire, conduct community mapping in two flood-prone neighborhoods, namely Quartier Mboukou and Quartier Tchiniambi and design the appropriate tools to support decision making.

The Open Cities project was composed of four keys phases, 1. Assess, 2. Map, and 3. Design, Phase 4. Develop; each phase entailed specific activities, with associated deliverables. This Report describes the full trajectory of the project, more information can be found in the project inception report, the monthly progress reports and intermediate reports delivered along the project.

PART 1: Project Overview

- **Problem Statement**

The refined problem statement for the city of Pointe Noire is:

> Pointe Noire is built on a coastal swampy flat land; thus, the entire city faces flood issues after most heavy rains. But the most threatened areas are precarious and over-populated districts such as Mboukou and Tchiniambi1. These two districts are threatened by recurrent floods, soil erosion, waste management issues, underground water and rivers' pollution and public health issues including malaria and water-related diseases. Infrastructure and development projects are being implemented to tackle these issues, but they lack the necessary maps, data and tools to ensure their success and the coordination of the different projects.
>
> The Town council of Pointe Noire and the borough councils lack accurate data usable for a sound and informed decision making related to urban development. The population and

community leaders of the two districts need to be involved and trained to collective actions to enable the follow-up and maintenance of public goods.

Our goal is to improve the living conditions in the two districts by reducing the impact of flooding and erosion, improving waste management, and providing data and tools to assist decision makers and to enable the long-term success of the on-going infrastructure projects.

To achieve our goal, we trained two Town council technical personnel, nine students, members of a local NGO and members of the local community to collect and update the OSM Database using satellite imagery, drone surveys and field surveys, we have also conducted participatory approaches and tools, including mapping exercises with population's representatives in the two targeted districts. We collected reference data for OSM at the Great Pointe Noire level, the altitude contour lines, building footprint and erosion and uncontrolled waste landfill for the two districts.

This problem statement was defined with the stakeholders of Pointe Noire, sevral workshops were organized with representatives of the key stakeholders of Pointe-Noire as well as of the two targeted districts. Besides, many meetings and interviews were also conducted with decision makers and technical services of the Urban council as well as resources persons from the District councils, the DURQUAP project, UCAC-ICAM and students.

Here are the main resource-persons met to define the above problem statement:

- DURQUAP Project Deputy Coordinator
- DURQUAP Focal Point and Town Council Counselor
- 1er Deputy Mayor of Pointe Noire
- The Mayor of Pointe Noire
- The Director of Planning and Statistics
- The Director of Information Technology and Digital Governance
- The Director of Human Resources
- The Director of Equipment and Urban Infrastructures
- The Director of the environment
- The Director of Geomatics services
- The Administrator/Mayor of the 4th District
- The General Secretary of the 4th District
- The Directeur de Cabinet of the 3rd District
- Administrator/Mayor of the 3rd District
- Supervisor and the Administrative services of UCAC-ICAM Institute
- 9 Students of UCAC-ICAM Institute

- **Project overview**

The project was conducted from June 2018 to June 2019, by 9 students from the Ucac-Icam Institute, members of the Pointe Noire city council and citizens under the supervision of the project team from Immergis Cameroun. The activities were conducted at two different levels:

- The Tchiniambi and Mboukou neighborhoods ("*quartier*") where drone surveys used for digitization of data, participatory mapping by habitants used to map infrastructures and environmental and social issues and field surveys for data collection were conducted.
- The city of Pointe-Noire and its suburban areas where buildings footprints, land use and street were digitized using Bing imageries, complemented by field surveys to collect points of interests.

From June to August 2018, students from the Ucac-Icam institute were trained on GIS, OSM tools and field data collection allowing them to digitize data and assist with the participatory mapping of the two neighborhoods. During this period were held several meetings with the main administrative authorities as well as workshops with representatives of the two neighborhoods. The project team trained local cartographers, organized gender differentiated focus group discussion and conducted drone surveys. Local cartographers then mapped their neighborhoods and results were digitized. From September to December, digitization of the building footprint continued, members of local NGOs and from the City Council were trained on collected OSM data within the two neighborhood and points of interests in the rest of the city and its suburbs.

From January to March 2019, OSM field surveys continued and efforts were concentrated on OSM data control and correction, designing and developing the project tools (specific maps for each stakeholders and a web GIS platform). In May and June 2019 project outputs were handed over to stakeholders, results were presented during the dissemination workshop held in Brazzaville and DURQUAP staffs were trained on the WEB GIS platform.

PART 2: Data Collection Process

2.1: Field Data Collection

- **Data Capture Methodology**

Task 1: Definition of our study area

- Task Overview :

The study areas are made of two distinct geographical features: First, the whole extent of the city of Pointe-Noire and its suburbs (called Great Pointe Noire) , for open cities activities; Second, the Mboukou and Tchiniambi quartiers/boroughs, for resilience Initiative. We defined the geographical extent of Great Pointe-Noire and the administrative boundaries of the two quartiers.

- Task Activities:

Activities related to this task were developed as follows:

First, we discussed with some DURQUAP project personnel in order to seek information related to Mboukou and Tchiniambi geographic areas. We took stock of their experience in working in these quartiers to sort out the administrative (District Government's point of view) and customary boundaries (local communities' point of view) of these two areas. These limits were provided by the geomatic services of the Pointe Noire city council and discussed with the local administration and the project partners. Digital and paper copies illustrating the limits of the agreed scope will be created and distributed.

- Task Requirements:
  - Inputs: Existing government/city data layers (vector/imagery) to help precisely demarcate study area.
  - Events/Training Activities: Meeting with City, DURQUAP project and WB counterparts.
  - Staffing: Key implementation staff (project manager, and head of geospatial activities)
  - Equipment: Computer, web browser, QGIS
- Task Outputs:
  - Map of the limits of the Great Pointe-Noire extent: including a detailed description.
  - Map of the limits of Mboukou and Tchiniambi.
  - Digital map file (.json)
  - Delimitation of area for drone mapping.

Task 2: Data model development

- Task Overview:

The data model developed is twofold: a simplified model to be used to characterize the entire city of Pointe-Noire, then another model specifically adapted to floods issues. The latter data model presents the geographic features to be collected, as well as the attributes (or labels) to be collected for these entities.

- Task Activities:

We consulted the World Bank Country Team, the Pointe-Noire City Hall and the DURQUAP project to determine the geographical features and attributes required to support the problem statement.

- Task Requirements:

- Inputs: a presentation explaining the basic OSM data model for World Bank/Government counterpart audiences/ DURQUAP, with suggestions on variables that can be added for disaster risk management scenarios.
- Events/Training Activities: Consultation with the World Bank and Government counterparts to discuss the details of the data model.
- Staffing: Key Implementation Staff (project manager, and head of geospatial activities)
- Equipment: Computer, web browser, OSM

- Task Outputs:

Rough Draft of the Data Model for the project: This lists the geographical features collected in OSM (Buildings, Roads, Waterways, Land Use etc., and the attributes or tags to be collected for each). In cases where data collection requirements extend beyond the OSM data model, a distinction was made for these variables in the data model. Data collected in the quartiers of Mboukou and Tchiniambi goes beyond the OSM data model to answer the data requirements of the DURQuAP project. The data model was discussed and defined with the stakeholders of the two quartiers and the DURQuaP project team. The data model was approved by all counterparts. The structure of the data model guided the creation of training materials for data collectors for the two quartiers and for the great Pointe Noire area in the workflow.

Task 3: Drone mapping

- Task Overview:

High resolution UAV imagery was used to map the infrastructures of Tchiniambi and Mboukou districts, the data was digitized according to the detailed data model designed according to the problem statement.

- Task Activities:

Creation and GNSS observation of target point. Flight activities.

- Task Requirements:
  - Inputs: map of survey areas, flight authorization, target point
  - Events/Training Activities: meeting with the Government counterpart to explain the detail of the activity and to obtain authorizations/permissions.
  - Staffing: Key Implementation Staff (project manager, and head of geospatial activities)
  - Equipment: GNNS receivers, drone, Smartphone, Computer, Software for drone data processing
- Task Outputs:

This task created an aerial imagery of Tchiniambi and Mboukou. Target points created could also be used in other projects. Using the detailed data model, the cartographers' team did remote mapping using the UAV imagery using the detailed data model. The infrastructure data was digitalized. This task aimed at creating the objects' geometry and some of their attributes, but most objects attributes had to be filled during the field mapping (Tasks 4 and 6).

Task 4 : Participatory Mapping of Tchiniambi and Mboukou quartiers

- Task Overview:

Young men and women identified in Tchiniambi and Mboukou were trained on participatory mapping. These local cartographers collected information and data related to some agreed parameters in their two quartiers in order to complement those derived from drone imageries. This field activity was based on the previously designed data model. Data collected and mapped were validated by at least 250 individuals belonging to the two quartiers.

- Task Activities:

Tchiniambi and Mboukou quartiers are made of 13 zones and 110 blocs1. Thus, 26 local cartographers (2 per zone) were selected, then trained and sent out to collect data related to floods, heath issues, waste and socioeconomic infrastructures in the 13 zones.

Local cartographer's selection criteria were the following:

  - 2 cartographers per zone
  - Permanently reside the area these past 10 years.
  - Aged from 21 to 40 years
  - Woman and man
  - Speak the most commonly spoken language in quarter, and French;
  - Education Level: At least GCE O level
  - No link of kinship or friendship between the two;
  - Live in different and distant blocks.

Data collected were inserted in an A1-map of each zone. Two validation workshops were further organized for Mboukou on August 18, 2018 and for Tchiniambi on August 22, 2018, gathering at least 120 individual each, during which collective actions and participation issues were discussed and maps validated.

- Task Requirements:
  - Inputs: Training documentation, survey instruments (field paper), A1 and A3 base maps of each zone, drone imageries.
  - Events. Training local cartographers on map and legend reading.
  - Staffing: Senior implementation team, and core mapping and survey team
  - Equipment: Computer, Printing, A0 and A3 format maps, flipchart, marquers, color pens, retro projector.
  - 2 large hall in each quartier, for the restitution workshop.

1 Each quartier is divided into Zones and each Zone into Blocs. They are managed locally by a President of Quartier, Chief of Zone and Chief of Bloc.

- Task Outputs:

This task provided more accurate data on people's vulnerability in the two quarters, which go beyond flooding. These data are the one that can't be captured either by the drone imagery or by the former data collector's techniques. Young people from the two quartiers seized the opportunity to discuss among themselves and share ideas on the strategies to put in place in order to fully participate to sustain their infrastructure and to be actors of their own development.

Album

Training local cartographers: Data reporting after the field trip

A view of Tchiniambi at the dry season

Restitution workshop, Mboukou

Local cartographer presenting their maps

Local cartographers sharing findings during field trip

Task 5: Remote (desktop) mapping of Great Pointe Noire City

- Task Overview:

The project team trained and coordinated mapping activities to trace infrastructure in the city area from satellite imagery in the OpenStreetMap platform. The data created during this task will be used to create orientation maps for field data collection activities. All traced data should be subject to secondary remote validation before the Field data collection process.

- Task Activities:
  Create a task in the OSM Tasking Manager to coordinate mapping activities for the study area. Decide whether the desktop mapping can/should be completed by the team, or, whether a Mappathon training activity should be held to supplement tracing.

- Task Requirements:
  - Inputs: Task in OSM Tasking Manager for study area
  - Events/Training Activities: Team training on iD, and JOSM platforms. Training/Mappathon for volunteers (students, or locals), or, city counterparts.
  - Staffing:
    - Senior Implementation Staff (project manager, and head of geospatial activities).
    - Core mapping and survey team. The senior staff will have to determine if this can be administered with a mixture of staff positions (students/locals), and key volunteers (students/locals), and, if these people will remain in these positions throughout the desktop mapping, surveying and data integration tasks.
  - Equipment: Computers/Laptops, JOSM, Internet,

- Task Outputs:
  Traced, and desktop validated infrastructure data for study area.

Task 6: Field mapping of Great Pointe Noire City

- Task Overview:

During this task, a field team was deployed in the city of Pointe-Noire to complete the information (attributes and any invisible data on the image) mapped beforehand in the previous phase. This field activity was based on the previously designed data model.

- Task Activities:

The study area was divided into survey areas that can be covered by a team of 2 in a half day. Size of these areas were tested. Trained survey team on the survey instrument (device/app/map), conducted small pilot data collection over the course of 1-2 days. Team feedback were used to refine the instrument, and potentially the field procedure (including the size of the assigned area).

- Task Requirements:

- Inputs: Training documentation, survey instruments, maps of survey areas, data of the previous task.
- Events/Training Activities: Field training on mobile devices and map reading for the survey team. This includes training on the details of the data model (for feature recognition and classification).
- Staffing: Senior implementation team, and core mapping and survey team
- Equipment: Laptops, Mobile Data Collection devices (android devices or tablets), WiFi connectivity, Printing facilities.

- Task Outputs:

This task allowed to produce the base data for the town of Pointe-Noire based on the predefined data model.

Task 7: Data Validation

- Task Overview:

This task involved the validation and integration of the data collected in the entire Pointe noire city with the remotely traced data in OSM.

- Task Activities:

Update the OSM base map using a systematic data integration workflow. If the workflow involves data that is incompatible with the OSM data model, have an alternate system for the consolidation, storage, and display/communication of this d

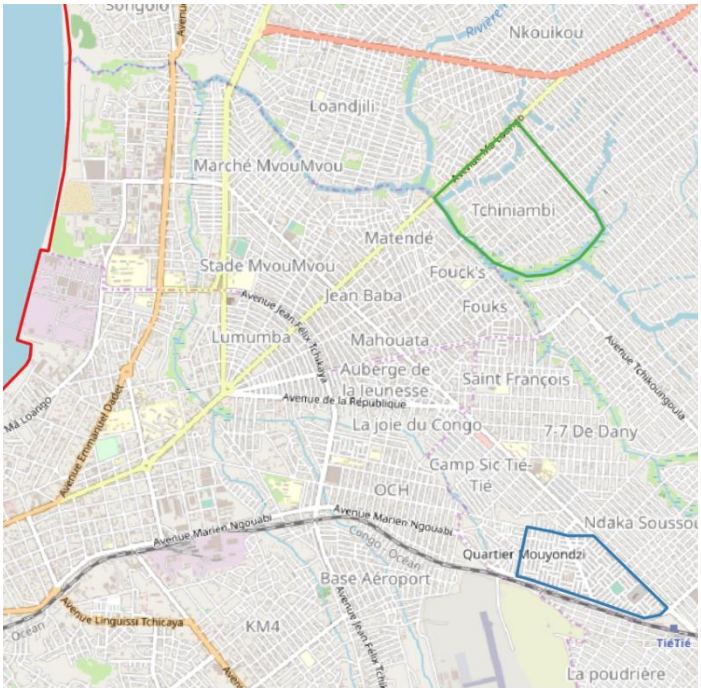
- Task Requirements:
  - Inputs: Field Data (Field Papers, survey content (uploaded to server))
  - Events/Training Activities: Train staff on the data validation/integration workflow, with peer validation
  - Staffing: Implementation core team
  - Equipment: Computers/Laptops, Scanners/Camera phones

- Task Outputs:

Updated OSM base layer with attribution/tags in place, with all content peer validated.

- **Areas of Interests**

The "Great Pointe-Noire" AOI of approx. 250 km²



Mboukou (Blue, 0.55 km²) and Tchiniambi (Green, 1km²) AOIs

For the Great Pointe-Noire AOI data was produced using remote digitalization (Bing images) completed by field surveys, the objective was to map streets, buildings footprints, land-use and points of interests.

For the two quartiers AOIs, we did remote digitalization using drone images, digitized the outputs of the participatory mapping conducted by the habitants completed by OSM data field surveys. We produced for the two quartiers resilience data used to produce maps for the authorities and the representatives of the quartiers as well as OSM data using a rather detailed (complete) data model.

2.2: Data QA/QC

- **What measures were put in place to enforce quality control in the field data collection, and data upload processes?**

Although field data collection was conducted by students, members of the city council, local NGOs and local cartographers from the two neighborhoods the project team retained control

over the critical steps and intermediates of the process. Thus, the following activities were either done by or supervised and controlled by the project team:

- building the questionnaires,
- controlling and testing the smartphones,
- defining the field areas of each surveyor,
- collecting and compiling field data,
- removing overlaps, controlling tags and duplicates
- uploading of data

Yet, we had to balance our commitment to produce good quality data with the main objective of this project: train citizens and key stakeholders on OSM tools and field data collection aiming at having a number of trained and autonomous OSM contributors in the city of Pointe-Noire. Thus, students and trainee were so enthusiastic and willing to produce and upload data on their own that we had to let them proceed, often leading to errors being uploaded onto OSM. Reinforced controls of the uploaded data had to be put in place, available control and editing tools for OSM were used.

- **What data cleaning procedures were carried out?**

There were several cleaning procedures that were conducted:

- Overlaps of field data collected between surveyors using QGIS
- Cleaning on josm, using filters and to do list and validation tool
- Map Campaigner used to monitor attribute completeness for the AOI's
- Osmose used to monitor feature geometry (such as overlapping buildings/nodes, incomplete features, and duplications), and also common tagging issues (such as missing, unsuitable or poorly formatted tags).
- OsmCha was also used to validate data, using filters and location
- The OSM "modify" tool was also used for specific modifications

    - Were these measures effective? Did these measures change during the course of the project?

Yes the measures were effective although some readjustments had to be done during the course of the project, tools such as Osmose or Map Campaigner were not used during the first months of the project. These tools proved to be very effective for monitoring and identifying tags errors.

- What were the overall findings in terms of data quality?

The main findings concerned the overall data quality produced by the students and trainees, Immergis is a private company specialized in GIS and used to work with well trained professional, thus the control, validation and moreover the correction phases were much more time consuming than anticipated. Some methodological adaptations that were made along the project to avoid duplicates of buildings for instance were not immediately applied by the trainees. The project willingness to avoid uploads of data to be centralized by Immergis allowed trainees to gain in autonomy but led to an increase of tagging and geometry errors but the tools mentioned above allowed us to easily identify and correct these errors.

2.3: Geospatial Data Overview

Here is an overall view of the OSM contribution during the project from the Open DRI web site (source) :

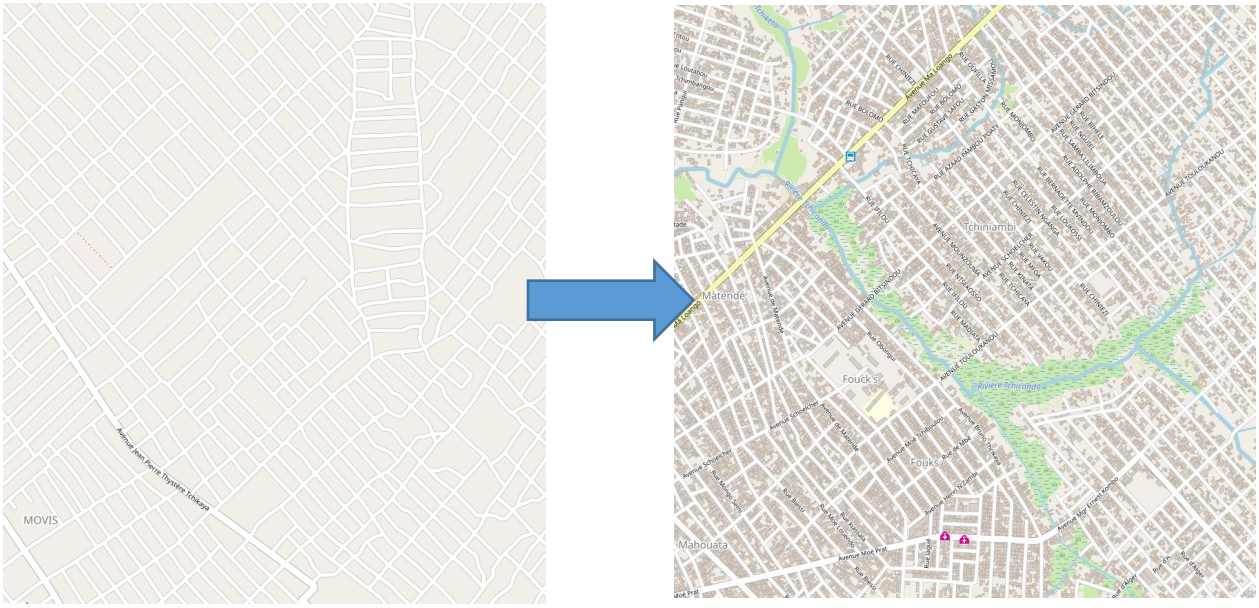
OSM OVERALL STATS

Jan 1st, 2018 to Jun 29th, 2019

BUILDINGS EDITED	200625
HIGHWAYS EDITED	10421km
WATERWAYS EDITED	132km
BUILDINGS	53contributors
HIGHWAYS	72contributors
WATERWAYS	3contributors

The major issues identified end of May 2019 in the Data Control report using Map Campaigner, Osmose, OSMCha, and JOSM to assess the quality of data uploaded to OSM by the OCA Pointe-Noire team concerned a number of crossing buildings, highways, and waterways identified in JOSM as well as missing tags. Most missing tags were filled-in except for the names and phone contacts of little street shops that do not have names of phone numbers. Some street are also lacking names of identification numbers. The report also stated that the data quality is high and can been seen as improved since the first quality control report published in March 2019.

OSM IN POINTE-NOIRE BEFORE AND AFTER THE PROJECT



Screen capture of Open Street Map in Pointe-Noire

PART 3: Project Results

3.1: Monitoring and Evaluation

Theme 1: Data Collection and Release

Indicator	Metric	Target	Data Source	Disaggregation
1.1 Amount of area mapped using a participatory approach, that has been validated	250 sq km	250 sq km	Official area of the city	N/A
1.2 Number of geospatial layers developed relevant to the resilience problem identified	7 layers	7 layers	Head of Geospatial activities Pointe-Noire City Council	N/A
1.3 Number of attributes collected relevant to the resilience problem identified	50	50 attributes	Head of Geospatial activities Pointe-Noire City Council	Drainage: ditch (03) Drainage:drain(03) pools of water (03) waste (03) waterway (03) building (08) healthcare (04) education (06) public water source (03) public toilet (03)
1.4 Number of government or other pre-existing datasets used relevant to the resilience problem identified	2	2 datasets	Head of Geospatial activities Pointe-Noire City Council	- Existing private and public schools - Project drainage data
1.5 Data collection has taken into account gender vulnerabilities	Criteria used to identify local cartographers were gender-sensitive. Our aim was to reach gender parity. We ended up with 19 men and 7 women. The impacts of recurrent floods on men, women and children were discussed, weighed and ranked in men and women groups separately in			

	order to sorting out gender-differentiated vulnerability to floods, which is the main threat in our study areas.

Theme 2: Data Product Development

Indicator	Metric	Target	Data Source	Disaggregation
2.1 Number of people attending presentations who are made aware of the data product	300	300 (See Annex for Disaggregation Targets)	Attendance List	15 council decision makers (13% F), 12 students and young professionals (40% F), 250 community members (20% F) 4 DURQUAP (25% F)
2.2 Number of people trained to use data product	300	300 people	Project team	GIS trainings: 7 females among 10 students, 2 Council technical advisors, 2 DURQUAP Participatory mapping: 9 females among 26 local cartographers, About 50 women among the 260 community members trained on using the maps
2.3 Number of people with improved understanding of the resilience problem identified	250	300 people	Members of the 2 quartiers trained on the vulnerability	Population from the two quartiers (72%), city council technical services (8%), students (8%),

based on data product			maps were considered here	Projet DURQuaP (8%), AfD office in Brazzaville (1%), private companies(3%)
2.4 Number of people who would use data product to inform their disaster risk management decisions	50	50 people	Members of the 2 quartiers trained on the vulnerability maps were considered here	City council (25%), Head of local communities (40%), Projet DURQuaP (20%), Donors in Brazzaville (5%), local NGOs (10%

Theme 3: Capacity Strengthening and Institutional Development

Indicator	Metric	Target	Data Source	Disaggregation
3.1 Number of training events held	18	20 events	Project team	6 for communities' capacity building workshops; 6 for local cartographers. 4 for students, 4 for Town council's Technical advisors.
3.2 Number of people trained	50	40 people	The community members who only attended the workshops on the vulnerability maps were not counted here (see 2.2)	GIS trainings: 7 females among 10 students, 2 Council technical advisors, 2 DURQUAP Participatory mapping: 9 females among 26 local cartographers,
3.3 Number of people participating in	250	260 people	Project team	About 20% of females among 260 from the COLODE,

community mapping activities				CGDC, Local cartographers, Association leaders, Heads of boroughs/quartiers, of zones and blocs. Ressource persons from each bloc/zone/quartier
3.4 Number of stakeholder groups consulted (in planning activities, product development, etc.)	group	24 stakeholder groups	Project team	DURQUAP, 2 COLODEs, 2 CGDCs, Town Council 2 District Councils, 7 Urban Council's technical Divisions and Services; 2 Borough's president, 2 women associations UCAC-ICAM 2 local NGOs 2 private sector
3.5 Number of women engaged in the design of community maps	15	37 women	women that only attended the validation workshops were not included, women who attended	4 students 13 community members 20 women from the gender focus group discussions
3.6 Gender-differentiated vulnerabilities identified through Gender Analysis	Mboukou: The main problems listed by men and women are floods due to bad drain systems; bad, un-paved damaged road; lack of public electricity; lack of secondary school, the only Primary school in bad shape; lack of market. Women emphasized on the lack of health center, lack of drinking water giving the fact that sandy soil is improper to wells construction and floods scatter feces everywhere so that the underground water cannot be used. Men concerns: Over-humidity destroying houses. Tchiniambi: Recurrent floods, difficult access to market, to work, to food, to health center, to drinking water, to school during rainy season. Men threatened with job termination as a result of repeated absenteeism.			

	Parents reluctant to let their children go to school after a rain. This is one of the causes of school failure			
3.7 Number of barriers to women's participation in Open Cities Africa identified	-Relevant background -Awareness or interest -Presence and power -Reproductive activities as barrier -Timing issues	5 barriers	Project team	N/A
3.8 Number of barriers to women's participation in Open Cities Africa addressed	-Awareness -Presence -Timing	3 barriers	Project team report	N/A
3.9 Exchanges and/or discussions with other City teams	There have been several discussions and exchanges with other city teams during the Kampala and Dar es Salaam meetings, as well as using the chat on the Open Cities website, emails and whatsapp. These exchanges concerned the work progress, the methodology as well as well as sharing ideas and good practices. The frequency and intensity of the exchanges have varied along the project, and still continue. Main exchanges concerned the data collection methodology, the QA/QC and about writing the deliverables, these exchanges were mainly held with the Saint Louis, Ngaoundere and Zanzibar teams.			

3.2: Gender

Gender Analysis were carried out to understand how men and women are affected differently by the resilience problem identified, and barriers that may affect women's participation in Open Cities Africa. Part 1 Part 2 of the Gender Integration analysis are presented in Appendices 2.

Below is presented Part 3: Moving from Insights to Action.

In this section we used the insights generated in Parts 1 and 2(see appendices 2) to determine actions our project will take based on gender considerations to maximize impact.

1) How will your team incorporate the findings from your Gender Analysis (Part 1) into your project approach and activities?

• Recurrent floods affect everybody living in the precarious swampy compounds such as Tchiniambi and Mboukou, but because of her specific reproductive role and responsibilities, women and children could be the one to pay the biggest toll. Specific gender-differentiated approaches were used to fully understand to what extend men and women are impacted differently and how to address those problems for the benefit for both men and women.
• Feeding the family becomes a big problem in wet periods, when roads and houses are often flooded. Children are trapped at home. Moreover, there is a proliferation of diseases such as malaria, diarrhea, and other water-related diseases.
• The urban council has many Divisions and each of them is reinforced by a technical service. Among them: Division of Planning and Statistics; Division of IT and Digital Governance; Division of Human Resources; Division of Infrastructures; Division of Environment; Division of Geomatics. Those technical services have few women whose capacity need to be strengthened.
• It comes out from the discussions we had with those Directors that a) their technical services are not gender-balanced; b) they eagerly need training or capacity building especially to innovative methodologies such as QGIS, participatory mapping.

2) What actions will your project take to encourage the participation of women as both members of the project team and as community stakeholders (Part 2)?

The project team is already gendered balance. We took care of gender parity when identifying students to be trained. 5 males and 4 females. Besides, we requested and obtained gender balance within Urban Council technical personnel to be trained: one male and one female technician.

As ongoing or completed actions:

- The project is training both students and Urban Council personnel on data collection and digitalization, and is encouraging them to fill OSM data even after the project closure;

- The project sought gender parity when identifying and training local cartographers. We ended up with 19 males and 7 females, that is 29% of female and 71% of male ;

- We planned to have female associations' leaders to be part of community representatives who carry participatory mapping and gender-differentiated focus group discussions, especially at the participatory diagnosis, visioning and mapping phases. But criteria set to identify local cartographers eliminated those community leaders, especially age factor. Nevertheless, they took active part to the validation workshops.

CRAC association's meeting: Plenary

CRAC male focus group discussion

CRAC female focus group discussion

- To what extent you were able incorporate findings on how men and women are affected differently by natural hazards in your city into your project?

The focus group discussions held by women and men separately allowed to raise 22 vulnerability parameters in the two quartiers. They were further grouped by local cartographers into three main capitals**. Human and social capital**: public and private health Centers, tape water, wells and boreholes, electricity, schools, private / public, habitats, the pools of water on the roads, gutters and drains, churches and mosques, sports yards, pharmacies, cemeteries. **Economic Capital**: conventional markets, informal markets, shops, fuel stations, restaurants and hotels. **Natural Capital**: areas permanently flooded, seasonally flooded areas, the waste/trash areas, gutters and drains, green areas, erosion.

The state of each of the parameter was described, using 4 levels of qualification (good, pretty good, bad, very bad shape). All these vulnerability parameters were included in the map of each zone by local cartographers and validated by their neighbors.

DURQUAP, the District council and the Urban council or development Agencies could use these maps for planning and monitoring purposes.

All the information and data gathered were tailored for the DURQUAP Project, the Urban council and the District council to help them put in place relevant development interventions which benefit both men and women

3.3: Stakeholder and Community Engagement

The following table presents for each stakeholder group we worked with, their 1) Name, 2) Potential Role/Contribution and 3) Level of Prioritization (High, Medium, Low).

NAME	POTENTIAL ROLE/ CONTRIBUTION	LEVEL OF PRIORITIZATION
TOWN COUNCIL	The TOWN COUNCIL is a territorial community whose main mission is to meet the daily needs of the population. Its attributions are multiple: civil status, urbanism and housing, schools and equipment, cultural activities, health and social assistance, police ...	HIGH
GEOMATICS SERVICE OF POINTE-NOIRE	Provides innovative geographical data of the city of Pointe-Noire	HIGH
C.G.D.C (Community Development Management Committee)	Inform the population of the DURQUAP events, Coordinate awareness activities; Ensure the well-being of the neighborhood	HIGH
CO.LO.DE (Local Development Committee)	Body providing support to the public authorities and third parties	HIGH
Women associations, citizens from the two targeted quartier	Contributed to the identification of criteria to be mapped in the two neighborhood	Medium
UCAC-ICAM POINTE-NOIRE	Provides students, supervision and logistical support (printing, offices, meeting rooms)	HIGH
IMMERGIS CAMEROON	Provides GIS expertise, data collection oversight, GIS training, data collection and data upload Open Street Map, Participatory Mapping of Local Mappers and Surveyors. It also relied on the OSM community in Cameroon to digitize data from satellite images and share its knowledge and expertise to ensure that this project creates or formalizes an OSM community in Pointe Noire. Immergis Cameroon also relied on their aerial Drone partner for Central Africa, So-Geo, to conduct the Drone survey of the Mboukou and Tchiniambi settlements.	Medium
DUrQuaP	DURQUAP will use our data related to people's vulnerability to climate hazards and other stress as well as our data on the evaluation of the communities 'social capital to plan adaptive responses that could help improve the living conditions of poor and precarious neighborhoods	High

RENADUC & RENATURA	They are NGOs that could do environmental assessment and risks that fit well with the requirements announced in the Terms of Reference.	Medium
Government: Ministry of Internal affairs; Ministry of Planning/Great Works, Ministry of Tourism and Environment	They are powerful stakeholders with medium level interest. But they are potential beneficiaries as they need such data as tools for effective decision making.	Medium
RENATURA (local NGO)	They were informed of the project from the start, provided assistance to get in touch with local mappers, proposed to host mappathons	Low
Economic operators such as: TELECOMMUNICATION COMPANIES OILS COMPANIES (TOTAL) and Internet providers	These companies are potentials users of the data generated by the project. They could become data providers if given opportunities to do so.	Low

Meeting with community leaders. Tchiniambi. June 27, 2018

- **We are especially interested in learning how your stakeholder engagement process evolved over the course of the project. After reviewing your list, please:**

The main evolutions regarding the stakeholder's engagement concerned the involvement of the geomatic services of the City Council and local environmental NGOs. Their willingness to participate and get involved forced us to increase the number of trainings on OSM tools and data collection and include new surveyors during the field surveys.

GIS mapping is a new tool for most of targeted stakeholders of Pointe noire. So it makes sense that the project started timidly. With the snowball approach, we gained the interest of stakeholders one after the other, starting with the Urban Council which quickly saw the benefits to gain from such a tool. Thus, progressively, entities such as UCAC ICAM University, DURQUAP, COLODE, SGDC, community associations in the two selected districts, and finally the populations were actively mobilize around the project.

Community's participation is certainly one of the project's greatest success. It has been done gradually. We began by sensitizing the community leaders about their vulnerability to multiple stresses, including climate change. Subsequently, this awareness spread to all populations in the two precarious neighborhoods.

The added value of this project lies in giving the affected populations the opportunity to come together to reflect on a common problem and work together on drafting the solution. Started with about 50 people, the project involved more than 300 people, one year after.

On August 22, 2018, the Tie-Tie town hall held the meeting of restitution and validation of participatory georeferenced maps developed by local cartographers. The hundred participants came mostly from the Mboukou district. There were mostly local people, but also students, DURQUAP Project representatives, NGOs, the Urban Council and the Tie Tie Town council. Besides, there was a delegation of 5 individuals sent from the Tchiniambi by community leaders to 'support their brothers and sisters in the Mboukou district, and to gather information in order to efficiently prepare our own restitution and validation meeting' to be held the next day. Community leaders and their people actually met until late at night to ensure the success of their restitution meeting. This activity initiated and funded by local people themselves was a convincing proof of ownership of the process by people living in the quartier.

3.4: Final Product

- **Provide an overview of the User Centered Design process followed to create your final data tool or product.**

The User Centered design process was based on the content provided in the Stakeholders and Persona Development lessons and meetings held with stakeholders in July, October and December 2018. Although there were intermediate deliverables produced during the project,

our understanding of the users' needs and requirement regarding data, information and tools was on-going background activity all along the project. From the first meetings with administrative authorities to the validation workshops held with more than 300 persons from the two targeted neighborhoods, the project team gathered information concerning the needs of the key stakeholders. Thus, different products were designed and prototyped to answer the needs of each group of stakeholders.

How were stakeholder needs and/or wants reflected in the final data tool or product?

Stakeholders were satisfied by the project products as the main request expressed by the key stakeholders were maps of their administrative areas showing infrastructures and administrative boundaries. For instance, districts mayors had no maps showing the limits of their districts and neighborhoods. Producing maps using the collected data was therefore a rather straightforward decision and easy way to answer the expressed needs. The Geomatics services requested maps and data whereas the DURQUAP project requested a WEB GIS platform allowing them to visualize and share data among the project and with their partners, here again we provided them with the required maps, data and a Web GIS platform.

- **How did the design of your product evolve over the course of the project?**

At the Open Cities Africa training in Tanzania, implementation teams were asked to brainstorm possible data tool and product ideas with local government representatives using rapid ideation. The project team main product ideas were the following:

- An early flood warning system using the local radios to communicate the alerts
- An early flood warning system using text messages sent by the local cellphone network providers to communicate the alerts
- An atlas of thematic maps for the geomatic services and other services of the Pointe Noire City Council
- Specific printed maps of infrastructures for the various project stakeholders

The discussion with the key stakeholders rapidly showed that their main need concerned basic data and maps regarding their areas of interests instead of web applications or complicated tools. Concerning the Web GIS platform, the project team initially intended to set up our professional Web GIS platform called Immergis Web that entails numerous complicated functionalities intended for professional uses by infrastructures managers. Here again, discussions with members of the DURQUAP project and the Geomatics service of the Pointe-Noire city council revealed that Immergis Web was a too complex tool, most of the functionalities offered by Immergis Web were not required and the licenses required to acquire Immergis Web were

problematic. Thus, the project team decided to shift to a more simple Web GIS platform with basic functionalities.

- **Present the final data visualization products.**

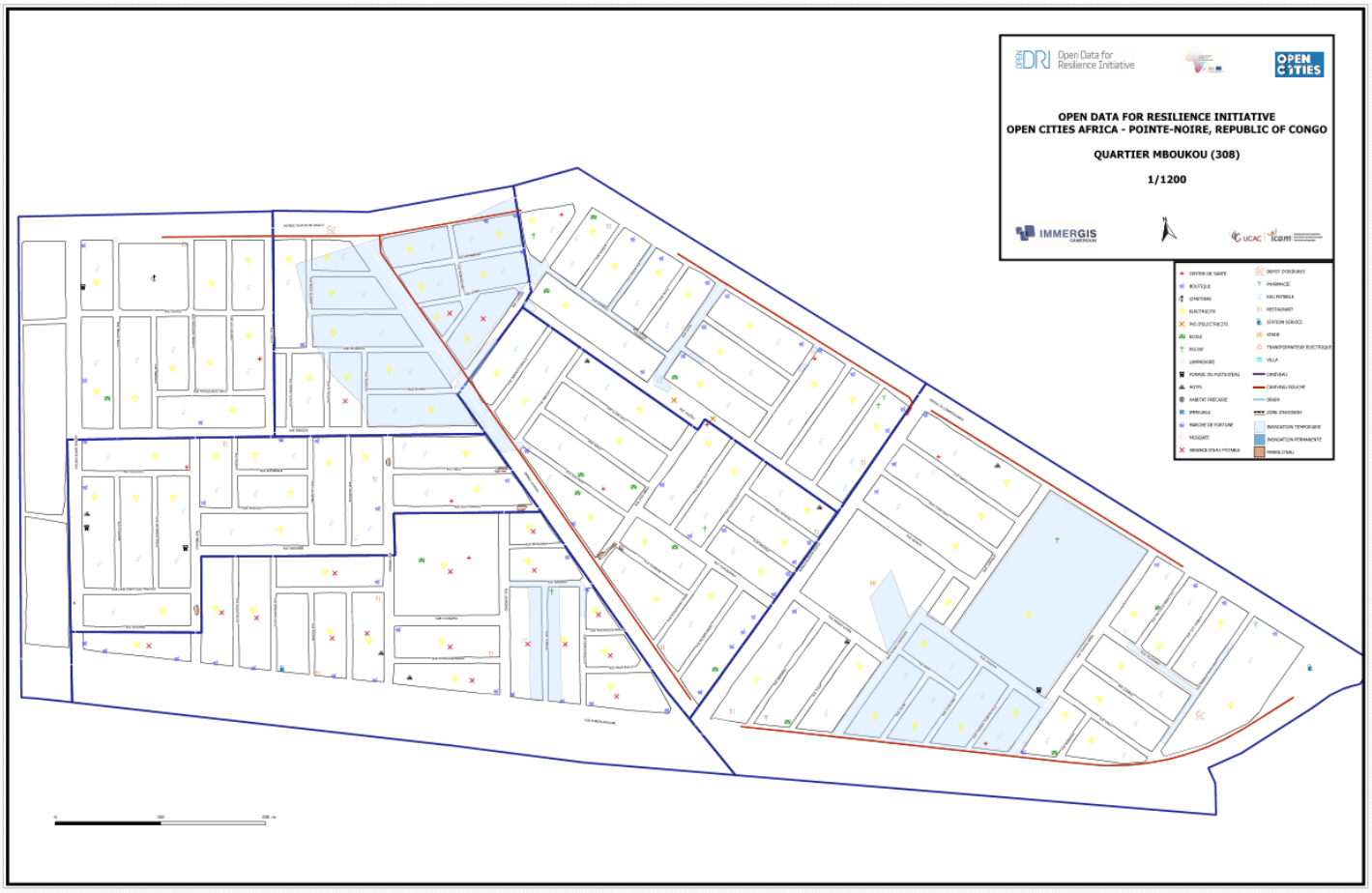
1) Tools for Mboukou and Tchiniambi1 representatives

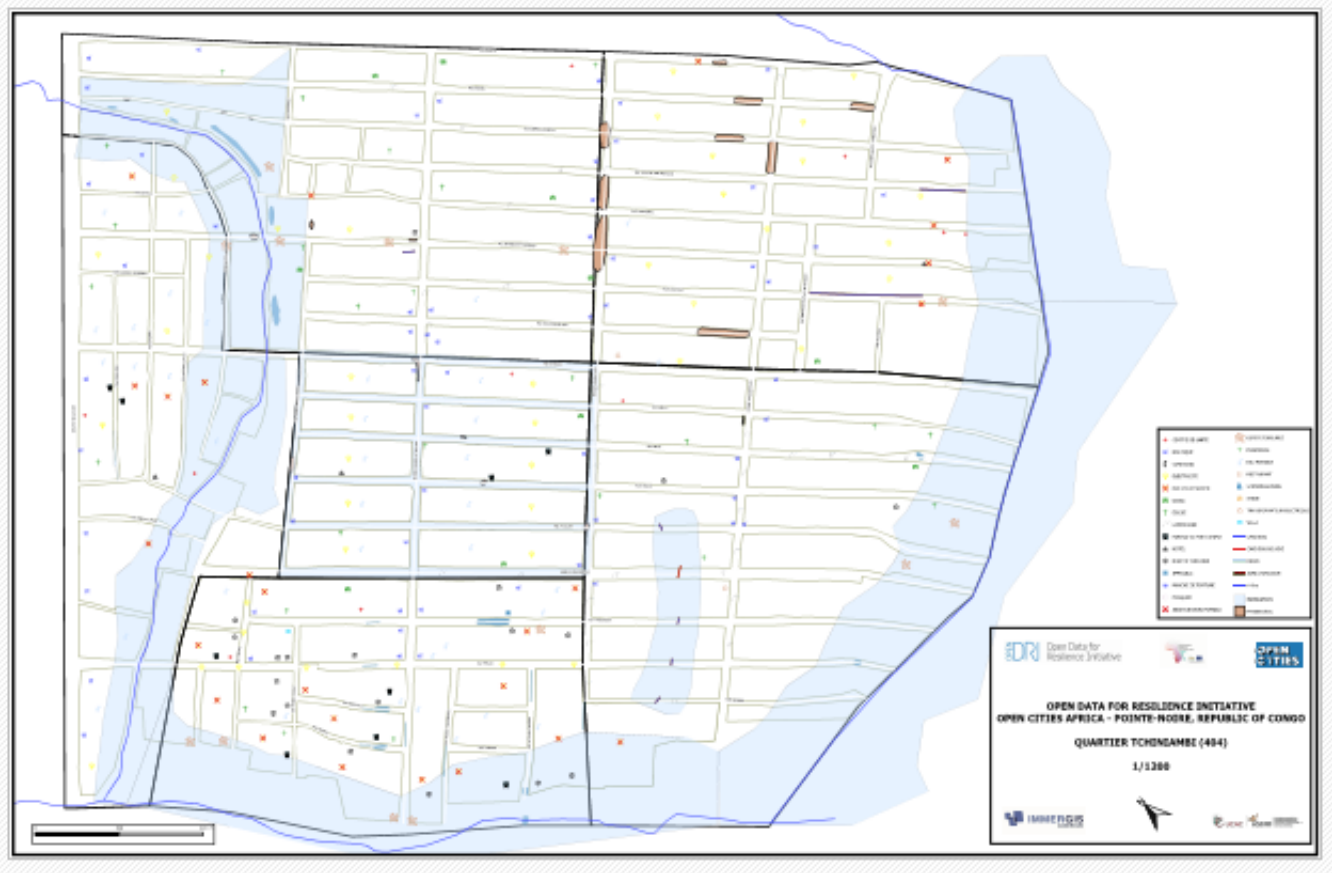
The tools designed and prototyped for the Mboukou and Thciniambi1 population are:

- Maps produced through the participatory mapping exercise
- Maps produced by collecting data using the drone survey and field surveys

The design and data collection process of the Maps produced through the participatory exercise was made by and for the people of the two targeted quartiers. The 26 indicators were defined by the participants and data collected by cartographers from the quartiers.

Below are the third version of the prototypes that we have produced:

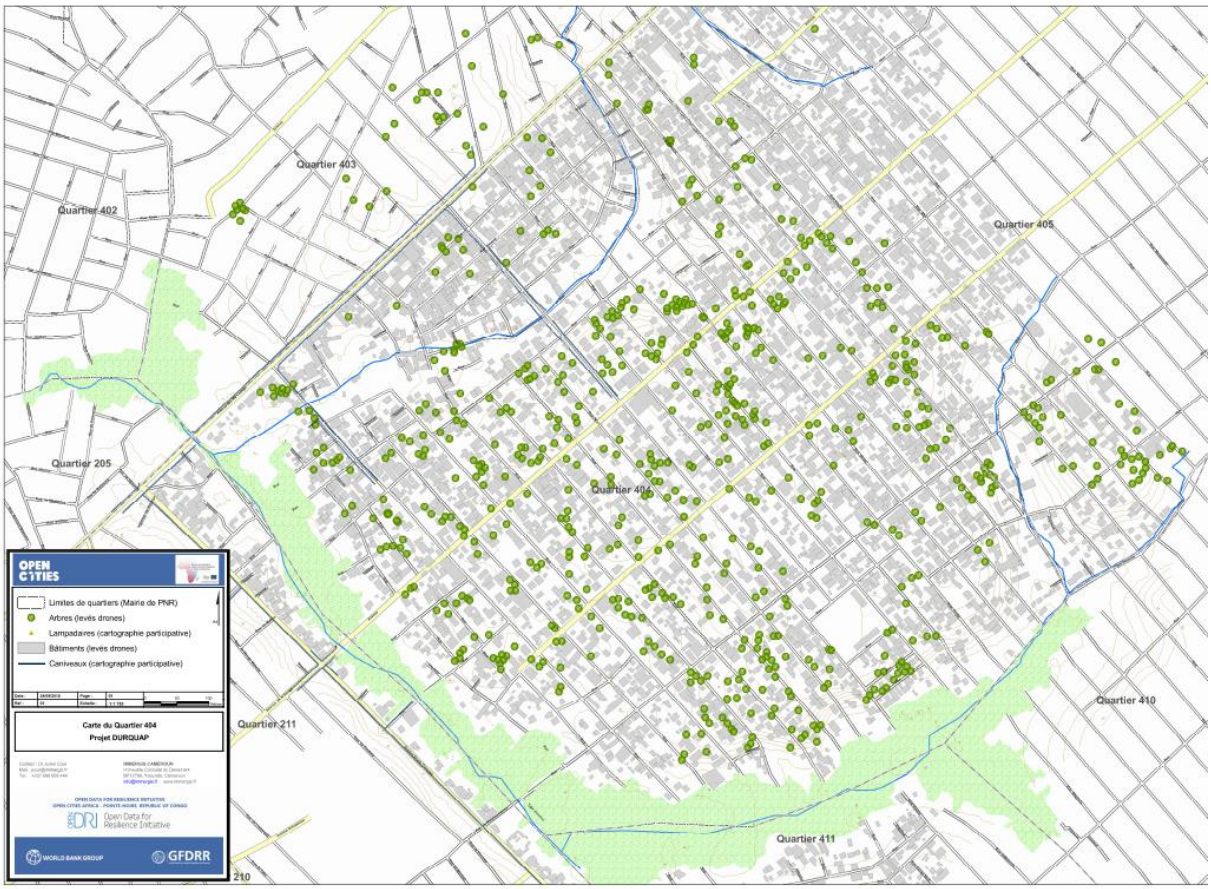




Between prototype 1 and 2, several modifications were made following comments from the review process: logos and flood areas were added, the symbology was modified. The blocks footprint were provided by the geomatics services of the city council.

During the November meetings with representatives of Mboukou and Tchiniambi (approx. 140 people) where the 2nd prototypes were handed over (cf picture below for Tchiniambi), some modifications were requested: an increase of the size of some symbols and adding the status (good, satisfactory or poor) of some infrastructures.

The following maps were initially produced for the DURQUAP project (secondary stakeholders group) but were also requested by the representatives of the Mboukou and Tchiniambi quartiers. Maps below are the 2nd version of the prototypes.



2) Tools for the 3rd and 4th District Councils

The mayors and their technical services requested maps of their districts showing the limits of their district and quartiers, roads (with names), main amenities and buildings footprints. The prototypes are under development.

During the meetings held with this group of stakeholders, Open Street Maps was used to show the types of data and symbology that could be used for the requested maps.. maps were printed using the OSM layout with a legend added and printed in A0 format in two copies for each city council.

3) Tools for the Pointe Noire City Council

The Pointe Noire City Council and its technical services requested soft and hard copies of the maps produced for the other stakeholder groups as well as all the data produced during the

project (as shapefiles and orthophotos for the drone survey), data was sent by internet and on a USB flash disk.

Beyond the maps and data produced during the project, the Public Works and the Geomatics services of the city council asked to be familiarized with the OSM tools, both for data collection and for display and use on their smartphones. Thus, members of the technical services were trained and involved in the mapping process of their city. They are now fully operational, some were given smartphones to collect and access OSM tools and Data.

City council members were provided and trained on ODK, OMK, QField, QGIS, JOSM and MapsMe. Members of the Geomatics services are now fully involved in the Open City Project in Pointe Noire, they are involved in field work and hosting the monthly mappathons in their offices.

4): Tools for the DURQUAP Project

Although the DURQUAP project was described as a secondary stakeholder group at the beginning of the project several tools are being produced to answer its needs:

- Maps produced during the participatory mapping exercise in the two targeted areas. These maps are described in the first section, prototypes were provided in soft copies to the DURQUAP project.
- Maps produced using the drone survey and field data collection. Two prototypes of these maps were already produced and shared with the DURQUAP project members, some modifications (such as adding the altimetric contours) were made during the review process. These maps will be finalized using field data (mainly amenities and drainage data). The 2nd prototypes of these maps are provided in the first section of this report.
- A Web GIS Platform allowing them to display, update, upload, download and share project data as shapefiles, kml, text, Excel, images and Pdf files. The first prototype of the Web GIS platform is under development, below are some of the basic functionalities that will be proposed to the DURQUAP project members for validation.

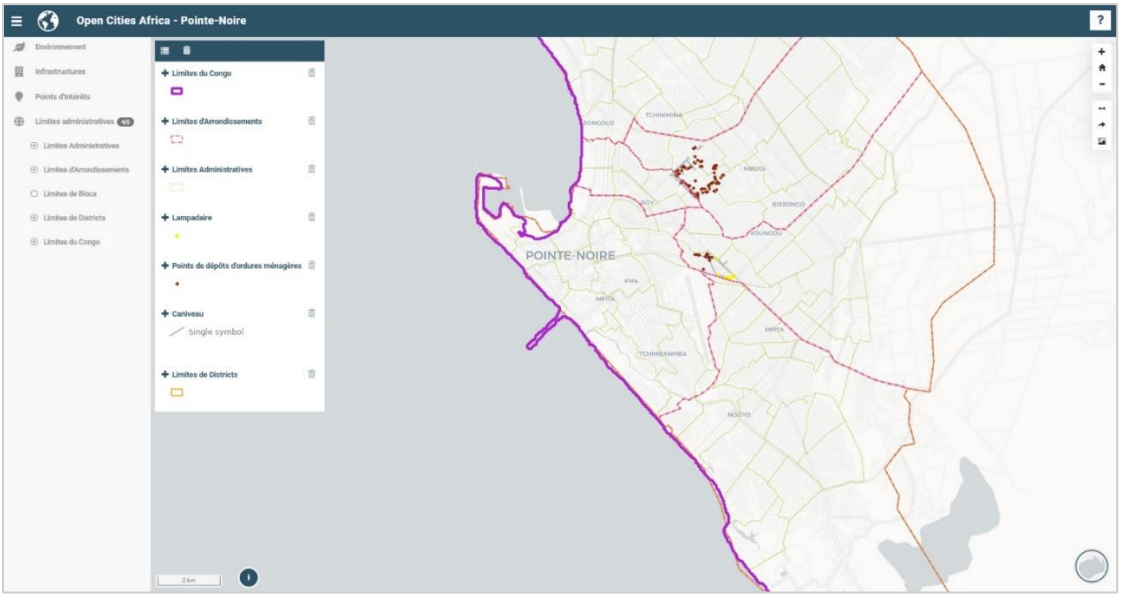
The Web GIS Platform developed for Pointe-Noire can be accessed through the following link:

http://pointe-noire.opencitiesafrica.org/

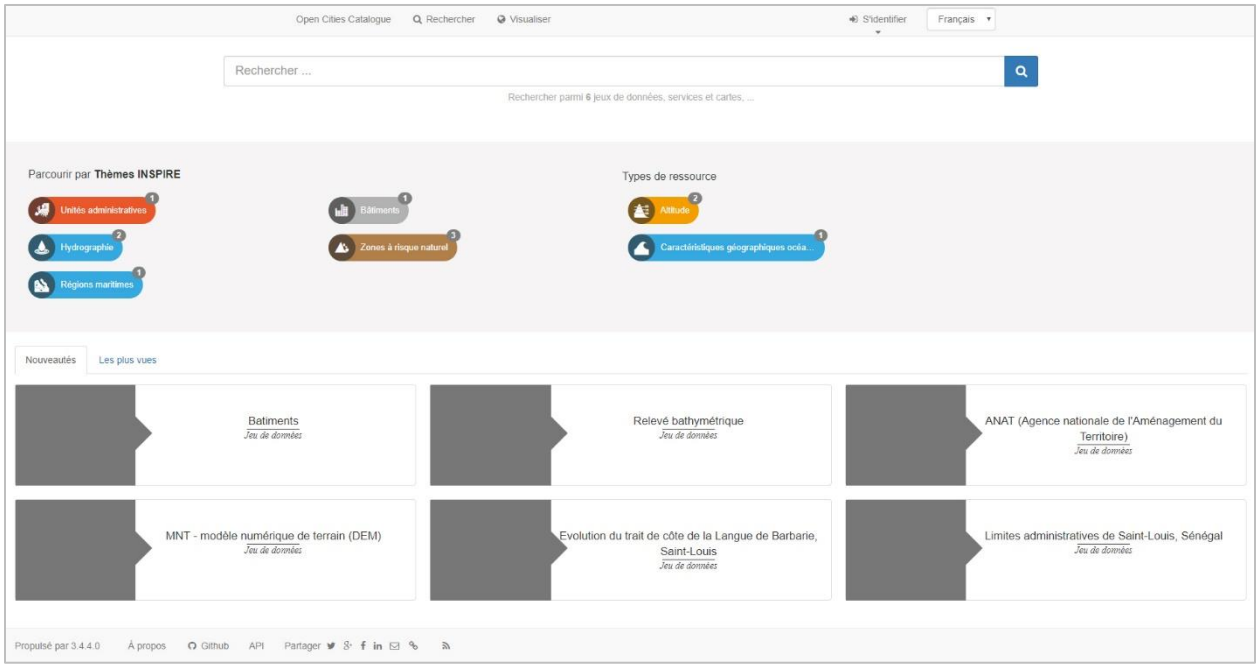
The training manual is given the appendices. The Web GIS platform is composed of three main interfaces, the welcome page, the data visualization tool and the Geocatalogue interfaces.

Screen captures of the three main pages are provided bellow:

Screen capture of the Welcome page



Screen capture of the mviewer page



Screen capture of the data catalogue interface (Geocatalogue)

PART 4: The Open Cities Africa Experience

4.1 Challenges & Successes

- What challenges did you encounter in implementing Open Cities Africa?

There was no major challenge encountered during the project as we were welcomed both by the local authorities and the habitants of the two targeted neighborhoods. The Ucac-Icam Institute was a very helpful and capable partner, students were motivated and willing to assist during all the activities conducted.

We received logistical assistance from the City Council, the Ucac-Icam and the DURQUAP project which greatly helped with the logistical and administrative issues that could have hampered the project progress otherwise.

The internet connection, power cuts and poor smartphones used by the data surveyors was a bit challenging, but we managed to find solutions: offline surveys, low memory applications and power banks.

The active participation of local communities can be considered one of the most important successes of this project. However, as in most cases, this participation leads to over expectations that the project alone cannot guarantee. In the case of this essentially mapping project, the fact that people met each other several times to discuss their own vulnerabilities in one hand, the presence of the DURQUAP project in the other hand may have led people to believe that solutions to their problems were imminent, anything that the Open Cities project could not guarantee.

- What successes are you most proud of?

Managing to work hand in hand both with the local authorities and the two targeted neighborhoods was our main success. Getting the people of the neighborhood to participate and fully embrace the open cities approach was very satisfactory.

Here are some of the successes that can be highlighted:

- getting the Geomatic services of city council to provide their own data for OSM, collect OSM data on the field and request for more trainings and follow-up activities
- getting students and surveyors hired by private companies for GIS and surveying contracts
- providing data for on-going infrastructure projects

- Participatory mapping described as an evaluation tool by the habitants of the neighborhoods and their request to conduct another participatory mapping exercise at the end of the infrastructures project to assess the achievements
- The mayor of Pointe-Noire that concluded the dissemination workshop in Brazzaville by saying that Immergis held high the banner of the Pointe-Noire city with this project
- The Brazzaville city council requested the Immergis should conduct similar activities in their own city during the dissemination workshop.
- Participatory mapping process and the validation workshops were the occasion to set or re-activate horizontal collaboration between local communities of the two quartiers; and vertical collaboration between local communities and other powerful actors such as the Urban council Mayor, the Town council Mayors, DURQUAP Project Managers.

4.2 Lessons learned

The OSM coupling with a development project like DURQUAP is very important for the acceptance of the project and later, for its success. The active participation of the populations has been motivated to a large extent by this coupling. Under these conditions, the OSM project was seen as the diagnosis phase of a great development project.

Moreover, once again, geo-referenced participatory mapping has proven to be a powerful communication tool. It deserves to be consolidated as a communication and monitoring and evaluation tool. Lastly, the participatory mapping process was a huge opportunity to strengthen social cohesion.

4.3 Recommendations

- Systematize the link of OSM projects with development projects so that the former serves as a vulnerability diagnosis while the latter aims at developing adaptive capabilities.
- Deepen the development and the use of participatory mapping as a vertical and horizontal communication tool, as a monitoring-evaluation tool and as a conflict management tool.
- Sustain the benefits of the OSM project through capacity-building activities;
- Develop and apply strategies to expand the circle of OSM data producers and users by finding the way of having private sector/economic operators involved.
- The methodology and supporting documents/videos were produced along the project, thus some activities were carried-out before having the guidelines or templates provided by the Open Cities teams. Thus, it is important to provide the full methodology and support documents to the implementation teams from the start of the projects.

PART 5: SUSTAINABILITY

5.1 ASSESSING THE BENEFITS TO SUSTAIN

The 4 main benefits to sustain are:

Benefit #1: Empower local communities in the two quartiers

Benefit #2: Institutionalize continuous OSM training

Benefit #3: Sustain/maintain the OSM products through continued use

Benefit #4: Expand collection of Data to the whole Pointe Noire

Benefit #1: Empowering local cartographers and their Communities to use participatory mapping as communication tools

- Local cartographers are able to update the current participatory maps and to realize new one with their communities.
- Local communities are able to use participatory maps as horizontal communication tools, to share information among themselves or with neighbor communities;
- Local communities are able to use participatory maps as vertical communication tool, to connect local population to decision makers;
- Local communities are able to use participatory mapping as a monitoring and conflict management tool within development projects such as DURQUAP.

The empowerment process could be enhanced by the DURQUAP project as this could be a way of having local people own the project.

Local cartographers are made of young boys and girls chosen in the quartier. It is an exceptional occasion to have youths gathered to discuss among themselves and with people of their surroundings the vulnerability and development issues. Besides, institutions such as COLODE, SGRN, local associations to be involved. The cost of this empowering process could be beard by DURQUAP, districts councils, urban council or World Bank.

Benefit #2: Institutionalize continuous OSM training

Building on the uptake of OSM tools by the Pointe Noire City Council, empowering them regarding data collection, data sharing and the use of OSM data for planning, continue hosting of mapathons at the Geomatics services.

Training, and sustaining a trained community of mappers (with continued opportunities to train and work together). Seek technical and financial partnership with organizations such as the City council of Pointe noire, University UCAC-ICAM, ONGs and the private sector.

Benefit #3: Sustain/maintain the OSM products through continued use

The DURQUAP project, the Urban council, the Town councils, development companies, private sector companies are continuously used data, maps and the web GIS platform produced by Open Cities Pointe Noire to share data with their partners, data update is continued and new partners involved in infrastructures projects join the Web GIS platform.

Benefit #4: Expand collection of Data to the whole Pointe Noire

Upscale and expand the data collection on environmental issues such as flooding, soil erosion, waste and drainage to other districts or the whole Pointe Noire City.

Activities conducted in the Mboukou and Tchiniambi districts could be extended to nearby districts in order to create a more significant, extended and continuous area. This could lead to more visible impacts, extend the area were development, urban and environmental issues are identified, mapped and debated locally, allow informed decision making and included in the urban development planning.

5.2: ASSESSING THE CHALLENGES

Challenges related to Benefit #1: Empower local communities in the two quartiers

Financial challenges: Although participatory mapping has the potentialities to be a good monitoring and evaluation tool as well as a community empowerment tool, it could be a costly exercise, not budgeted within DURQUAP project. Uncertainties remain as for the source of the the funds to be used for such a process. However, the World Bank could fund this activity through the DURQUAP project or using project evaluation budgets that would allow more independent results than if the mapping exercise is directly funded and managed by the DURQUAP project itself.

Social Challenges: How to sustain gender representability among local cartographers and local representatives.

The OSM project of Pointe noire was gender-sensitive starting from its design. We took extra care to have gender parity when identifying students to be trained: 5 males and 4 females. Besides, we requested and obtained gender balance within Urban Council technical personnel to be trained: one male and one female technician. Although we sought gender balance when

identifying and training local cartographers. We ended up with 19 males and 7 females, which is 29% of female and 71% of male.

How to sustain gender balance at all level of the project implementation? By a conscious process of seeking gender balance among students, local cartographers, population representatives and validation committees and workshops.

Technical Challenges:

- Are the local cartographers trained during the open cities project always available?
- If they are, are they sufficiently trained to conduct the participatory mapping without assistance?
- Who would digitize the data collected on the field, using paper maps?
- Will the people involved in the exercise be capable of transforming their results into communication and monitoring tools?

The issue of the availability of local cartographers is linked to the people mobility. They could leave the quartiers after the training.

The proposed solution is to include new trainings at the beginning of the mapping exercise, associate members of the OSM community or external partners such as the Geomatics services of the City Council to assist with digitization, training and dissemination.

Institutional Challenges: What is the legitimacy or power do other stakeholders grant to the results obtained by local people? Will the DURQUAP or mayors seriously consider the issues expressed by the local entities?

It is important to provide a social « status », a space for expression and adequate logistical means to the local entities involved.

Benefit #2: Institutionalize continuous OSM training

In order to sustain OSM, it is important that a process of recycling former local cartographers and training new ones be systematized. However, the development of such a mechanism faces many challenges including:

Financial challenges: Who pays for the training, for the trainers? What are the incentives for the OSM community members? To ensure long term momentum, trainings and mappathons must be organized regularly either within a university, a local NGO or another partner. Both trainers and OSM community members will need to remain motivated.

Social Challenges: If the trainings are hosted by a local university how can we ensure that external members will join the OSM community?

Technical Challenges: How to find local champions and local institutions capable of training and hosting trainings

Institutional Challenges: How to convince/sell the benefit of supporting the OSM community to the private sector, local NGOs and INGO

Several solutions are possible :

- Create an OSM training session within the UCAC-ICAM Institute, seek sponsors from the local private sector; Seek new projects and funding from donors to bring new opportunities for OSM trainings, data collection and use of OSM tools.
- Some trainings will need to be organized outside of the UCAC-ICAM, thus trainings will need to be adapted and specific to the different audiences. Specific communication means will be required to get people from the poor districts involved in the OSM community.
- Work with the Ucac-Icam and its partners from the private sector to support long term trainings and data collection as well as look for a group of private companies and NGO capable and willing to provide technical and logistical support to the OSM community
- Support the launch of the OSM community in Pointe Noire, through the Ucac Icam and the City Council meanwhile convincing some private companies and NGO to participate and support the OSM community.

Benefit #3: Sustain/maintain the OSM products through continued use

OSM products were considered innovative and very useful by all OSM project stakeholders. However they are new and are not yet well known by potential users including DURQUAP.

The **main challenge** here is to get the DURQUAP project integrate the outputs of the Open Cities project into their project, how to get the Urban city Council, the town councils, and private sectors familiarize themselves with the use of the OSM outputs?

To meet this challenge, a targeted communication system must be put in place in order to promote OSM activities and products.

Benefit #4: Expand collection of Data to the whole Pointe Noire

Data were collected in detail in the two selected precarious neighbourhoods and looser outside. It would be interesting to extend systematic data collection to other precarious areas. And map the whole city of Pointe Noire. This could be possible only if the financial means are available. Until potential stakeholders take an interest in OSM products, the World Bank and will be the first support of these activities.

Appendices

Training support Manual used for the training

Final report Open Cities Pointe-Project

June 2019