Leveraging GIS tools to improve water and sanitation infrastructure programming in Haiti

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Maxim Fortin, B. Eng.
Water and Sanitation Engineer

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INTERNATIONAL INC

Cowater International

- Cowater provides professional consulting solutions and services tailored to the needs and challenges faced by developing and transitional countries;
- Established in 1985, more than 300 successful projects completed in over 65 countries;
- Expertise: water and sanitation, public financial management, social development, municipal services and financial institutions;

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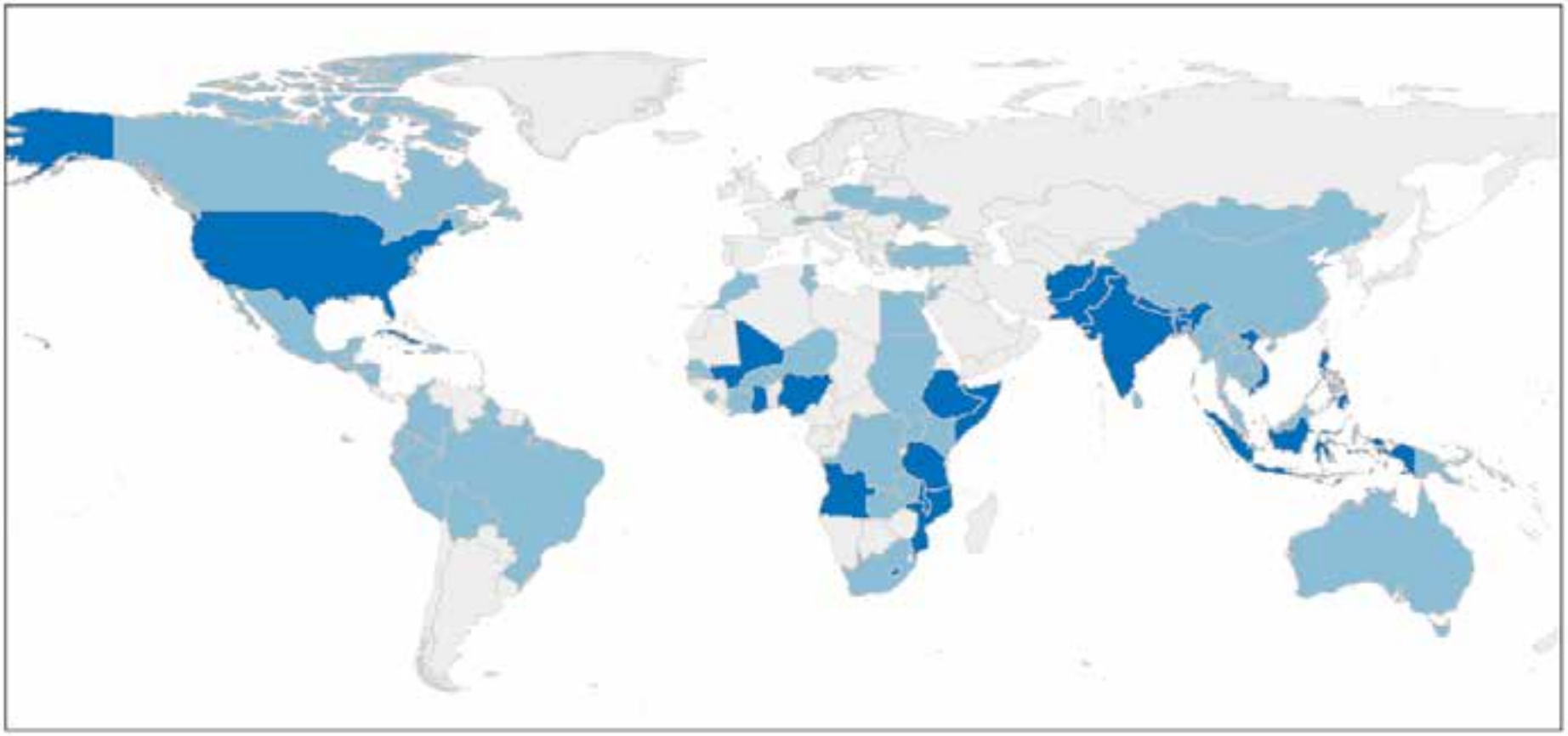

Cowater Country Experience

Active Projects

Completed Projects

Plan

1. Introduction
2. Water and Sanitation Sector in Haiti
3. Inventory Objectives
4. Methodology and Data Collection
5. Results
6. Lessons Learned and Future Work

Water and Sanitation Sector in Haiti

Population: 9.7 million (2011)

GDP: 758$/capita

Poverty: 80% of people live on 2$ or less per day

Official languages: French and Haitian Creole

Capital: Port-au-Prince

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Water and Sanitation Sector in Haiti

Access to:	Urban	Rural	Total
Improved water source	78%	49%	64%
Improved sanitation	34%	17%	26%

WHO/UNICEF Joint Monitoring Program (2011)

- Lowest coverage levels in the hemisphere for both water supply and sanitation;
- Rural:
  - Access to water through protected springs, boreholes and hand pumps, small piped systems and public standpipes / kiosks;
  - Access to sanitation through latrines;

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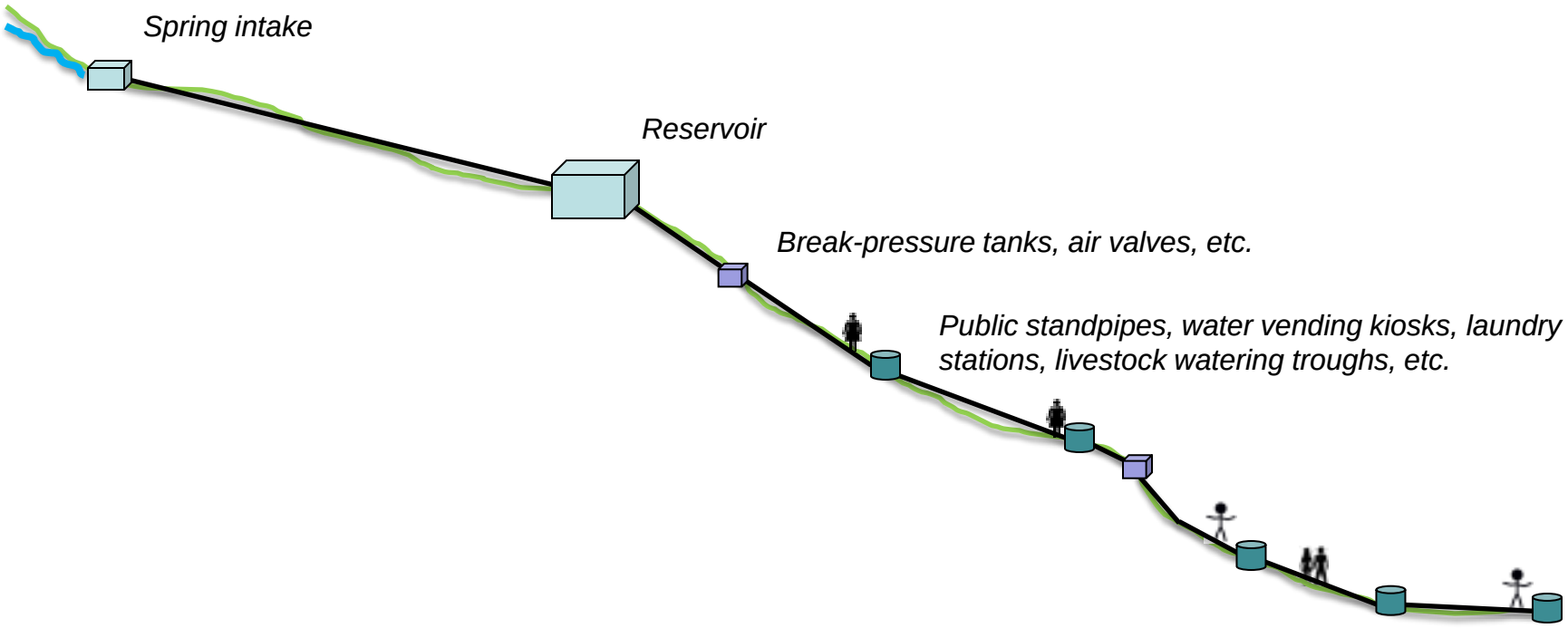
ORÈ
CNAK

Water and Sanitation Sector in Haiti



Brief overview of gravity-fed water distribution systems commonly found in rural areas of Haiti

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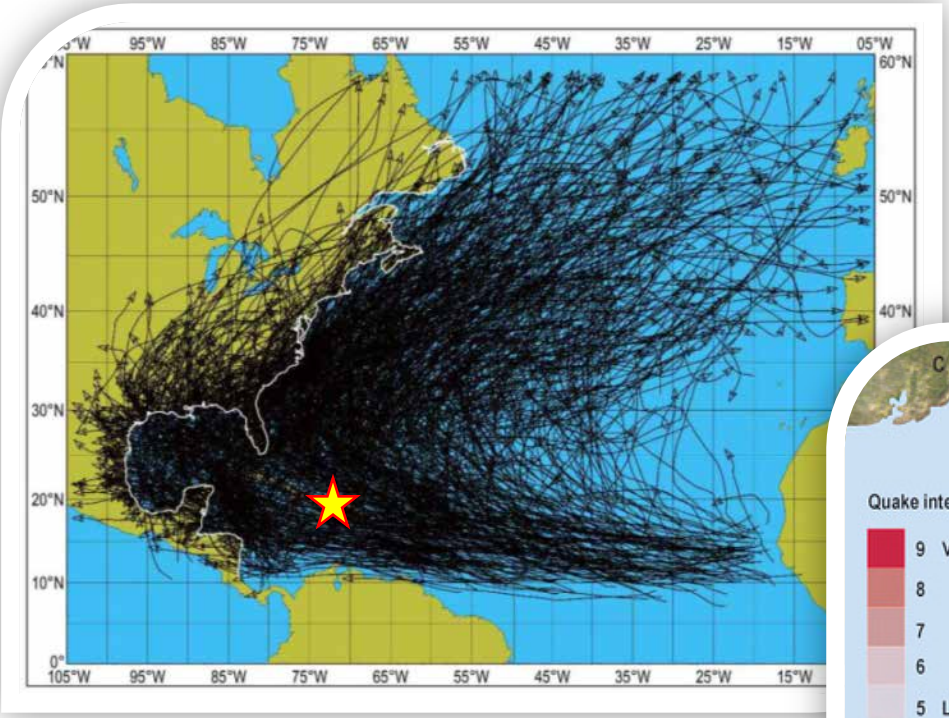
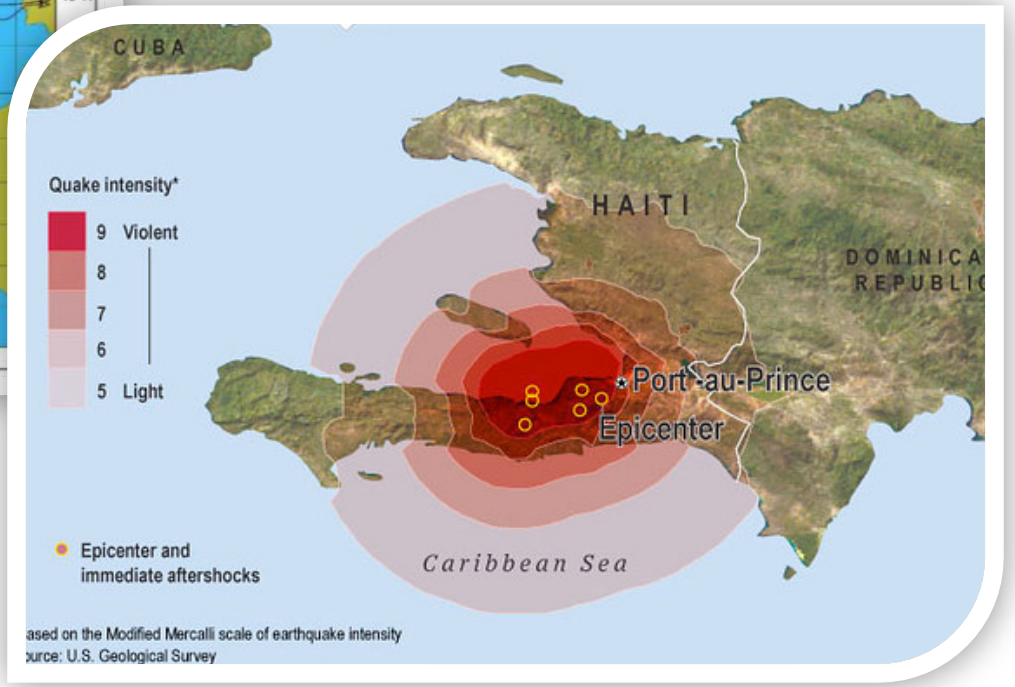
Water and Sanitation Sector in Haiti



Estimated trajectory of 1325 storms between 1851 and 2004 – major floods, mudslides, crop damage, etc;



And then, earthquake… January 2011 – 200,000+ killed, 1M homeless, 60% of government buildings either destroyed or badly damaged, cholera outbreak;

Water and Sanitation Sector in Haiti

- **Bottom line:** already a lot of work to do in the water and sanitation sector, the government was in the middle of a water sector reform, and recent events complicated things significantly;
- Large new investments coming in through international aid, donors, development organizations, NGOs, etc;
- Challenge: effectively planning infrastructure investments without reliable information on existing situation;

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Water and Sanitation Sector in Haiti

Haiti Aid Map (2011):

Many organizations operating sometimes independently, with little coordination and information sharing (lots of people for a country 3x larger than the Ottawa-Gatineau area)

Only the tip of the iceberg
(“Interaction Alliance” NGOs only!)

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Inventory Objectives

Phase 1:

Survey, inventory and map all rural communities and water sources in Haiti's largest department;

Phase 2:

Survey, inventory and map all small rural piped systems, including functionality and condition assessments;

Methodology and Data Collection

Phase 1:

(communities + water points)

1. Development of survey tools
2. Training
3. Survey planning & management
4. Data collection
5. Spot checks for QA/QC
6. Data entry and verification
7. Final treatment and compilation
8. Additional house counting for population estimates (satellite)
9. Final QA/QC

Phase 2:

(piped systems)

1. Identification of piped systems from phase 2 results and local contacts
2. Development of survey tools
3. Training
4. Survey planning & management
5. Data collection and spot checks
6. Data entry and verification
7. Final treatment
8. Preparation of deliverables
9. Final QA/QC

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Methodology and Data Collection

	M1	M2	M3	M4	M5	M6	M7	M8	M9
Phase 1 (communities + water points)	X	X	X	X	X				
Phase 2 (piped systems)					X	X	X	X	X

Important inputs:

- 14 local surveyors (have to be from each commune);
- 6 Haitian civil/water engineers;
- fully staffed local project office;
- 4x4 vehicles and motorbikes;
- laptops, GPS units, cameras, notepads, etc;
- measuring tapes, flow measurement devices, water quality kits;
- offline satellite images;

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Methodology and Data Collection

Key information collected for phase 1 (communities + water points)

Communities	Water points
Administrative data	Administrative data
GPS location	GPS location
Population estimate	Key communities served
# school, health center, church, police, etc.	Water point type (spring, borehole, well, river, etc.)
Local informant and contact info	Functionality and condition
	Flow and preliminary quality assessment (color, taste, smell, etc.)
	Level of protection
	Water usage

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Methodology and Data Collection

Key information collected for phase 2 (piped systems)

Piped systems
General information on system (year built, by who, etc.), population served and administrative data
Information on management and cost recovery, contact info for management committee
Detailed specifications of each system component (reservoir, intake, treatment, pumps, etc.)
Detailed specifications of each standpipe and kiosk
Pipe data (length, material, location)
Causes of technical malfunction and social issues
GPS location and photos for each system component, and pipe breaks identified visually

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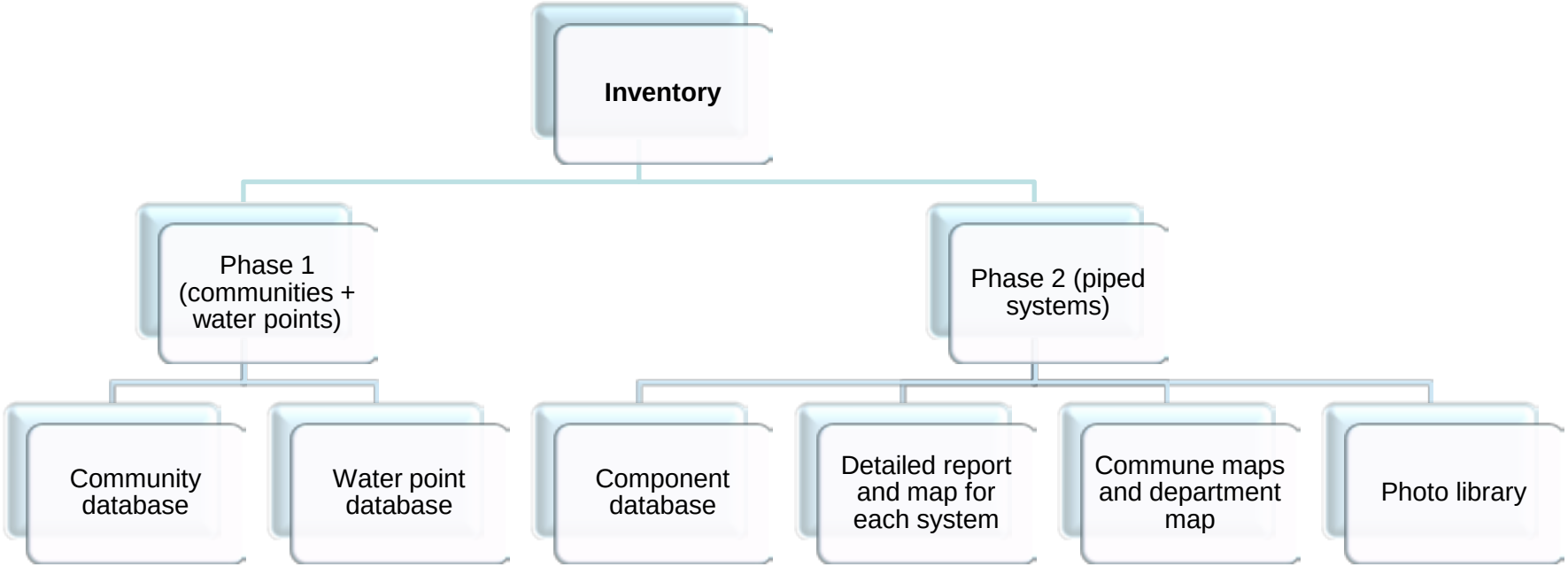
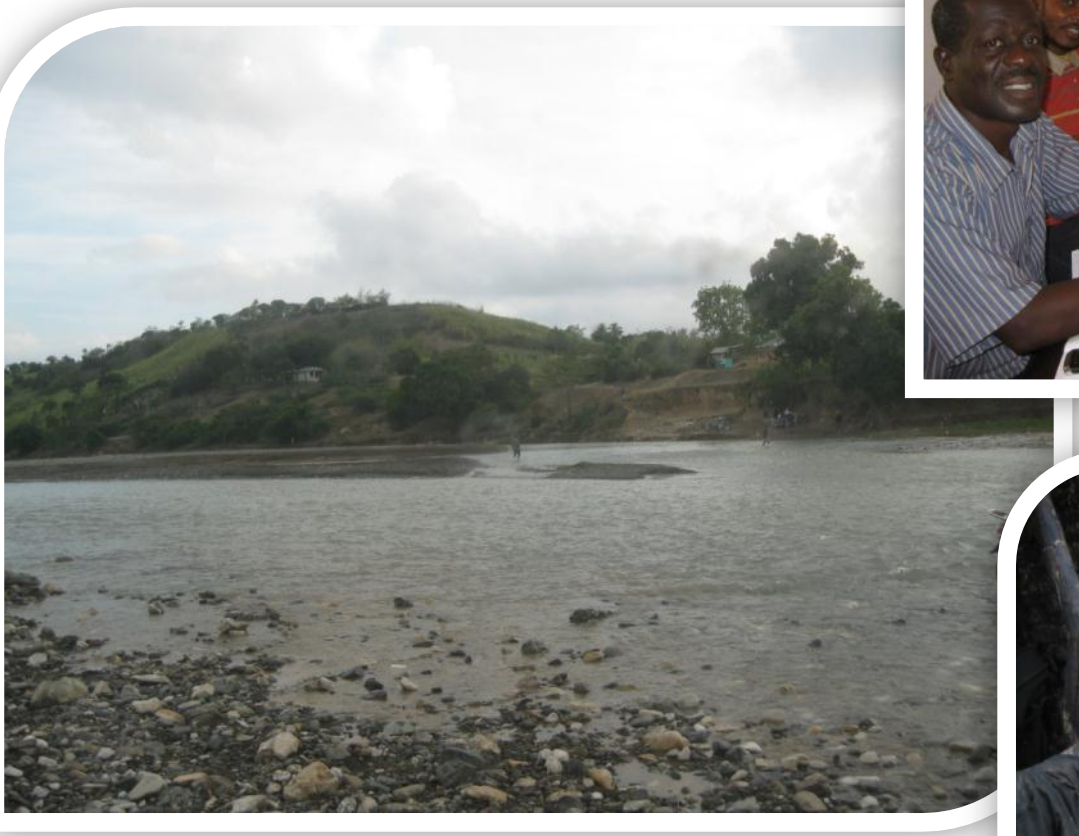
Methodology and Data Collection

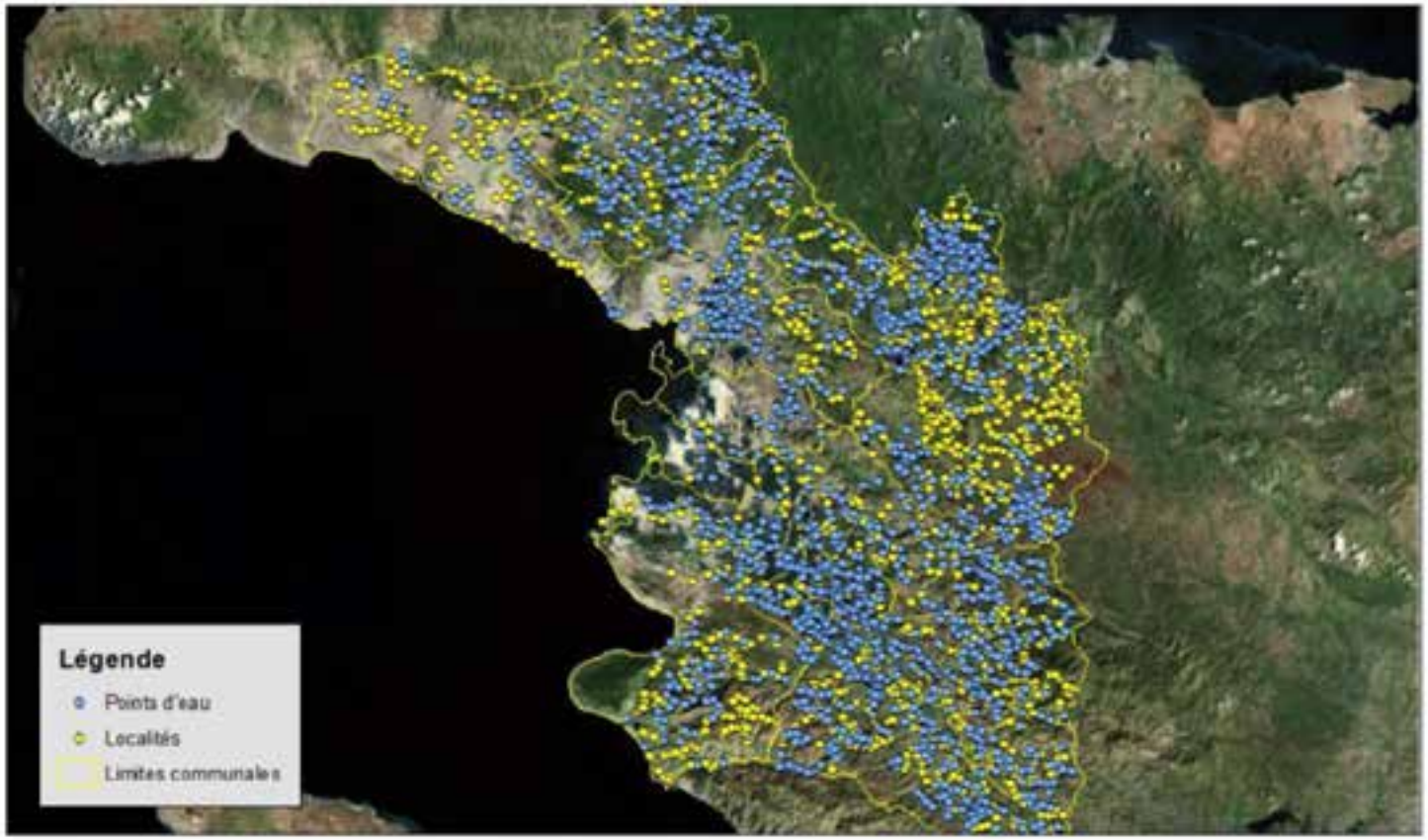
General data structure



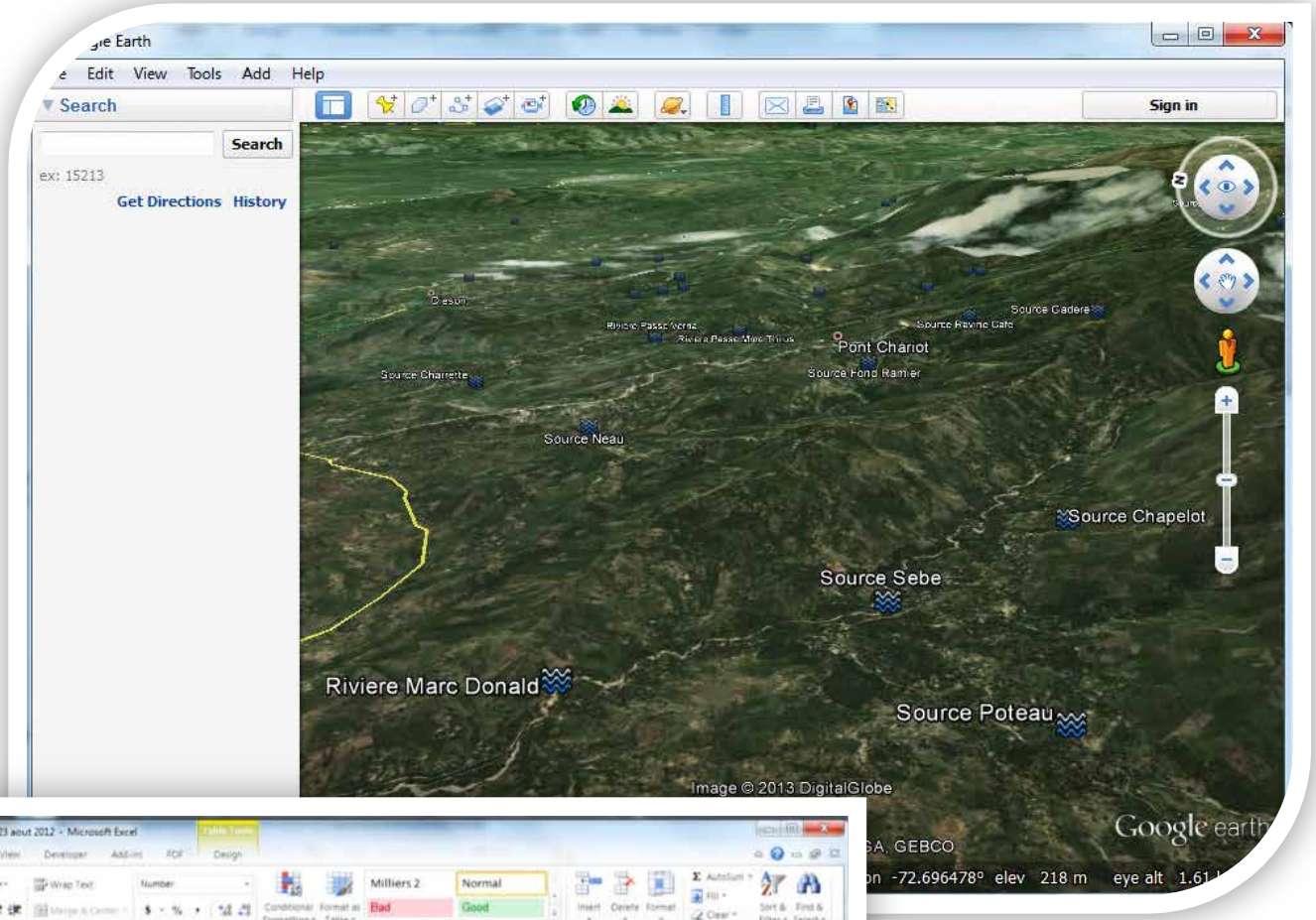


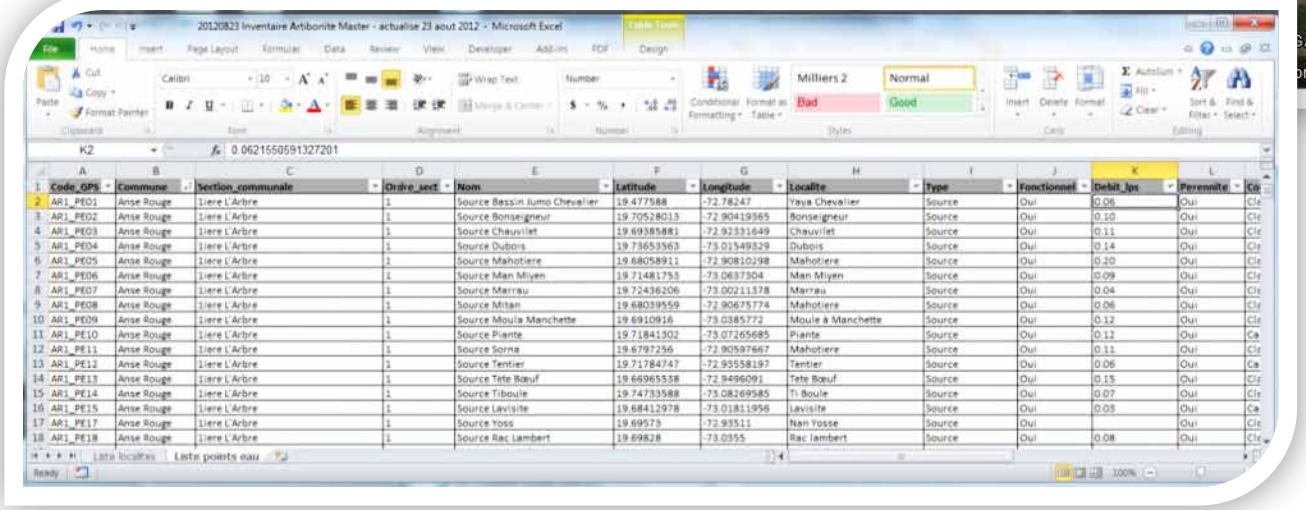
Results

Phase 1 (2,909 communities and 1,932 water points)



Google Earth export for water points

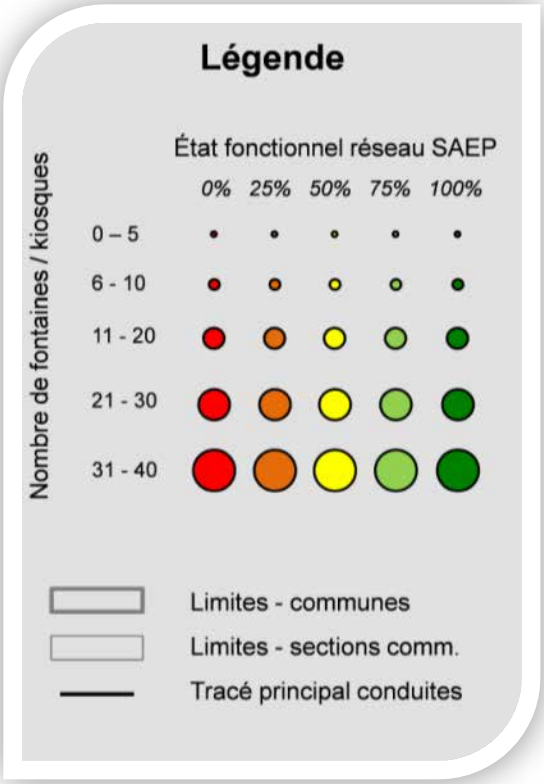


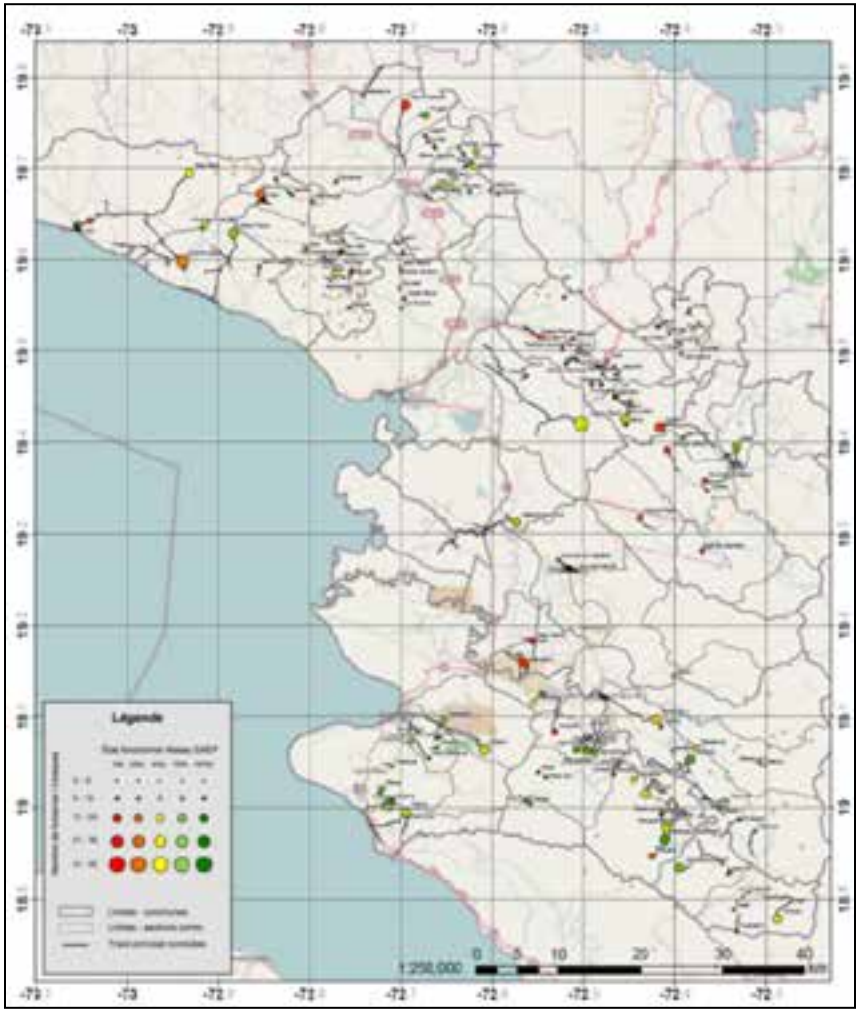


Excel export for water points

Results

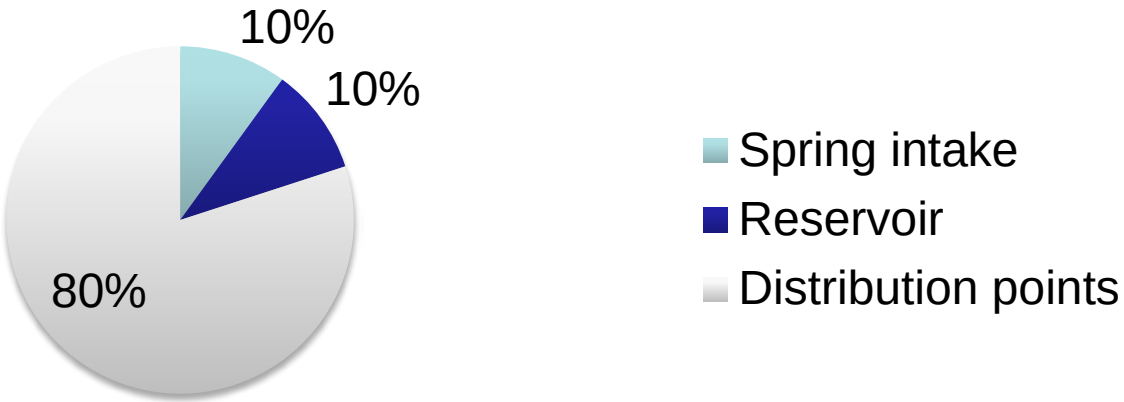
Phase 2 (156 piped systems)





Results

For each network, a functionality score was calculated based on:



Systems were then categorized using those rules:

- Functional if score > 80%
- Partially functional if score between 40% and 80%
- Non-functional if score < 40%

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Results

Commune	Non-functional (%)	Partially functional (%)	Functional (%)	Number of systems
Anse Rouge	50%	50%	0%	6
Desdunes	0%	0%	0%	0
Dessalines	67%	33%	0%	3
Ennery	45%	35%	20%	20
Gonaïves	50%	25%	25%	8
Grande Saline	0%	0%	0%	0
Gros Morne	35%	35%	31%	26
Lachapelle	20%	40%	40%	5
L'Estère	0%	100%	0%	1
Marmelade	42%	33%	25%	12
Petite Rivière	27%	33%	40%	15
Saint Marc	13%	33%	53%	15
St Michel	88%	0%	13%	8
Terre Neuve	47%	12%	41%	17
Verrettes	15%	30%	55%	20
Total	-	-	-	156

Sample table from overall functionality assessments

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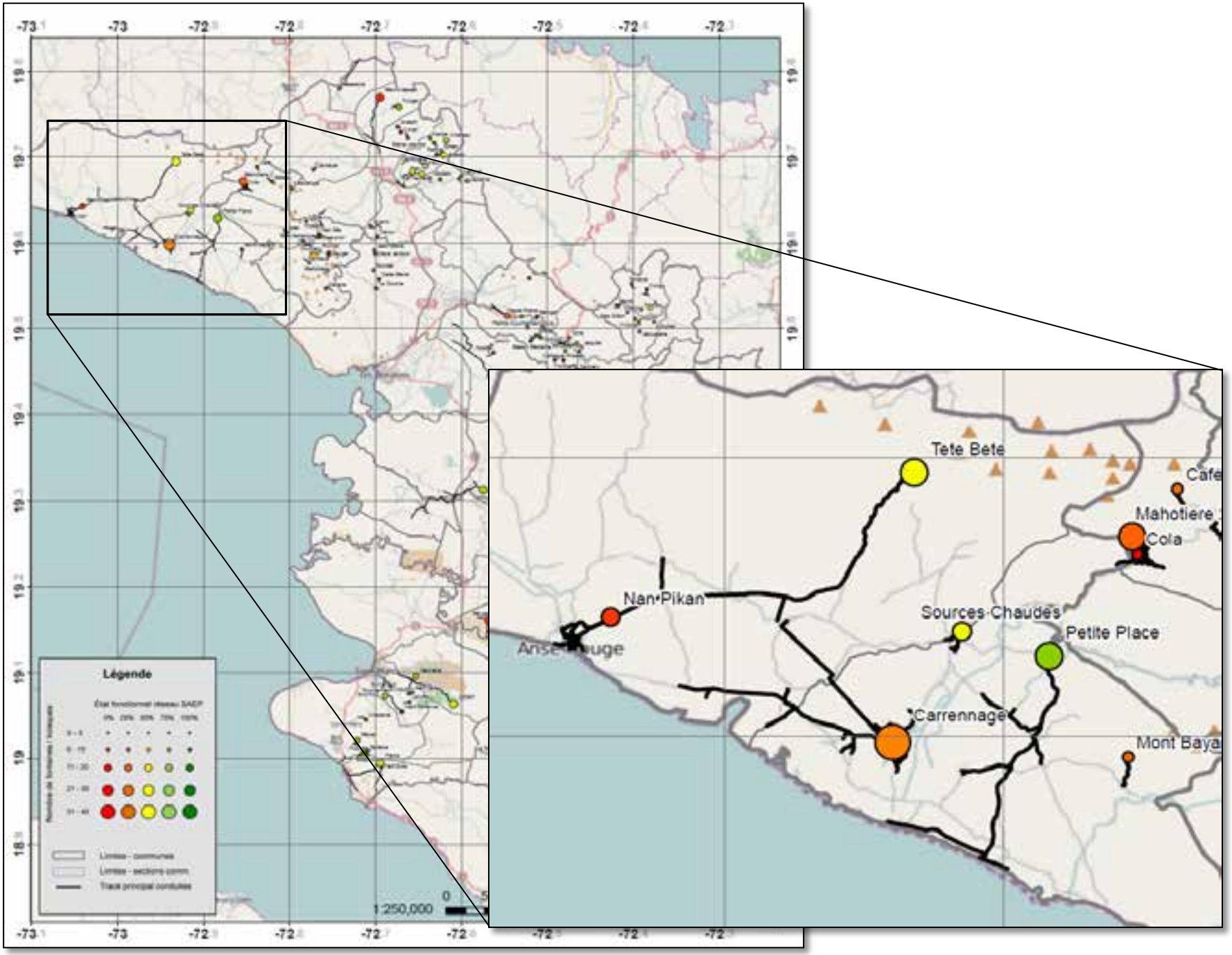
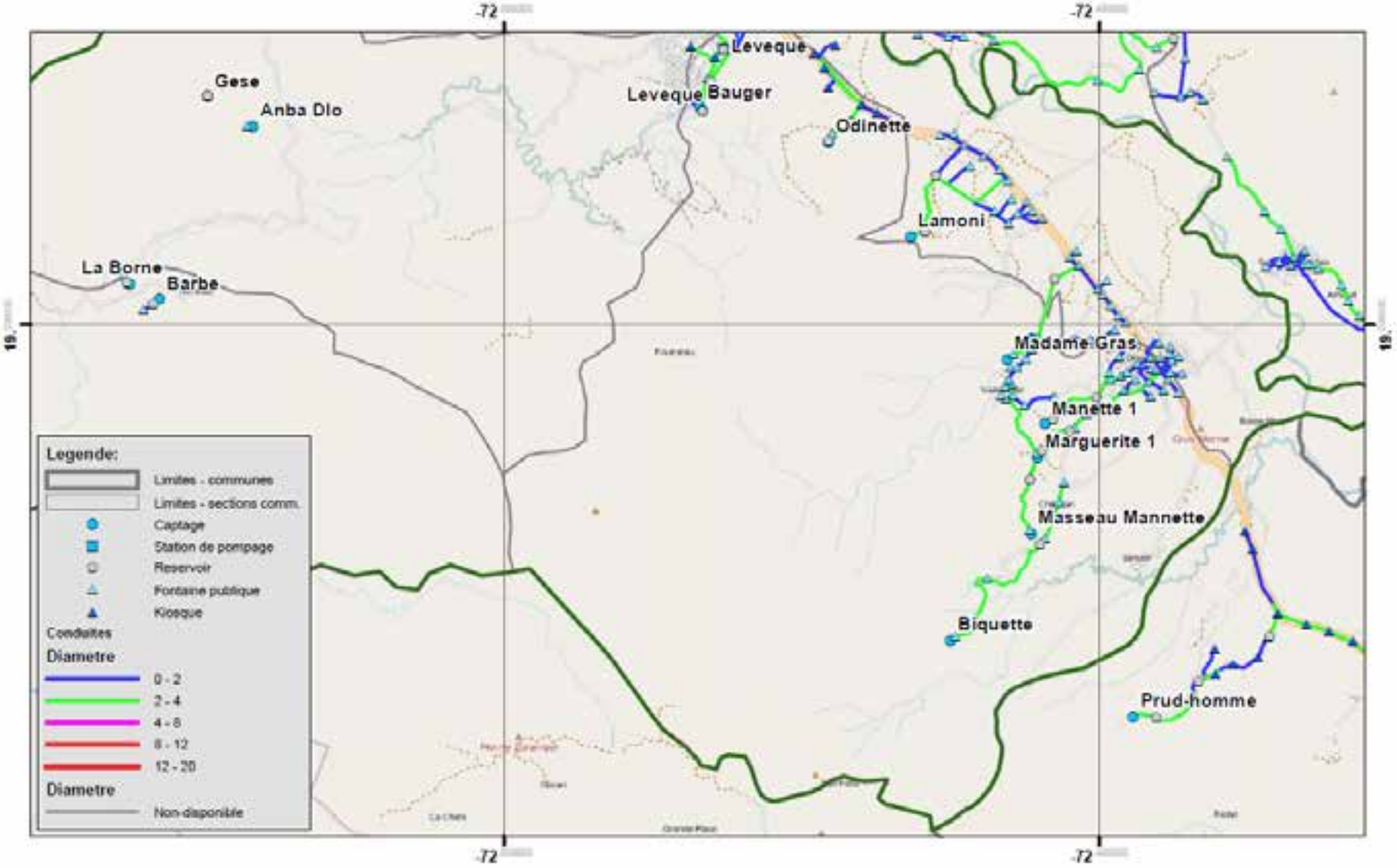
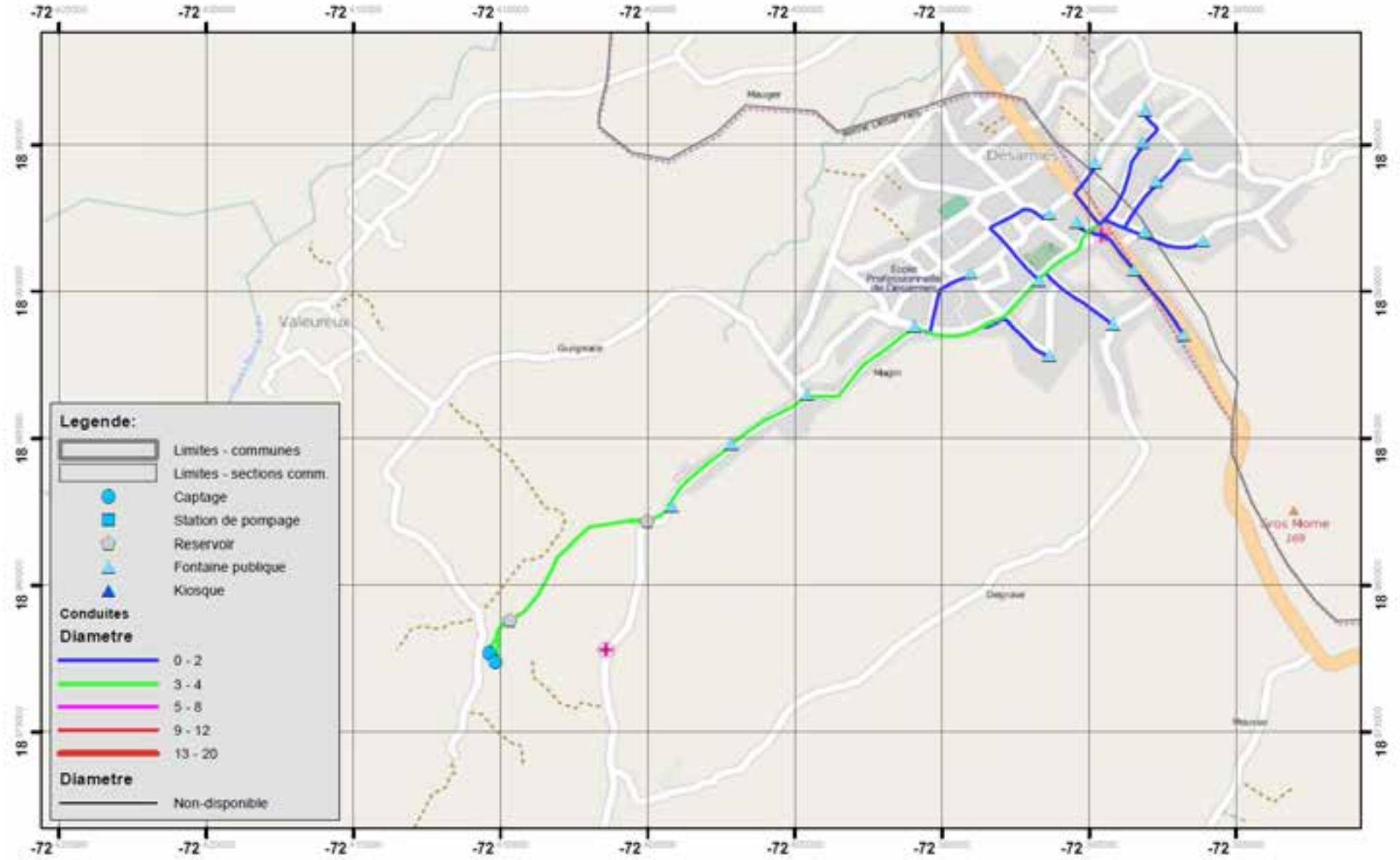
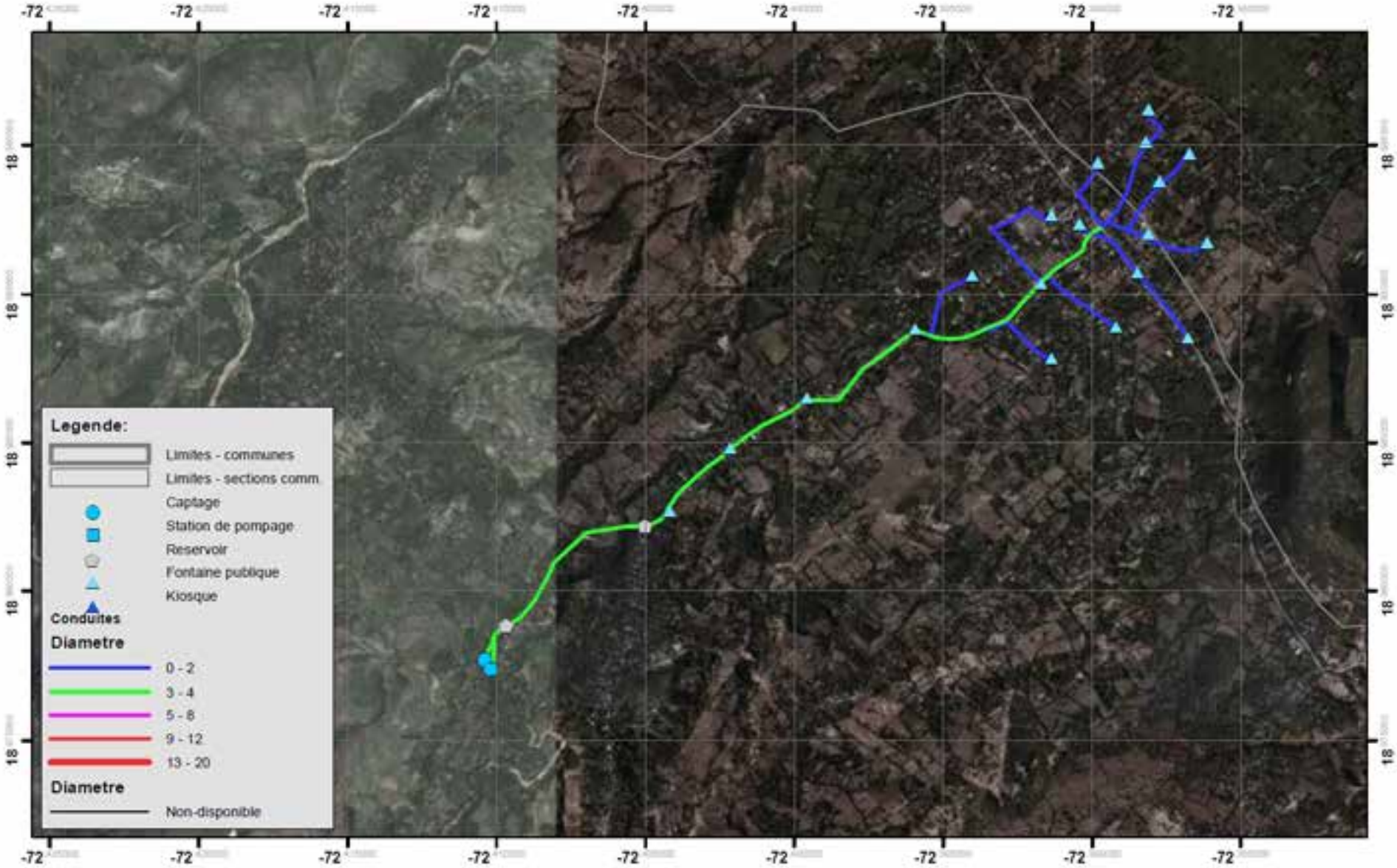

Légende
Limites - communes
Limites - sections comm.
Tracé principal conduites
1:250,000
Tete Bete
Cafe
Mahotiere
Cola
Nan Pikan
Sources Chaudes
Petite Place
Carrennage
Mont Baya



Sample from commune maps

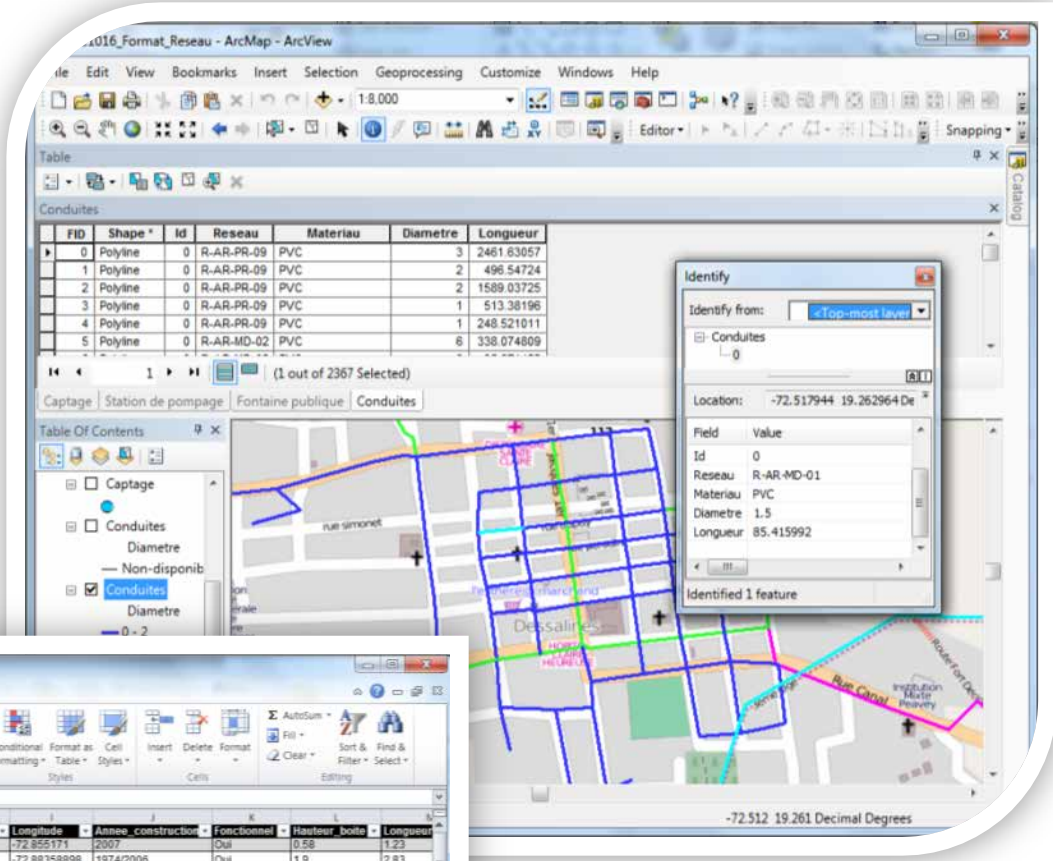


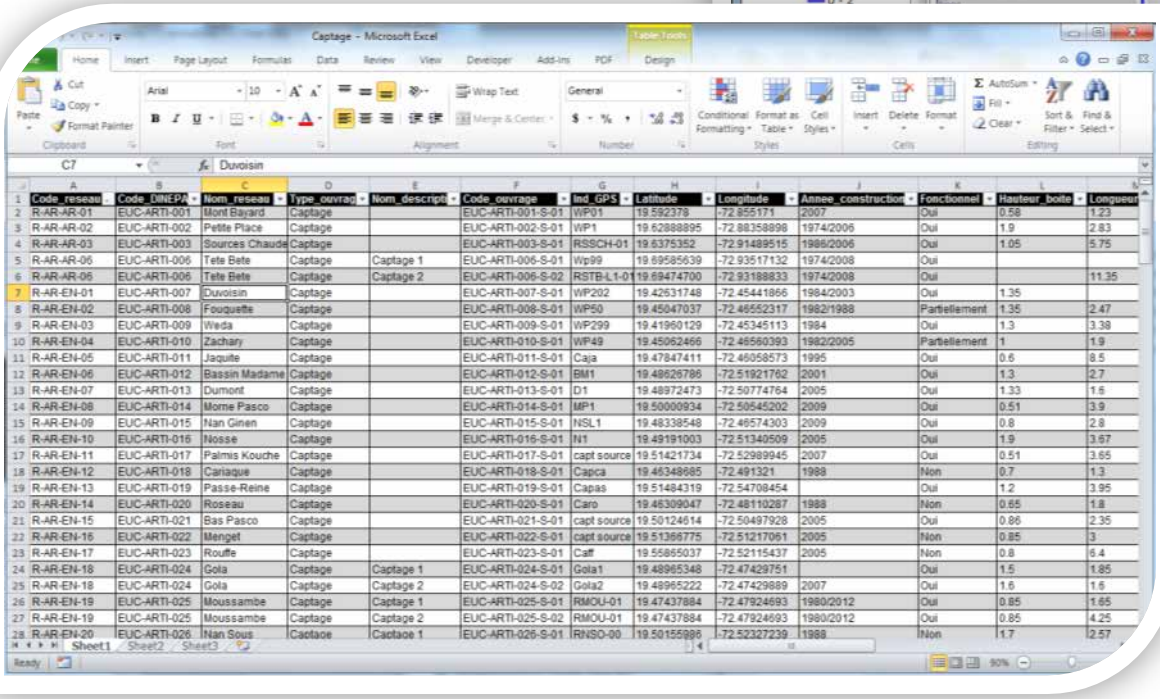
Sample from system maps (OSM background)



Sample from system maps (satellite photo)

ArcGIS view





Excel export by system component

Results

- Increased knowledge of current service levels and infrastructure condition;
- Water system “atlas” produced for each commune and department-wide using variety of tools (ArcGIS, Excel, Google Earth, hard and soft copies);
- Local government focal points can effectively interact with development actors about needs for rehabilitation / new infrastructure;
- Data incorporated into newly-developed national database for water and sanitation infrastructure (web-based);

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Lessons learned and future work

- Incentives for surveyors / engineers in the field and comprehensive quality control are key;
- Challenges in data collection, entry and management call for a mobile/tablet based integrated platform;
- Open Street Map layers surprisingly detailed, even in small rural towns of Haiti;
- Good snapshot of current infrastructure condition, but better mechanisms should be developed to regularly update data;
- Scaling up at the national level;

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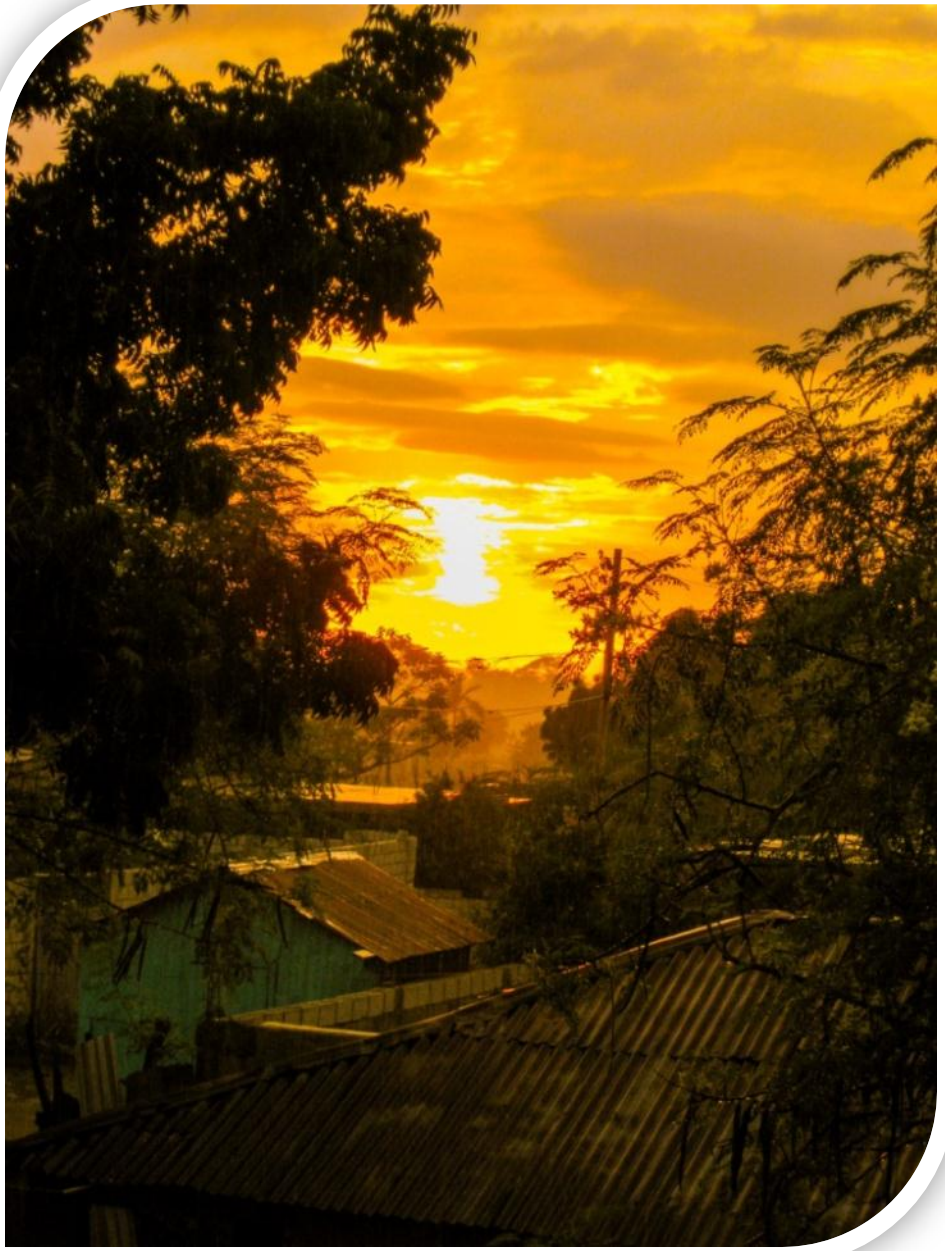
Questions

- Thank you!

- Contact:
  mfortin@cowater.com



Sunset view from project office