



ESTIMATION OF WATER DEMAND AND SUPPLY IN A MICRO-WATERSHED. CASE OF STUDY EL TIGRE STREAM



IWA-IDB INNOVATION CONFERENCE



Eng. María Alejandra Lozano Reyes

Eng. Natalia Andrea Otalora Rodriguez

MEng. Diana Carolina Ospina Mora

October 1st 2019

Guayaquil- Ecuador





Image Landsat / Copernicus
© 2018 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geographer

Google Earth

Fechas de imágenes: 12/13/2015 14°06'16.39" N 48°56'10.92" O elevación -4619 m alt. ojo 4279.60 km

PROBLEM

Rural supply
system with bad
frequency service

50% population
live in poor
conditions

No service during
more than 4 days

Storage tanks are
not enough



WHAT WE DID?

- CAR, IDEAM y PBOT =municipal, environmental authorities
- Field visits

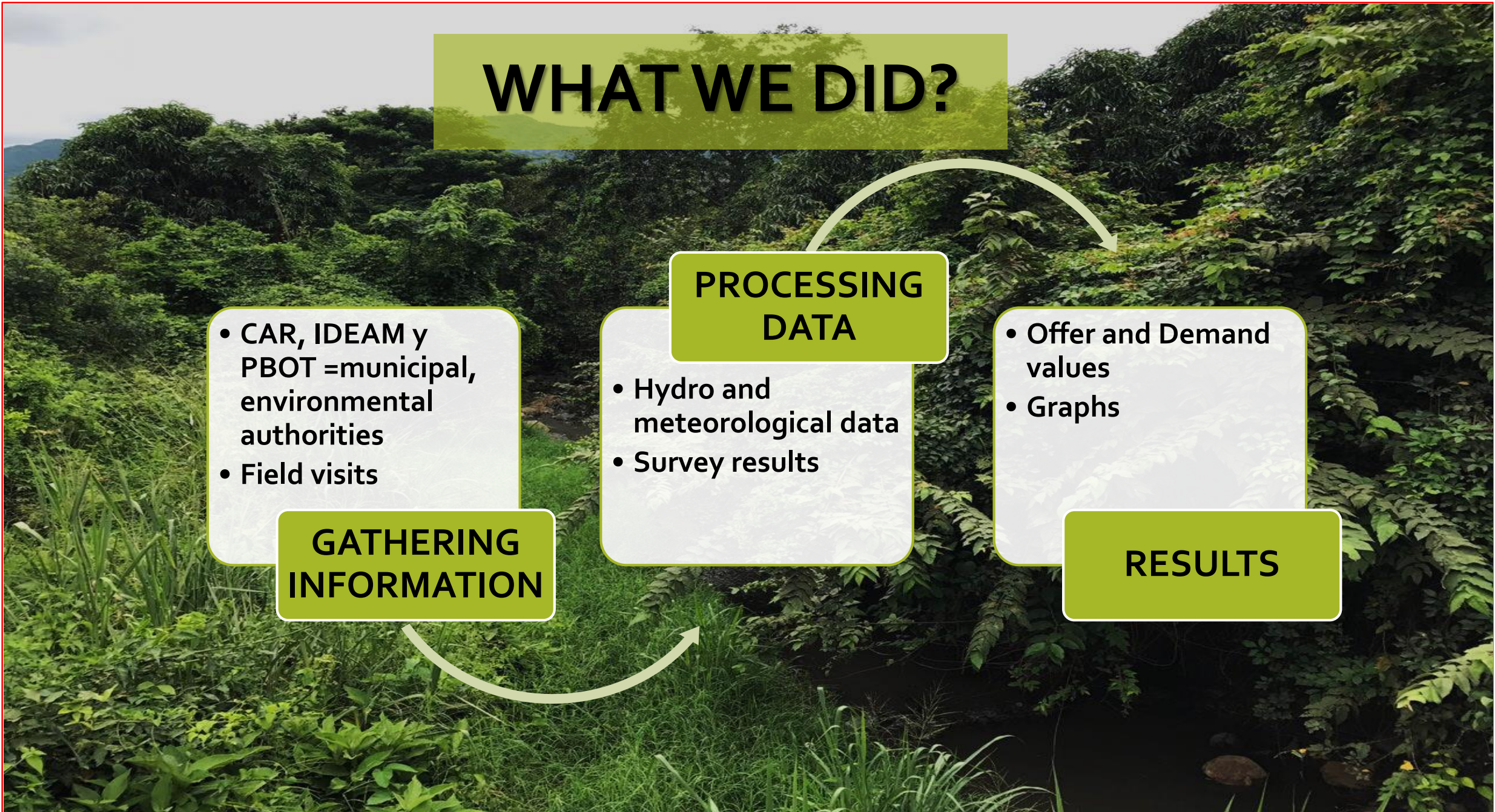
GATHERING INFORMATION

PROCESSING DATA

- Hydro and meteorological data
- Survey results

- Offer and Demand values
- Graphs

RESULTS





OFFER ANALYSIS

MAIN CHARACTERISTICS

AREA (Km²) = 12,57

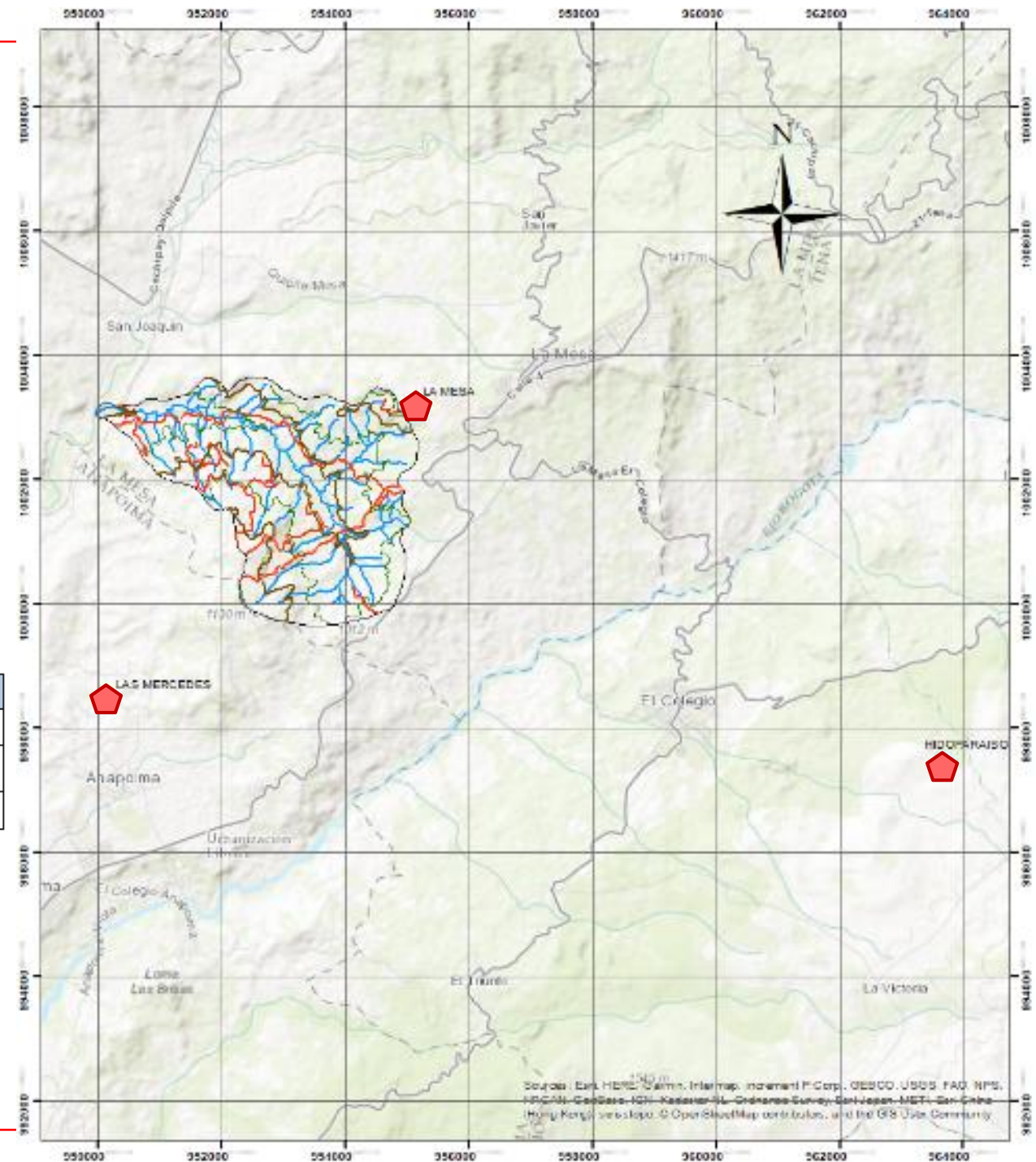
PERIMETER (Km)= 16,48

LENGTH = 7,16 Km

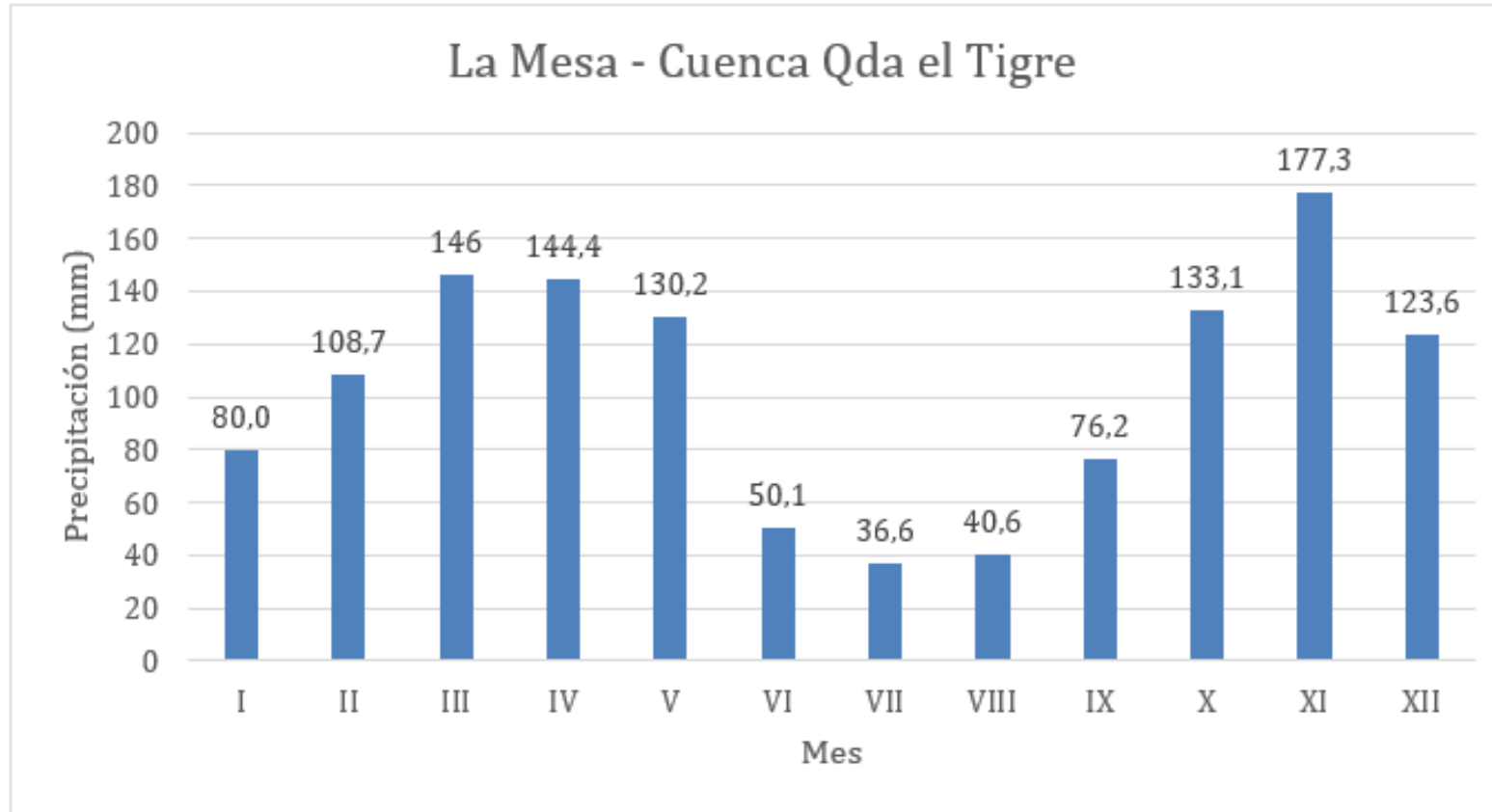
BEST DATA FROM:

ID	NOMBRE	LONGITUD	LATITUD	ALTURA	TIPO	PROCEDENCIA
1	LA MESA	955138	1003154	1194	CON	CAR
2	LAS MERCEDES	950164	998433	810	AUT	IDEAM
3	HIDROPARAISO	963677	997461*	1600	CON	IDEAM

*4,68 Km distance from the basin

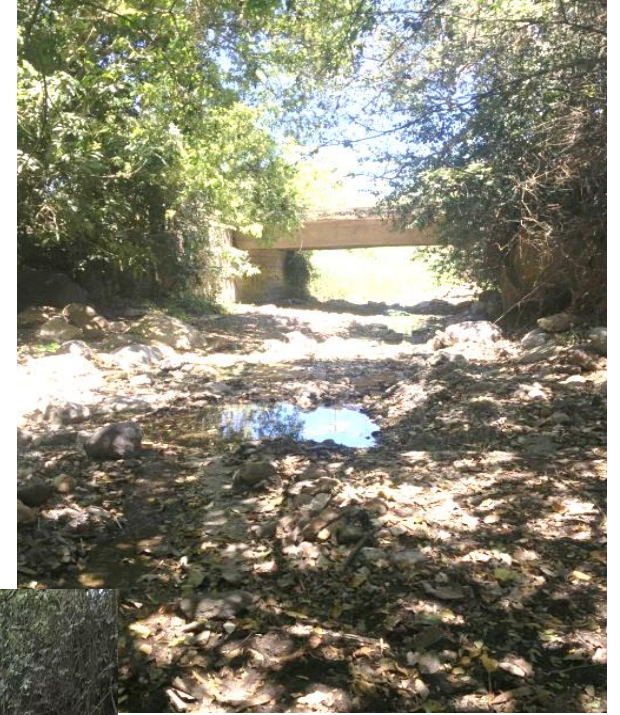


RAIN BEHAVIOR



OFFER = FLOW VALUES

- Rational formula (Tr_5) estimation= **175 L/s**
- Q measured (rainy season)= **30,85 L/s**
- SCS method = **no available appropriate data**



Photos taken by: Otalora, N; Lozano M

FLOW MEASUREMENT



**Rainy season:
APRIL 21
2018**

Photos taken by: Otalora, N; Lozano M

FLOW MEASUREMENT



**AUGUST 4
2018
2,72 L/S**





DEMAND ESTIMATION

WATER DEMAND

SURVEY

- Field visit:
 - Water for human consumption

AGRICULTURAL USE

Estimation from each type of plants using

ET_c = crop evapotranspiration (mm/mes)

K_c = crop coefficient

ET_o = reference crop evapotranspiration

TOTAL DEMAND

- all uses
 - **0,049 L/s**
 - **43,88 L/s***
 - *natural flow

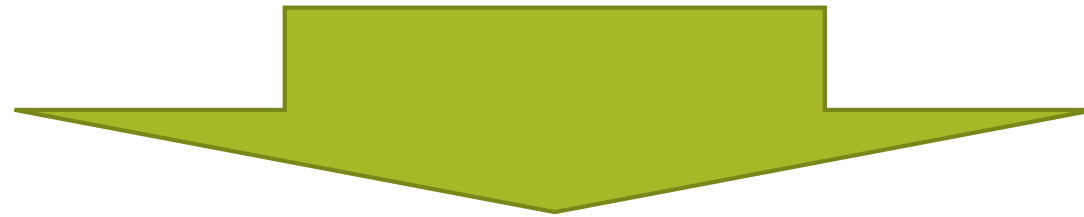
OFFER VS DEMAND

- Rational formula (T_r5) estimation= **175 L/s**

- \bar{Q} measured (rainy season)= **30,85 L/s**

Vs

DEMAND =
43,93 L/s



Not enough water

Expansion of tourism activities



PEOPLE

LOW INCOME: 50%



- No options

HIGH INCOME: 50%



- People buy
- bottled water
 - Water trucks





CONCLUSIONS

- Planning water is a “fake” notion when the information used came from a macro or general view.
- Land planning is not related to water planning.



Water is accessible only when population has money

GRACIAS POR SU ATENCIÓN

Acknowledgments

- My students: Natalia Otálora y María Lozano and their families.



GRACIAS POR SU ATENCIÓN

Acknowledgments

- Universidad Libre
- Conference Organizing Committee