



REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF SCIENCE AND TECHNOLOGY

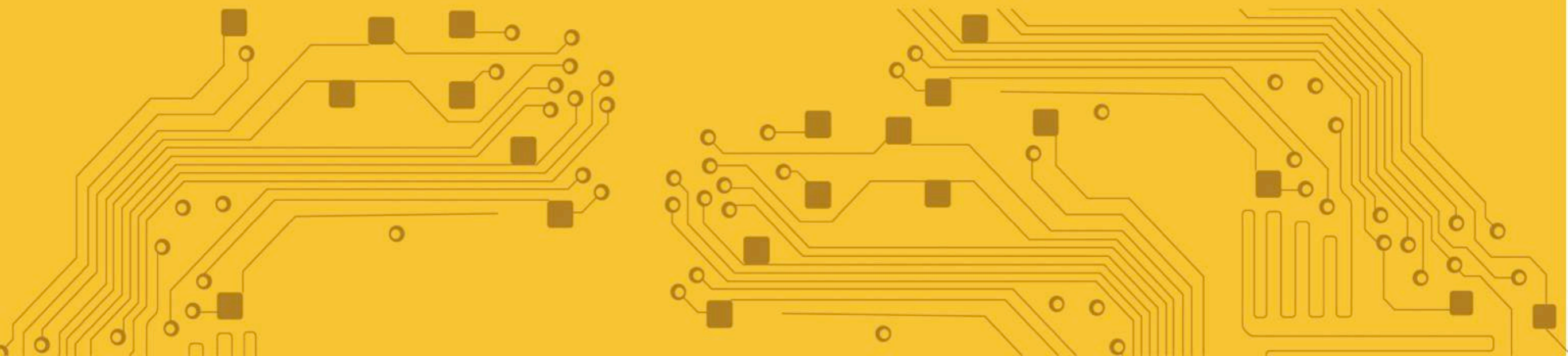


INFORMATION AND  
COMMUNICATIONS  
TECHNOLOGY  
OFFICE

# TV White Space Technologies

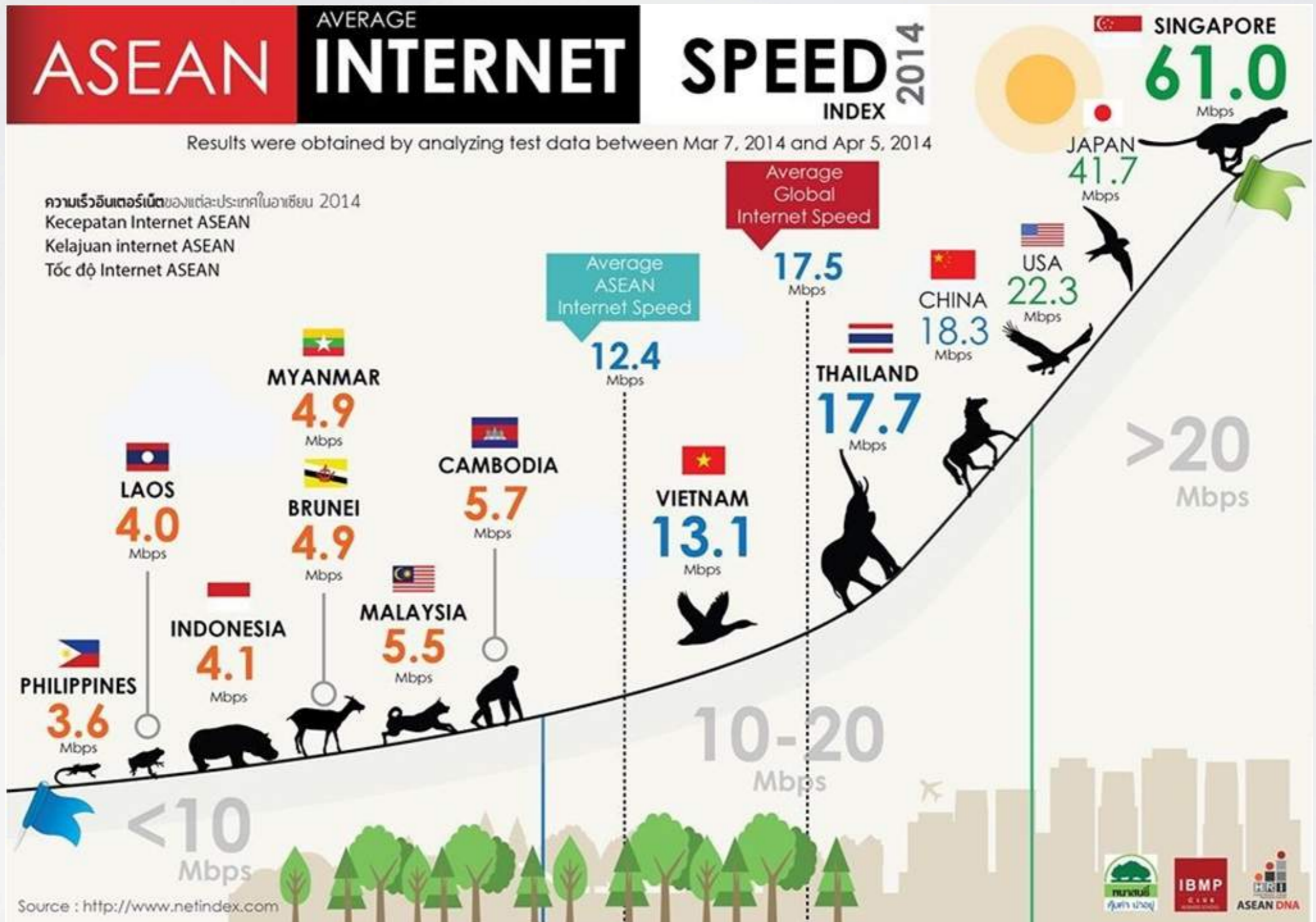
## Super Wi-Fi, Weightless

From a Wasted Resource Into a Tool for Public Service & National Development



# The Philippine Internet Landscape

# The Philippine Internet Landscape



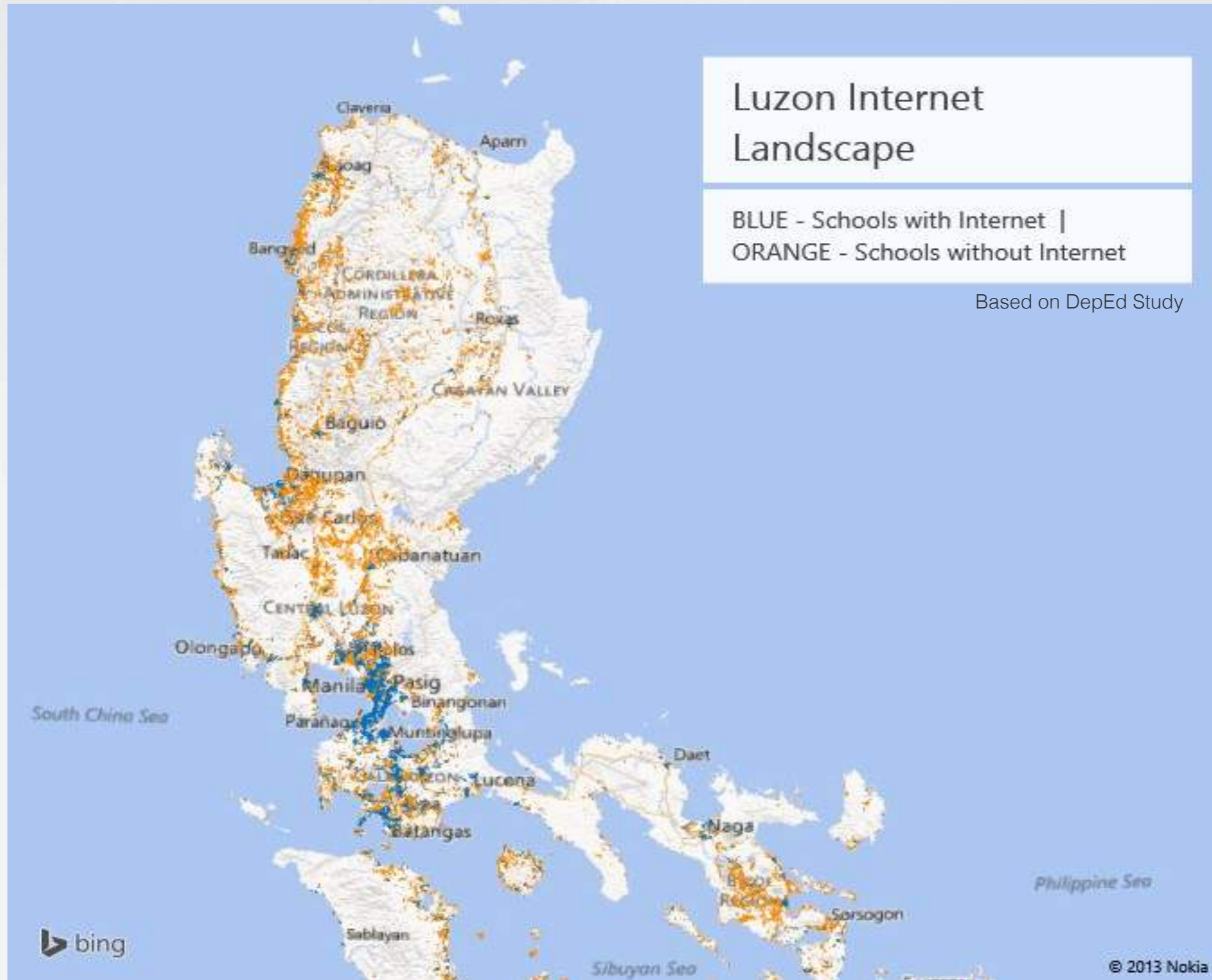
# The Philippine Internet Landscape



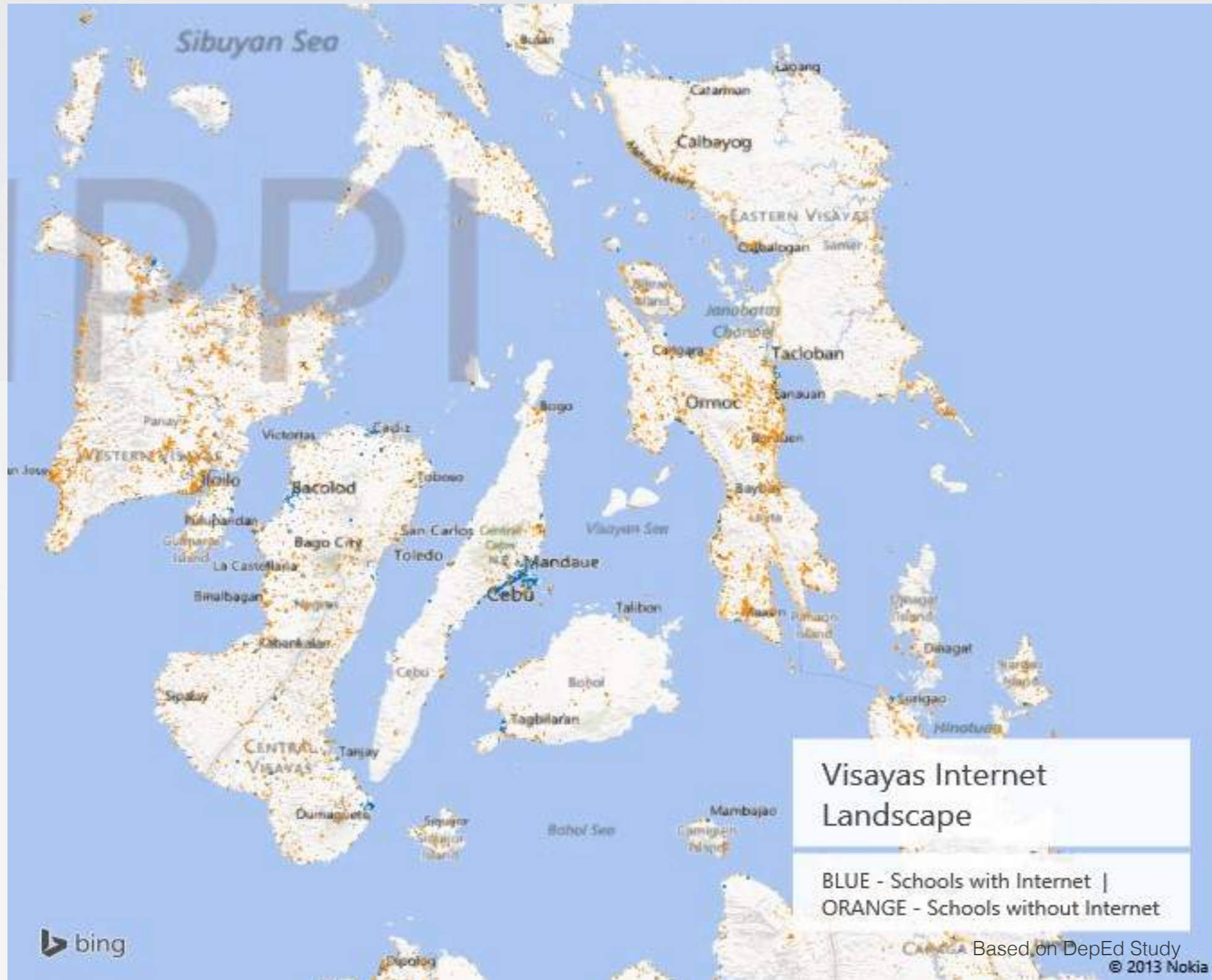
# The Philippine Internet Landscape



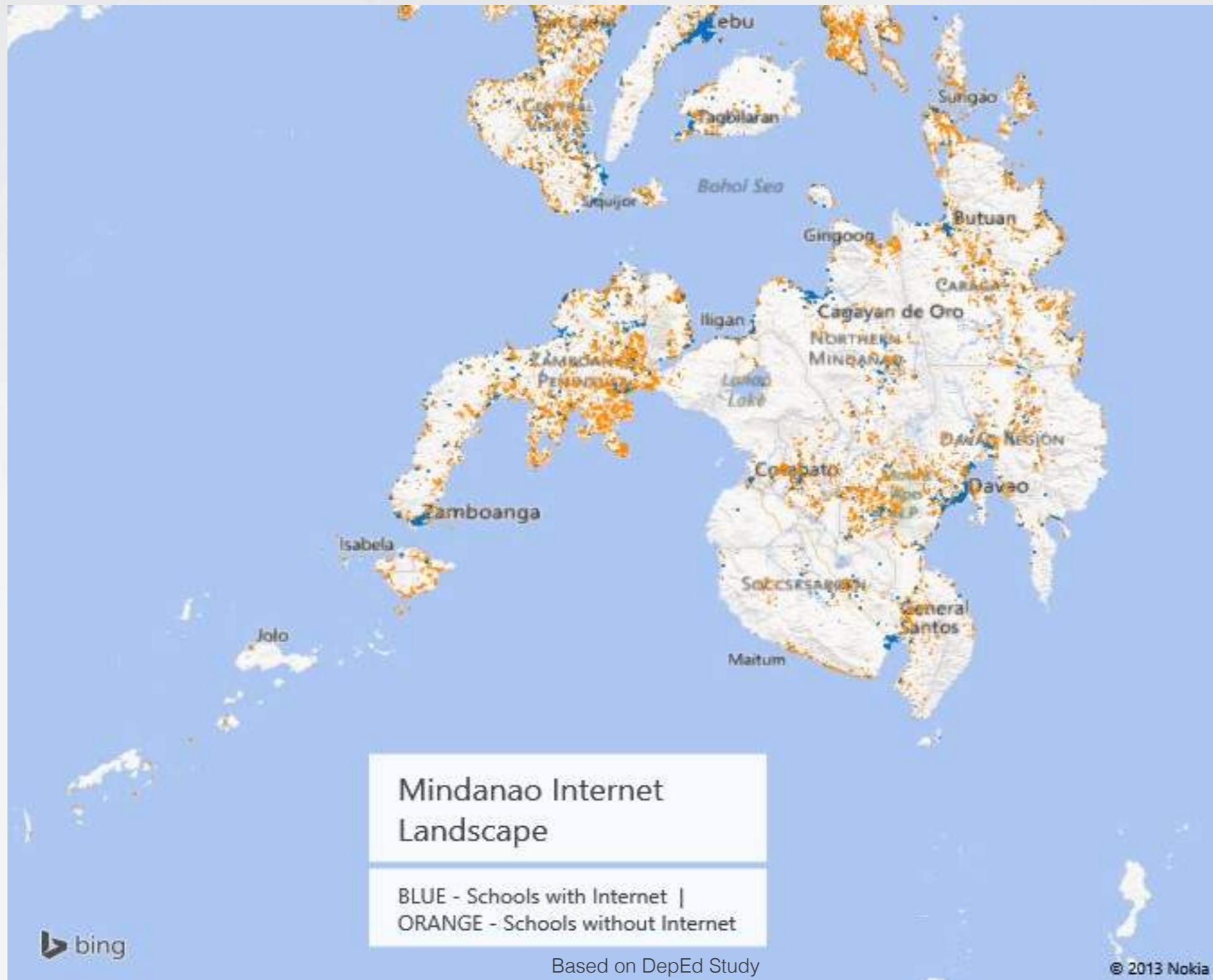
# The Philippine Internet Landscape



# The Philippine Internet Landscape

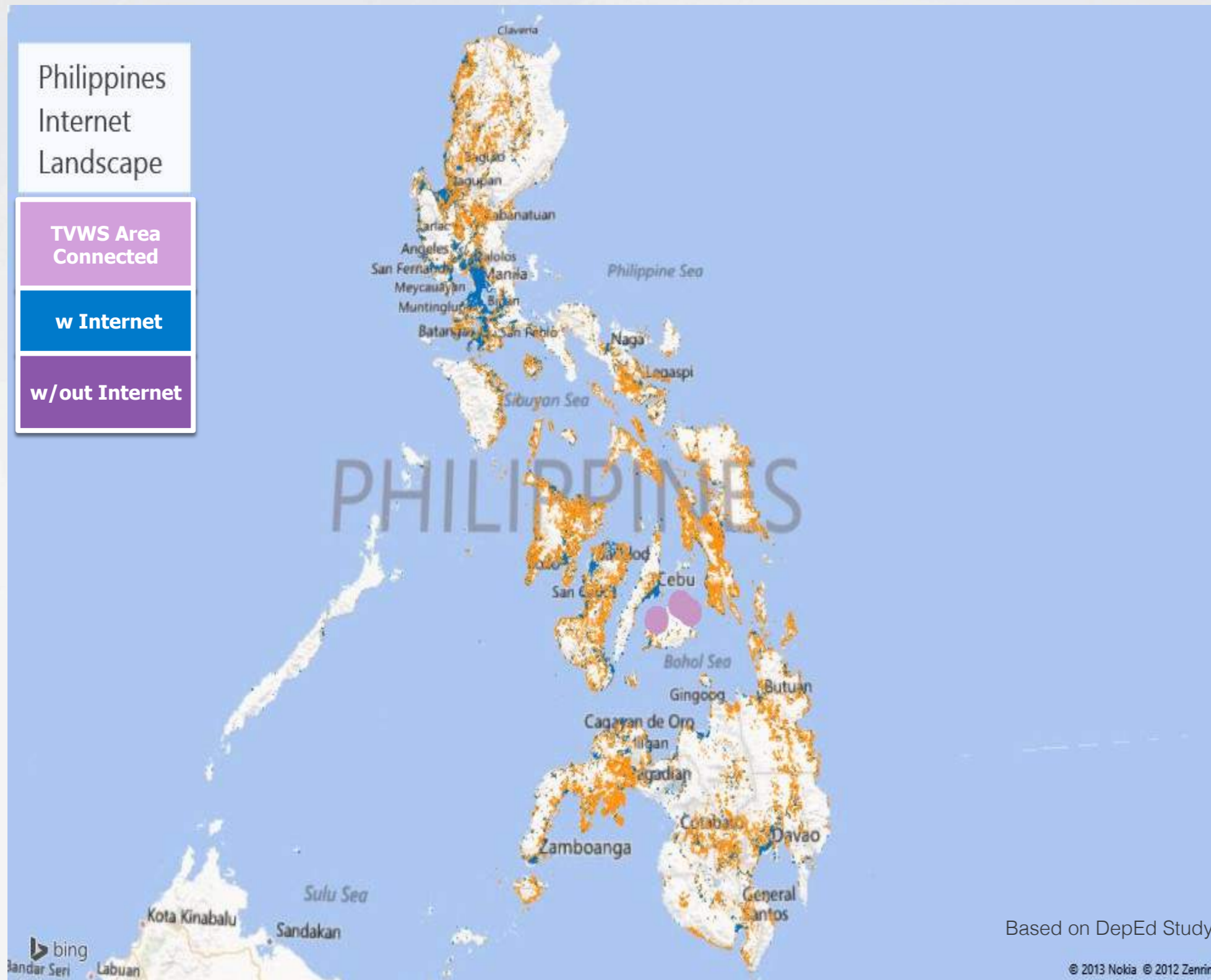


# The Philippine Internet Landscape





# The Philippine Internet Landscape



Based on DepEd Study

# The Philippine Internet Landscape

## The Philippine “Connectivity”

**55.42%**

cities and municipalities have broadband access (fixed or wireless) which is more often than not limited to the immediate vicinity of a municipality’s center.



**35%**

or **33.6M** out of **95.9M** Filipinos use the Internet

**20%**

of households have computers



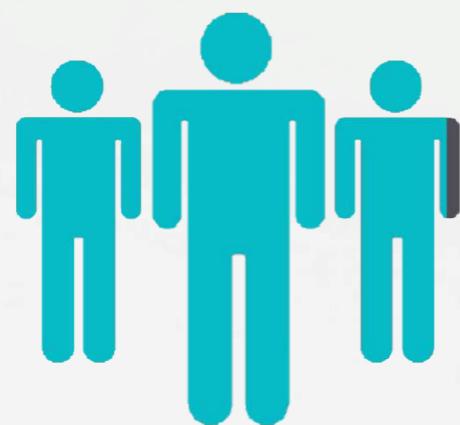
# The Philippine Internet Landscape

## The Philippine “Connectivity”



**98.52%**  
of municipalities

Cellular Mobile Telephone Service



**99%**  
population (CY2011)

**2 Billion**  messages handled daily

# The Philippine Internet Landscape

## ICT Situation of Public Schools

Elementary Schools

38,659



High Schools

7,750

4%

use a wired connection

17%

are in an area with an ISP

86%

public high schools use available connectivity

53%

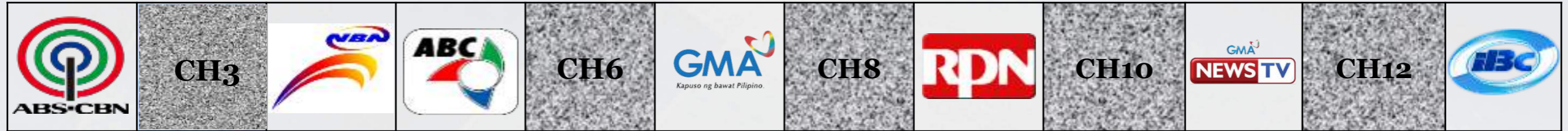
public elementary schools use available connectivity

**P1,026.60** Cost Per Elementary School is equal to the lowest household ISP subscription.

# TV White Space



# TV White Space

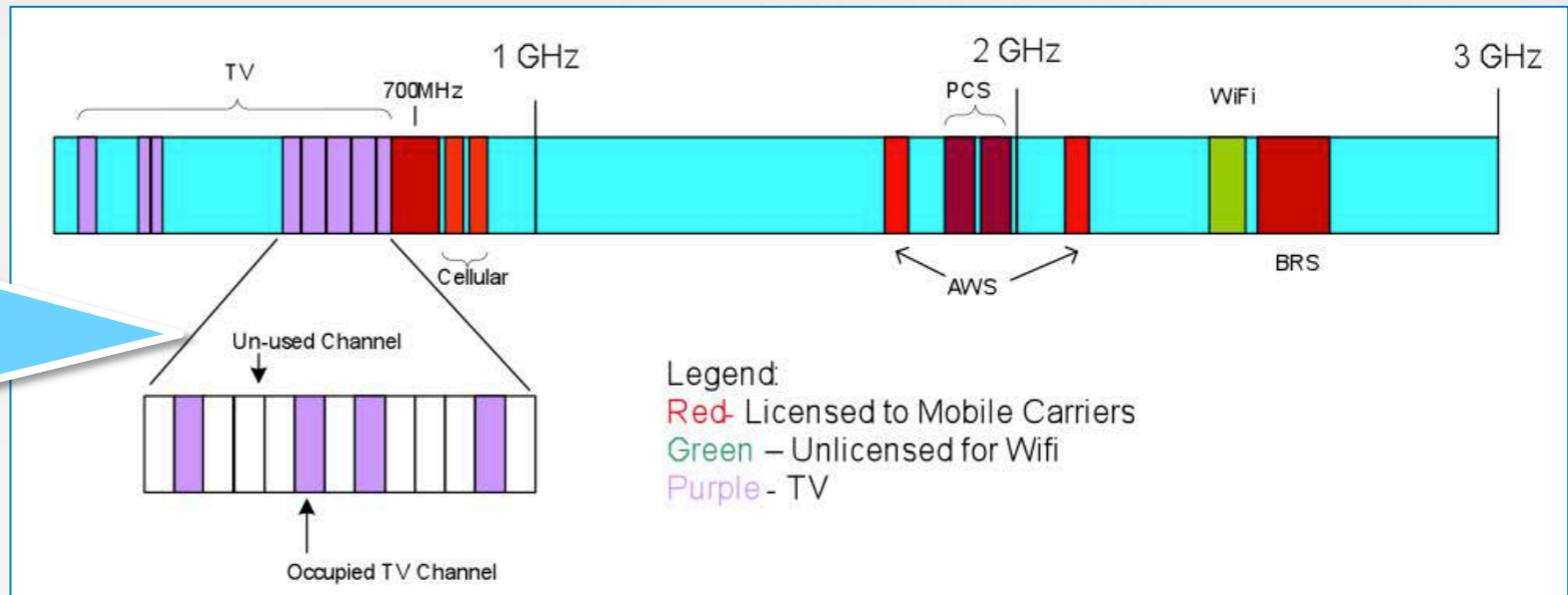


TV White Space refers to the unused TV channels

“Guard Band” channels are intentionally kept between active ones to distinguish signals clearly.

There many unused TV channels possibly due to insufficient commercial opportunities

When tuned to these unused TV channels, this displays what looks like “snow” with a hissing sound.  
The “snow” and hiss in tech jargon is called *white noise*. Thus, the term “*white space*”.



# TV White Space

## Why TV White Space

TVWS technologies are ready for deployment.

A perfect solution for last mile distribution

IDEAL for the Philippine landscape.

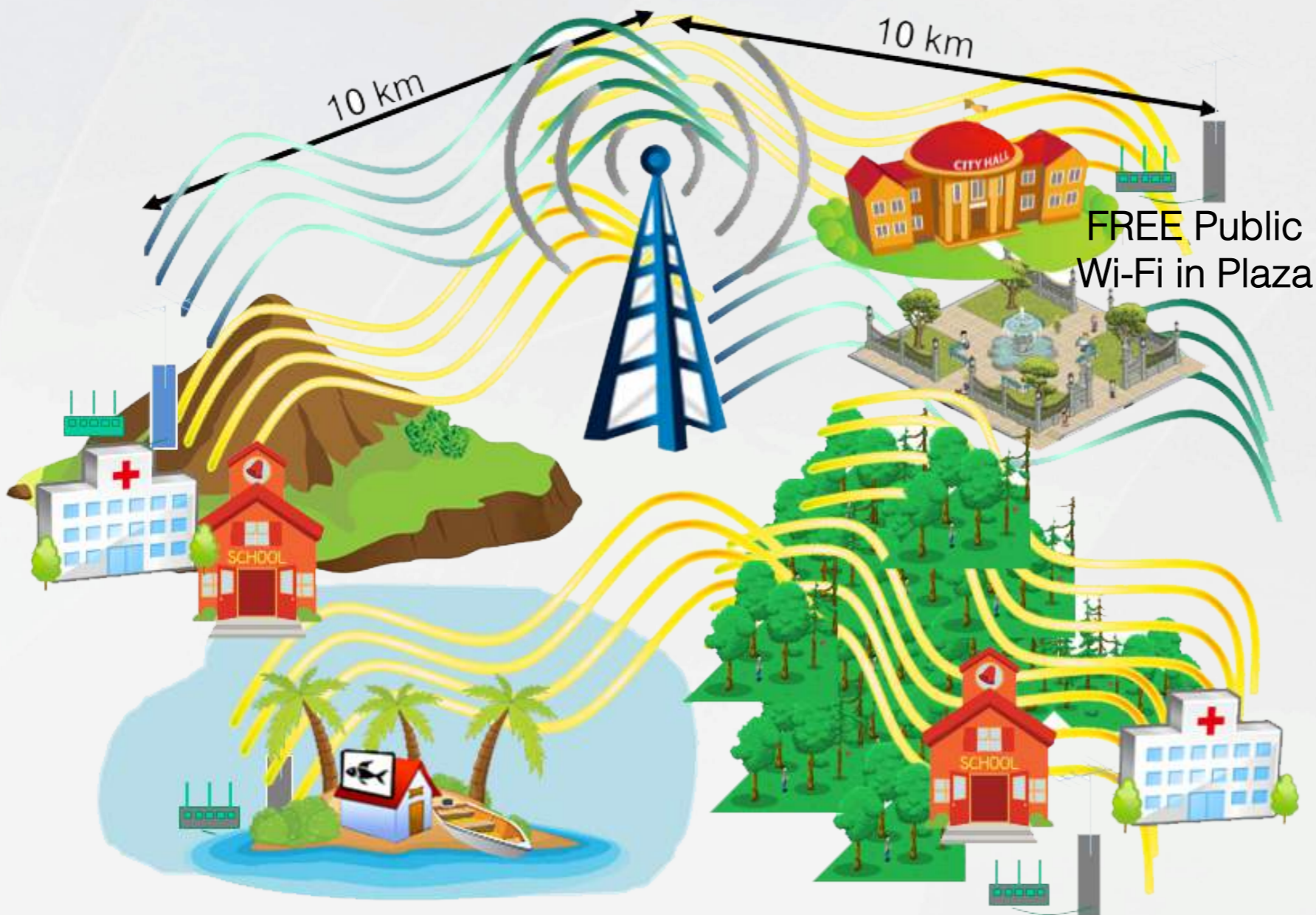


83%

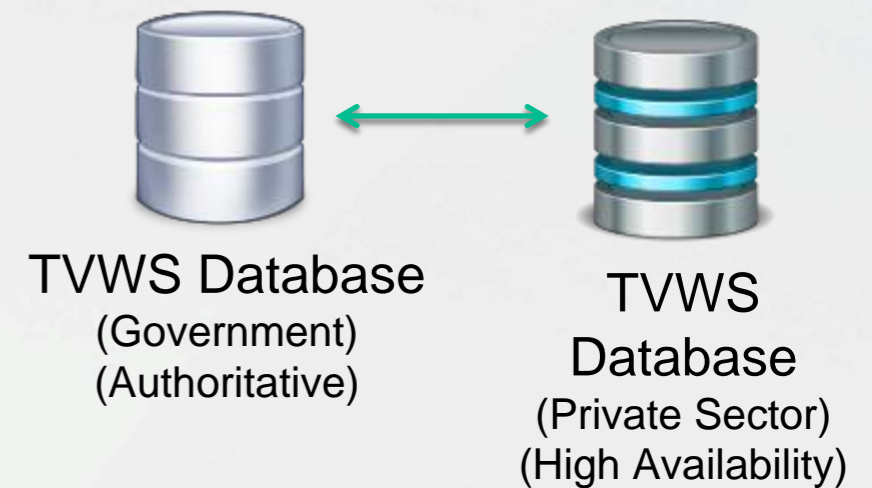
**No broadband connectivity in most areas.  
No ROI for big ticket infrastructure  
investments by the private sector.**

# TV White Space

## Dynamic Spectrum Allocation



A TVWS device queries an online TVWS database service for an empty TV channel to use for particular location on a daily basis or more. By updating the database, the usage of channel can be DYNAMIC.





# TV White Space

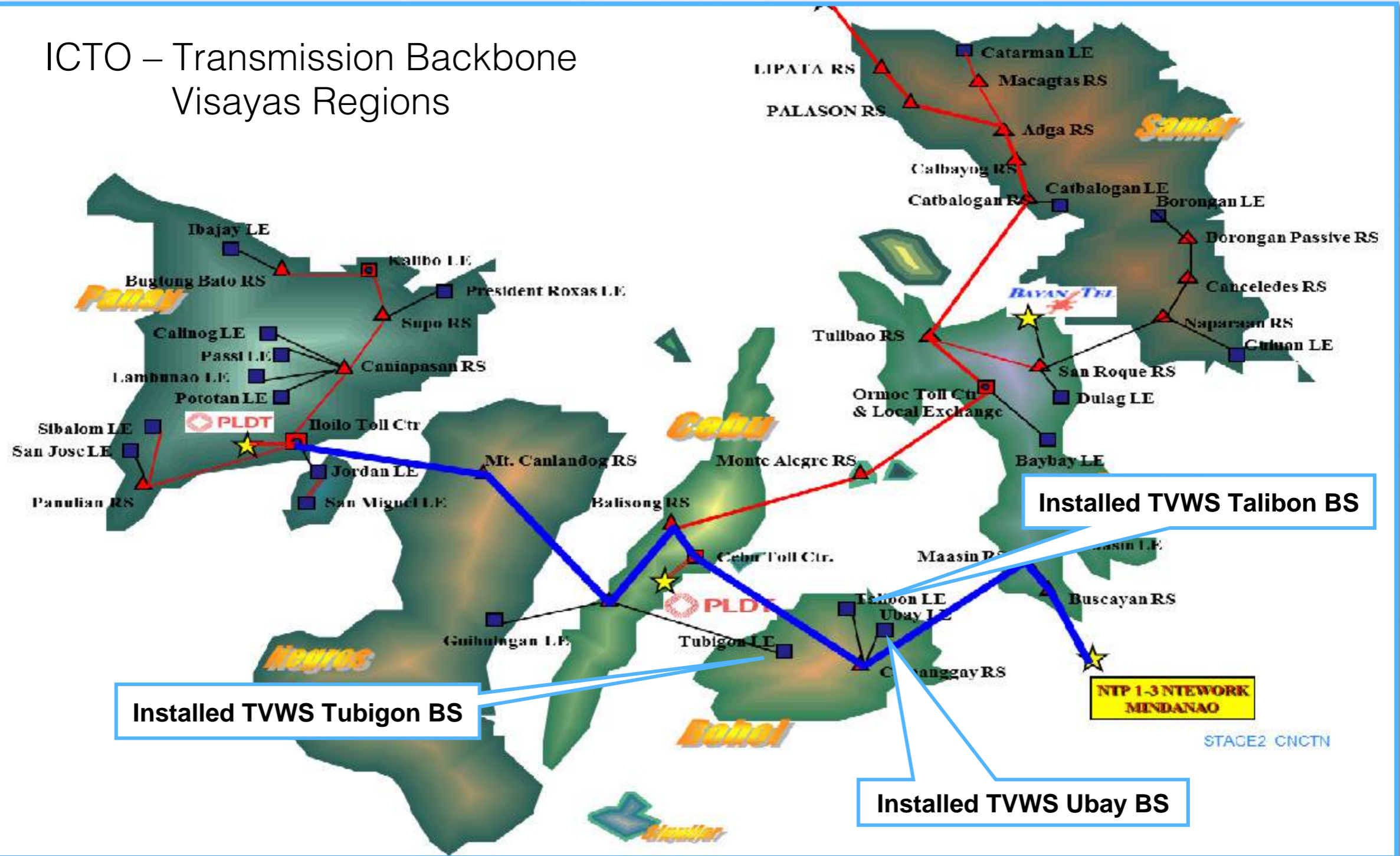
## Government Intervention



# TV White Space

## DOST-ICTO TVWS Trials

ICTO – Transmission Backbone  
Visayas Regions



# TV White Space

## Current Partners

DOST – ICT Office has partnered with various government agencies, technology providers and stakeholders, such as the following :

- National Telecommunications Commission (NTC)
- Department of Education (DepEd)
- Microsoft
- Nityo Infotech
- Federation of International Cable TV and Telecommunications Association of the Philippines (FICTAP)
- ABS-CBN
- Ecofish, BFAR & USAID

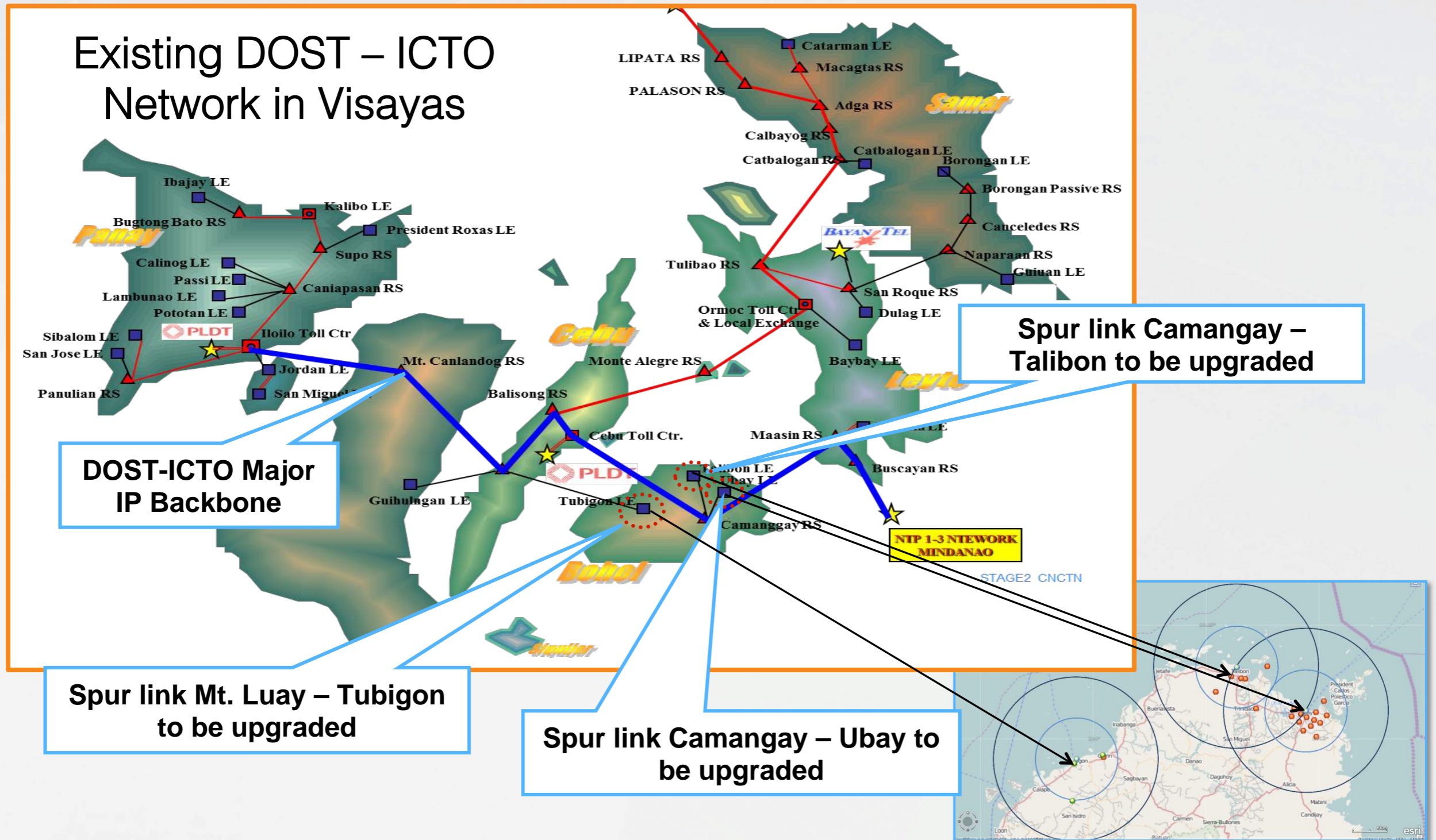
# TV White Space Bohol Coverage

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3 Base Stations

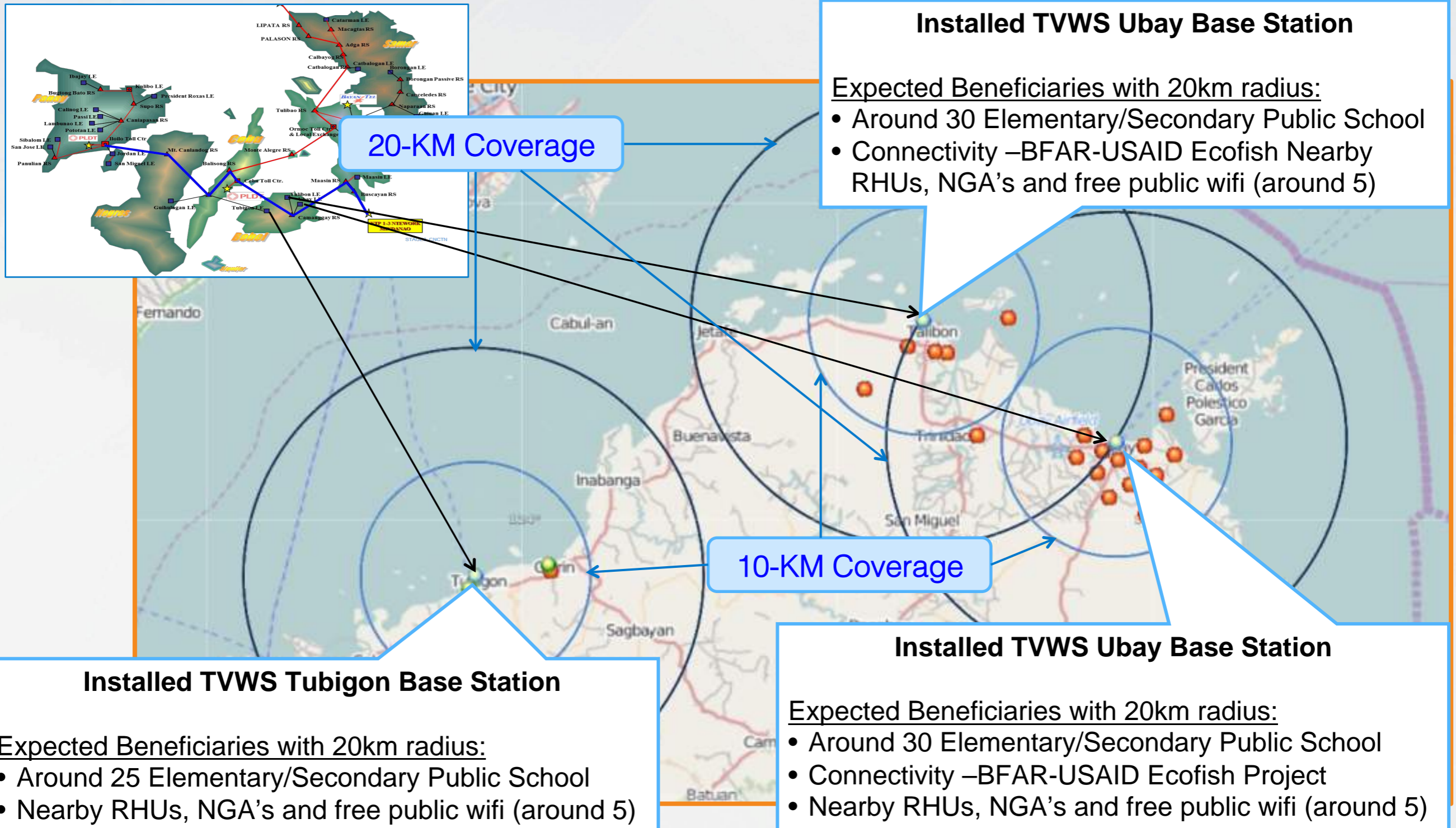
# TV White Space Bohol Coverage

## Technology Trials – Bohol, Philippines

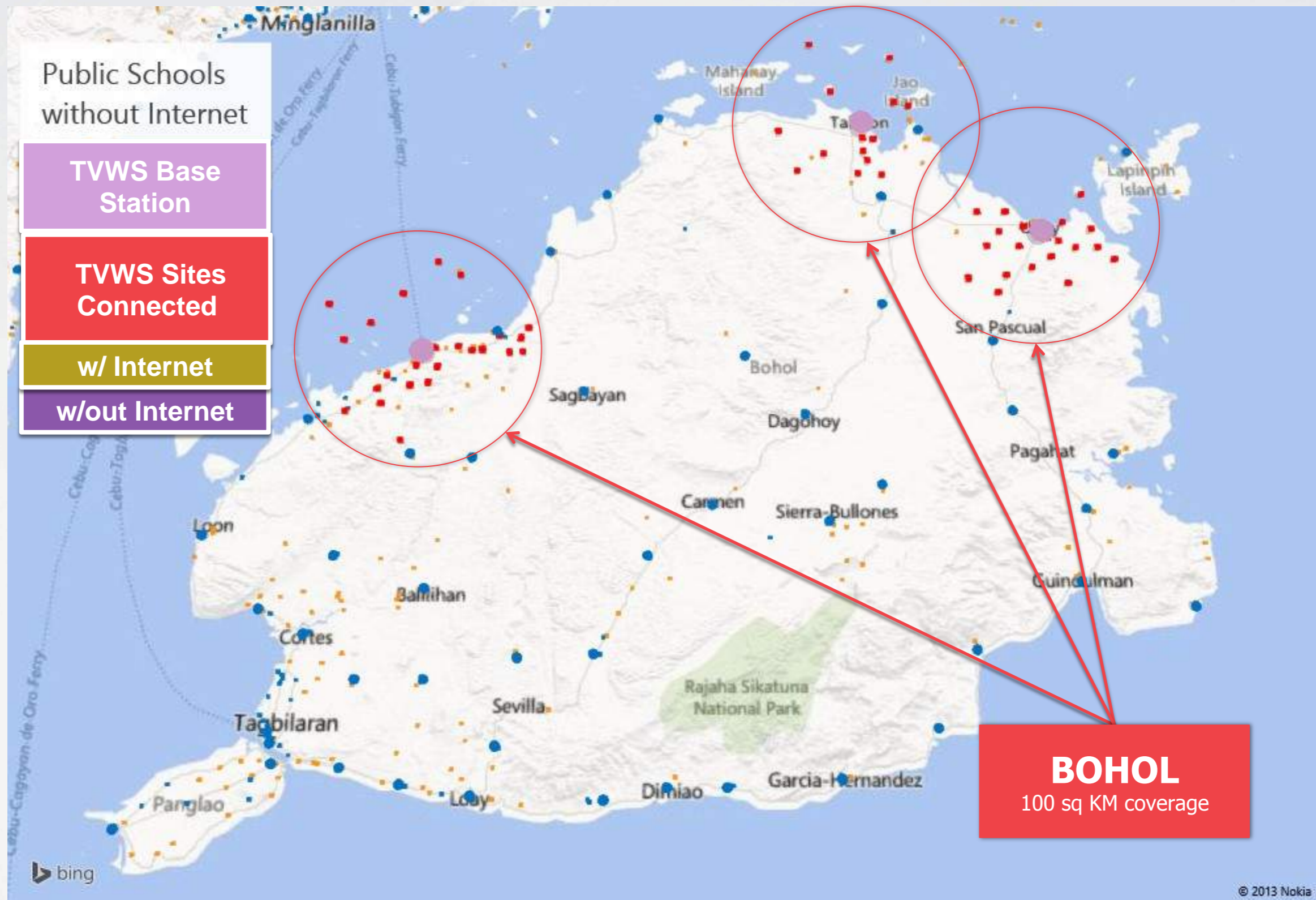


# TV White Space Bohol Coverage

## Technology Trials – Bohol, Philippines



# TV White Space Bohol Coverage



# The Earthquake

## Tubigon, Bohol Experience

1 Base Station, 3 CPE's



# The Earthquake Tubigon, Bohol Experience

TVWS base station being installed at comm tower



# The Earthquake Tubigon, Bohol Experience

TVWS radio at Community Hospital

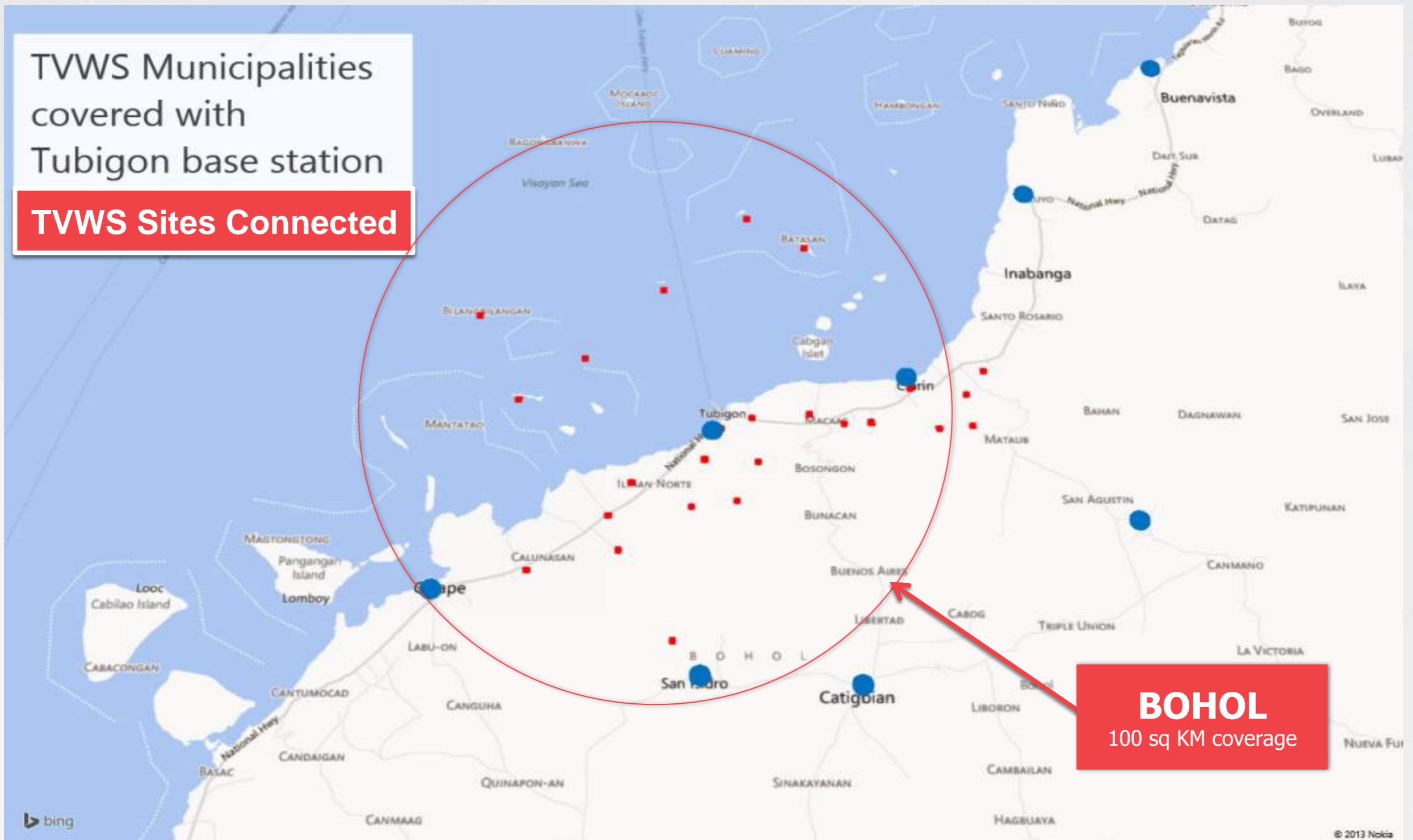


# The Earthquake Tubigon, Bohol Experience

TVWS Free Public Wi-Fi 6 days after the Earthquake



# The Earthquake Tubigon, Bohol Experience



# The Earthquake Tubigon, Bohol Experience

## TVWS Technology Trial – Tubigon, Bohol

### Tubigon Base Station:

Installed two (2) master/channel Base Station with an aggregate capacity of 24 Mbps (~12 Mbps per channel).

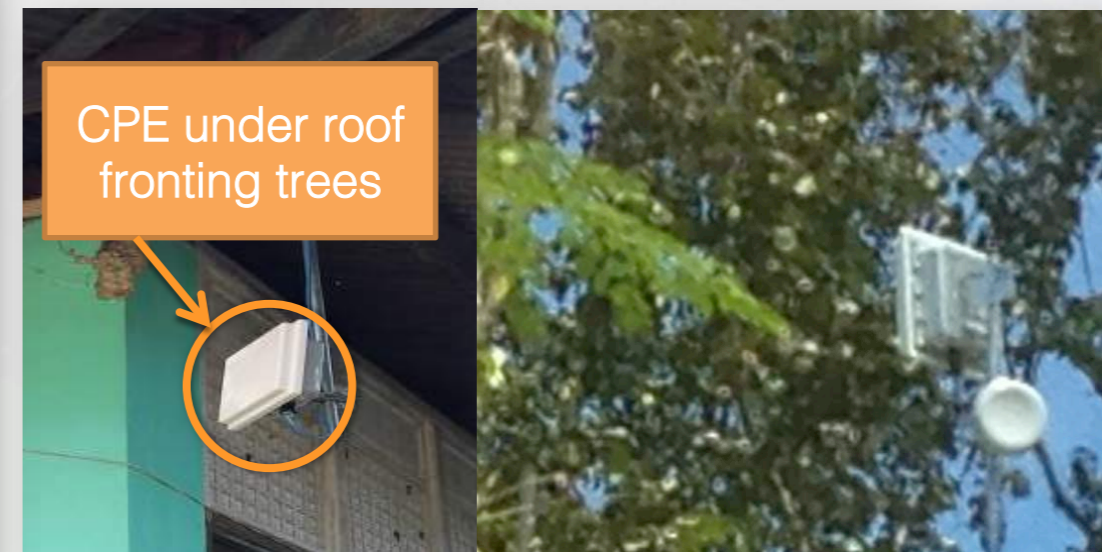
Installed three CPEs in the following locations:

- ✓ Tubigon Community Hospital serving connectivity to different government agencies inside Tubigon Government Center (these are PNP, DSWD, DOST, MCTC, TESDA as well as the Tubigon Rural Health Units (RHU));
- ✓ Tubigon Multi-purpose Gym with Public wifi access to cover Tubigon public market, public plaza and Tubigon church;
- ✓ Tubigon Central Elementary school with Wifi Access point

# The Earthquake Tubigon, Bohol Experience

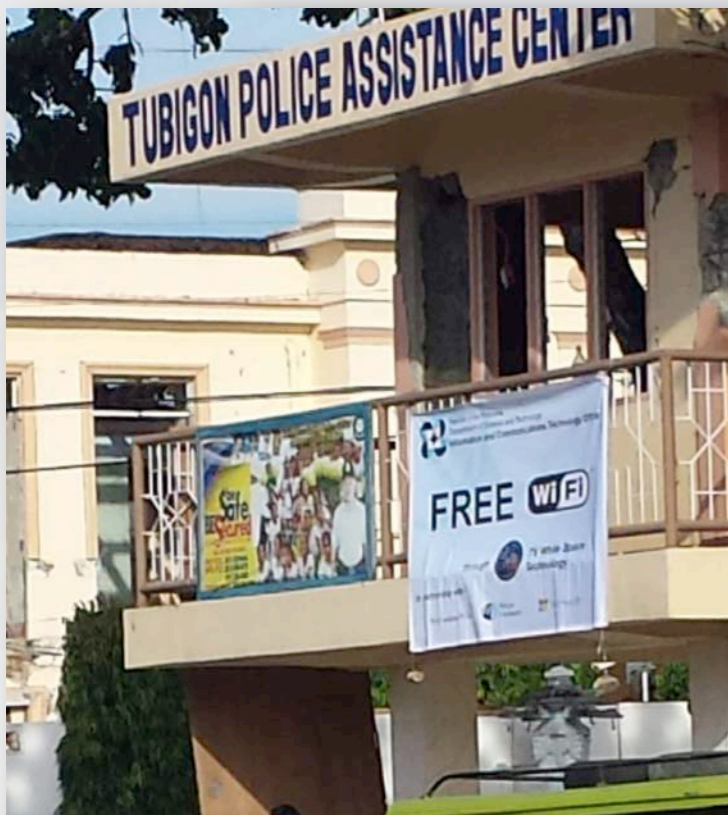
## ICT for Education

- Multimedia instruction, access to the better teachers
- Information access and delivery



# The Earthquake Tubigon, Bohol Experience

Free Wi-Fi – Plaza, Church, Market



CPE on  
Balcony

# The Earthquake Tubigon, Bohol Experience

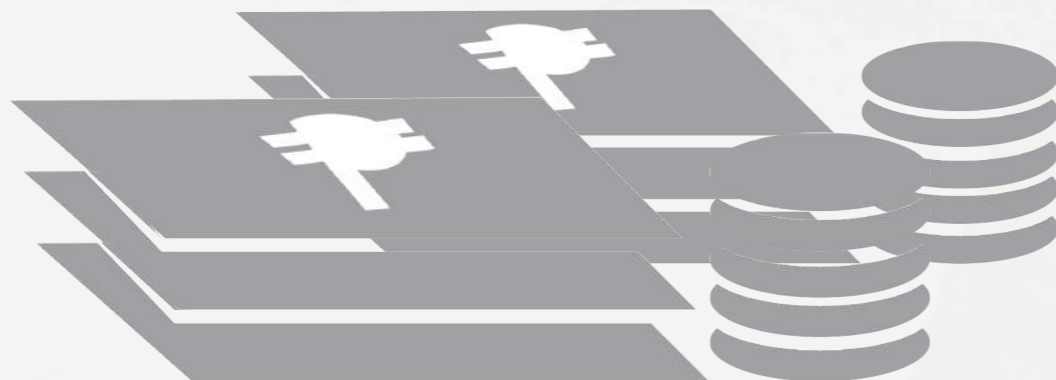
## ICT for Governance



- LGU/NGA coordination
- Access to e-Government Services
- Bottom up Budgeting



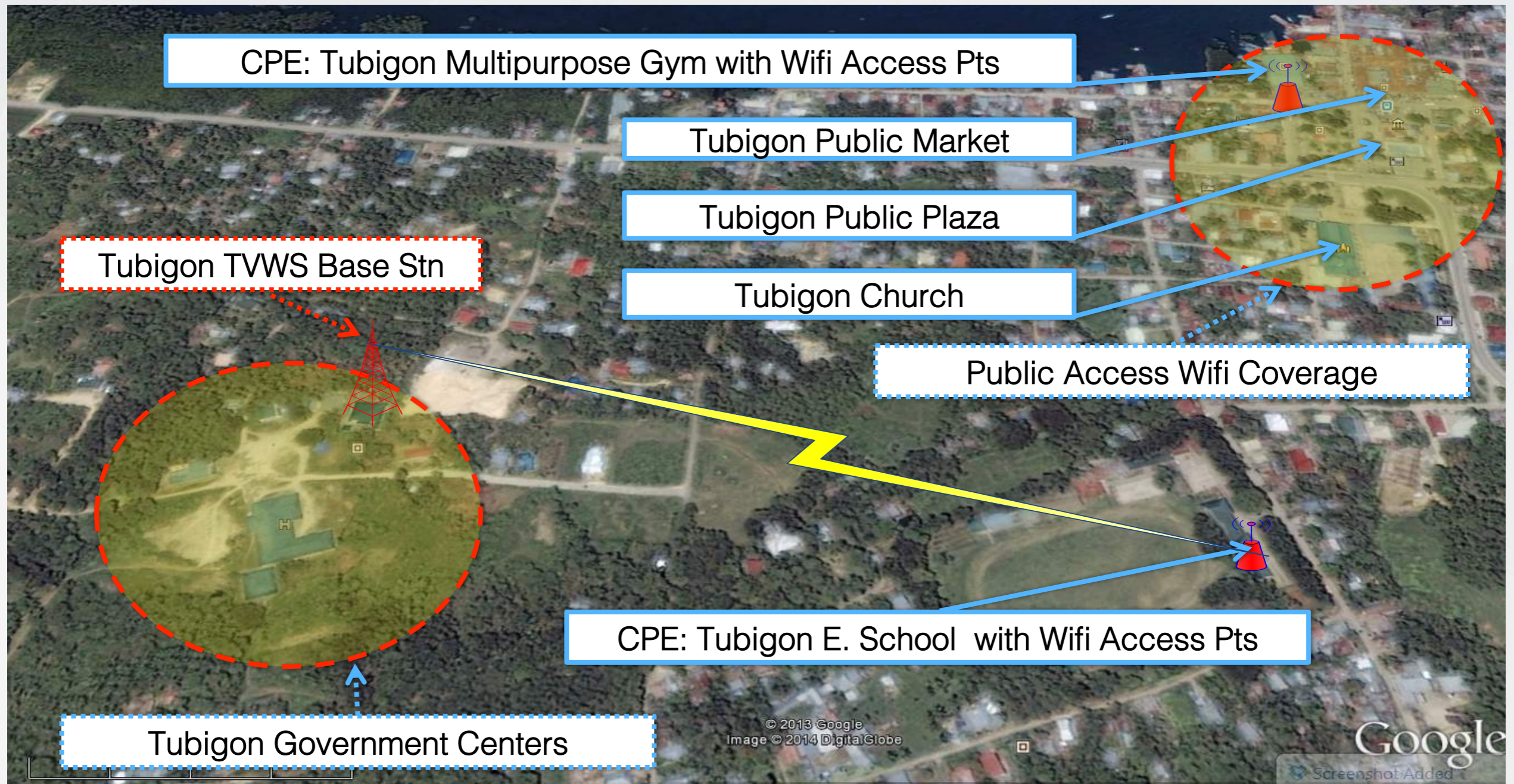
**E-GOVERNMENT**





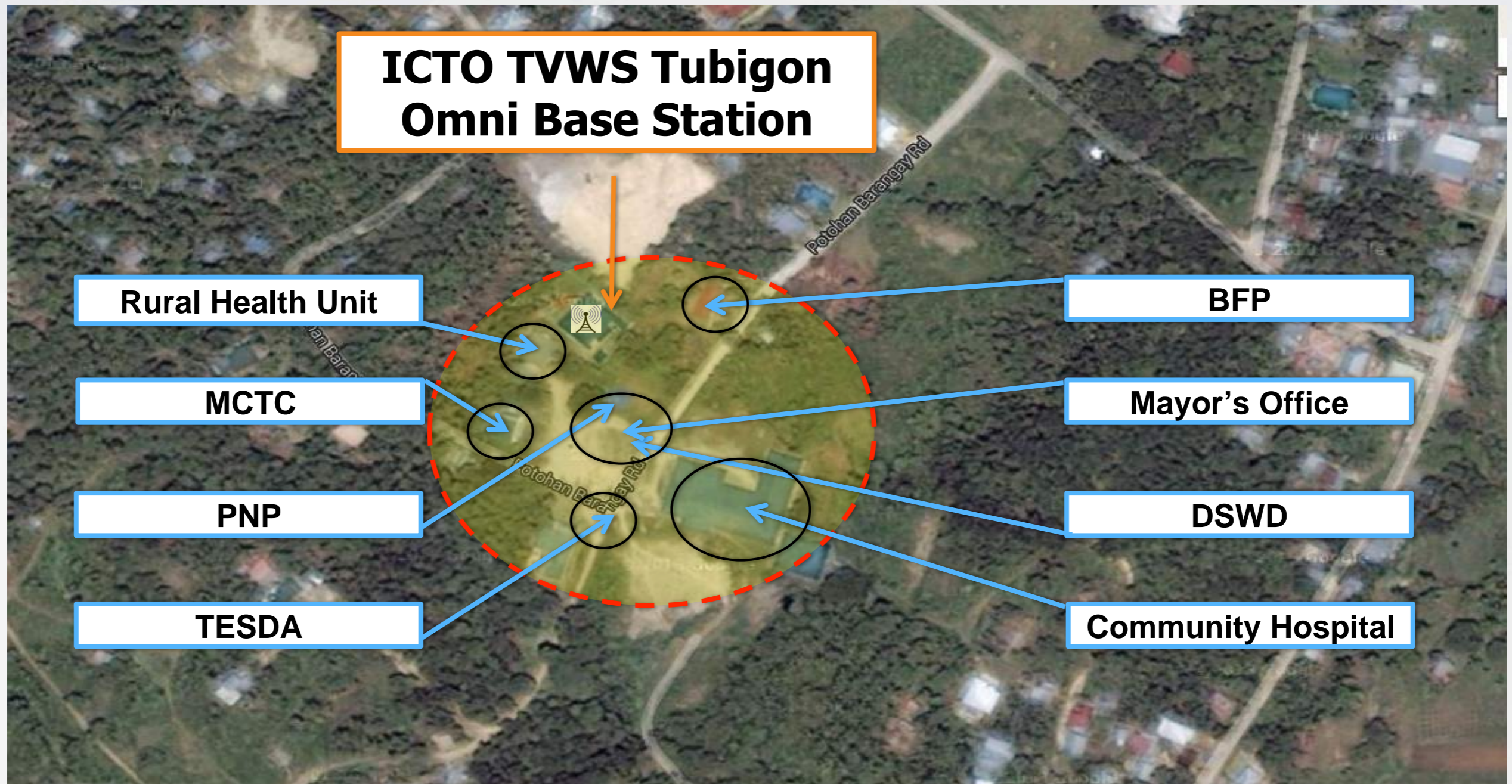
# The Earthquake Tubigon, Bohol Experience

## ICT for Governance Service

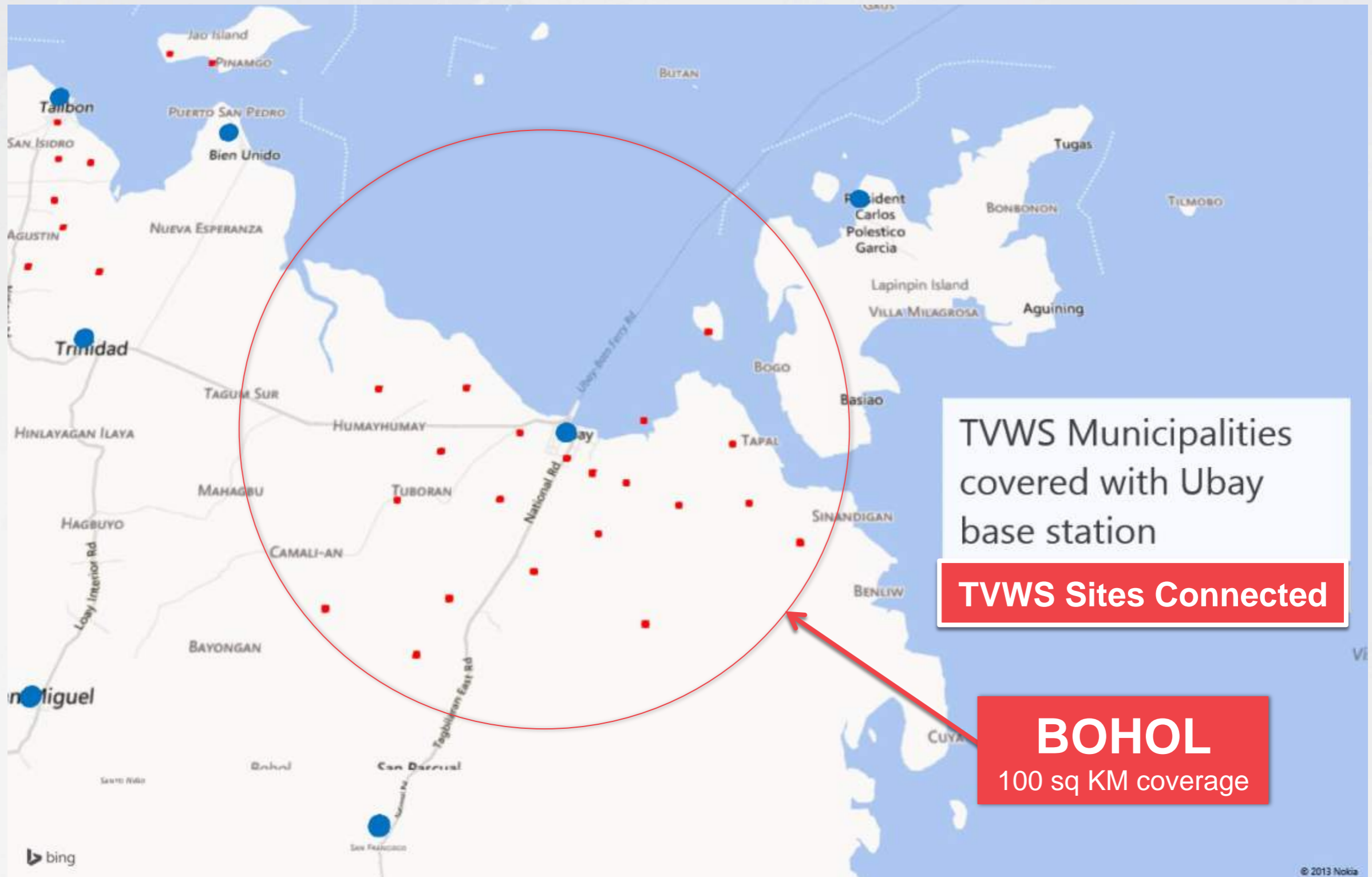


# The Earthquake Tubigon, Bohol Experience

## Maximizing Through Hotspots



# The Earthquake Tubigon, Bohol Experience



# The Earthquake Tubigon, Bohol Experience

## TVWS Technology Trial – Ubay, Bohol

### Ubay Base Station:

1. Installed four (4) master/channel Base Station with an aggregate capacity of 48 Mbps (~12 Mbps per channel)
2. Installed thirteen (13) CPEs in the following public elementary schools and CeC:

✓ Poblacion

✓ Casate

✓ Tapon

✓ Achila

✓ Camambugan

✓ Bood

✓ Katarungan

✓ Carlos P. Garcia CeC ( CP Garcia)

✓ Tipolo

✓ Kalanggaman

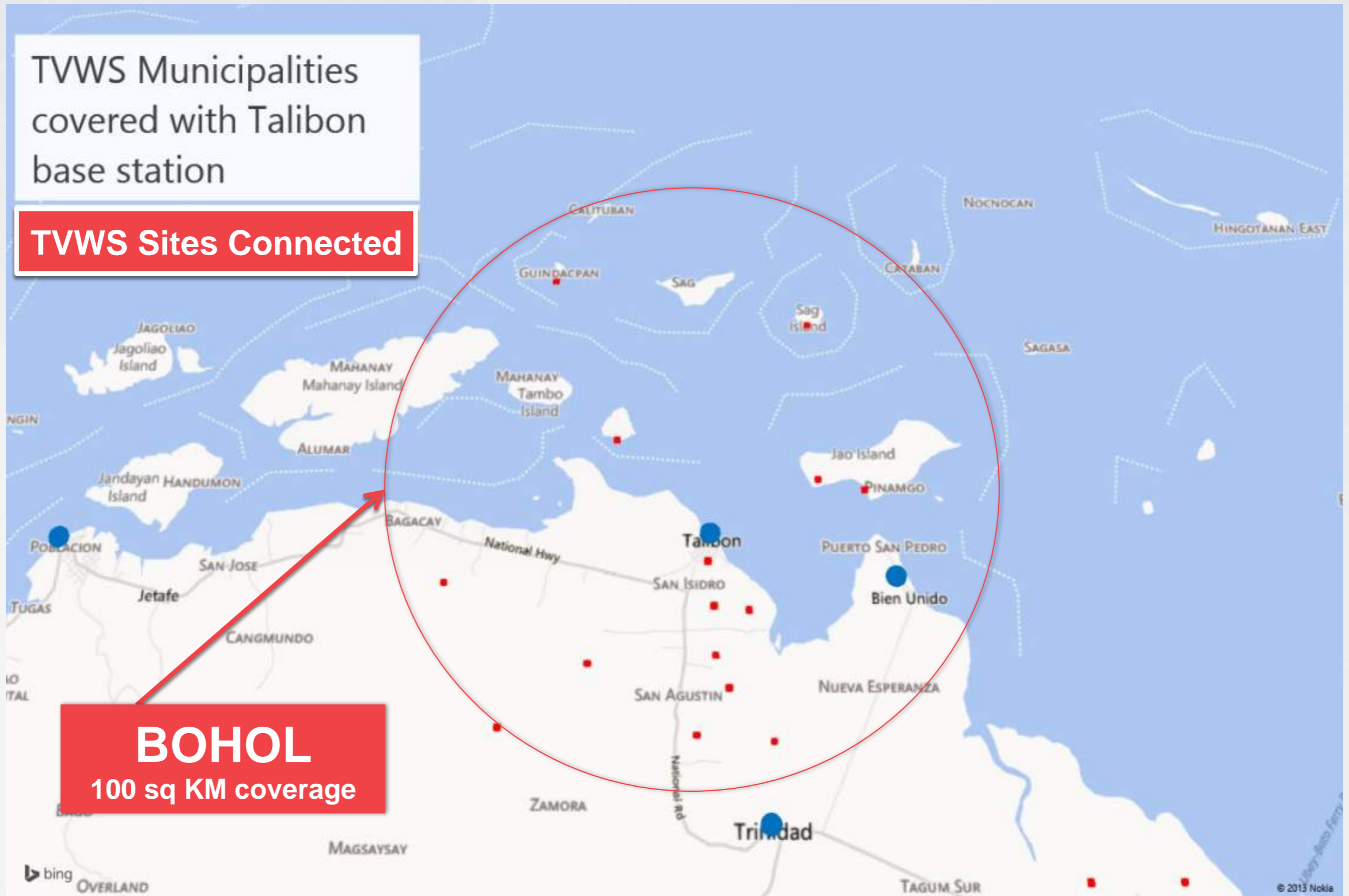
✓ San Isidro

✓ Tapal

✓ Sentinela

✓ Emelda

# The Earthquake Tubigon, Bohol Experience



# The Earthquake Tubigon, Bohol Experience

## TVWS Technology Trial – Talibon, Bohol

### Talibon Base Station:

1. Installed three (3) master/channel Base Station with an aggregate capacity of 48 Mbps (~12 Mbps per channel)
2. Installed five (5) CPEs in the following sites:
  - ✓ San Jose National High School
  - ✓ San Pedro Elementary School, Talibon
  - ✓ Sto. Nino Elementary School, Talibon
  - ✓ Ginubatan Elementary School, Trinidad
  - ✓ Pinamngo Barangay Hall, Buen Unido

# The Earthquake Tubigon, Bohol Experience

## Notable Result of TVWS Trials

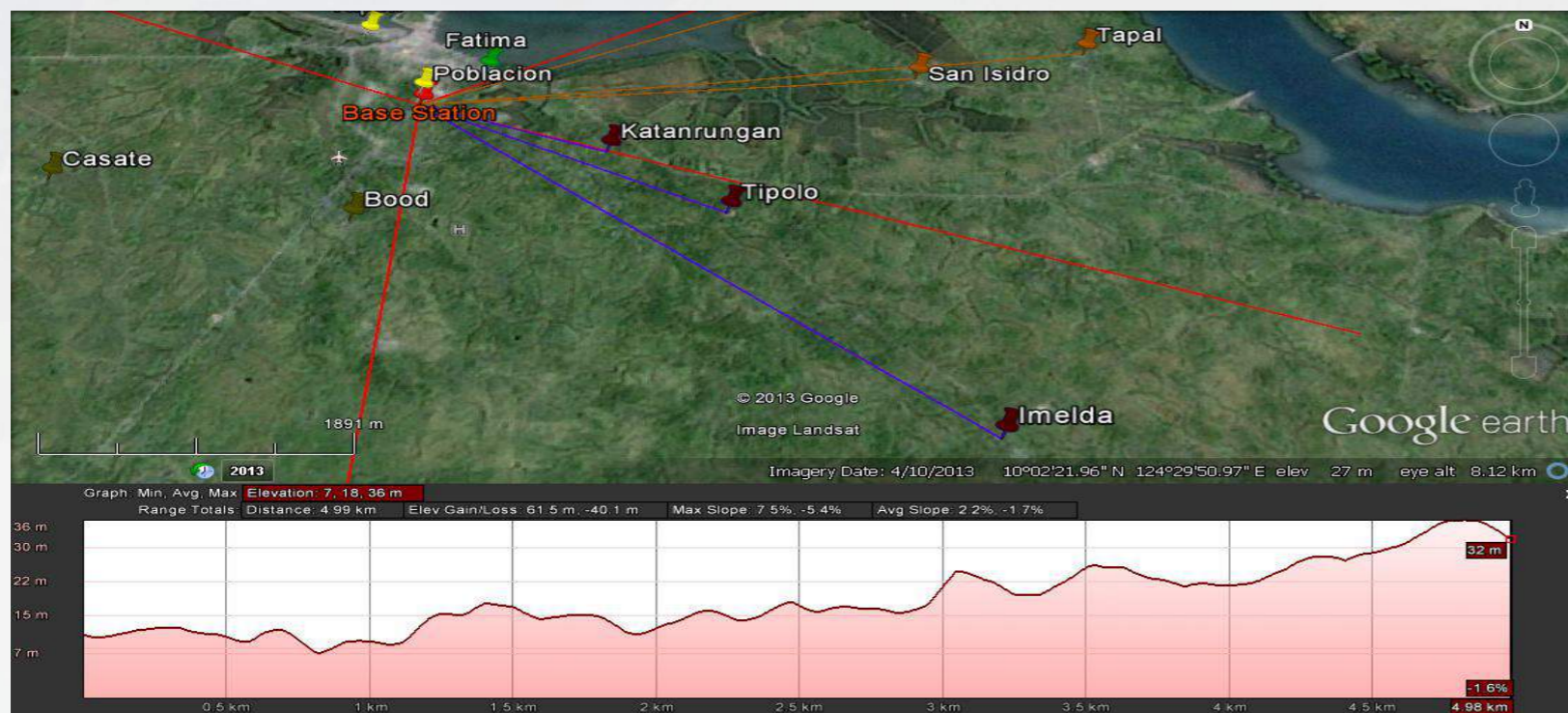


Location	Tapal (Bohol)
Distance	4.72km
Base Station Antenna Gain	17dBi
Destination Antenna Gain	6dBi
Avg. Bandwidth	1.75 Mbps

With obstruction such as mountains, the average bandwidth speed measures around 1.75 Mbps at the distance of almost 5 kilometers.

# The Earthquake Tubigon, Bohol Experience

## Notable Result of TVWS Trials



Location	Imelda (Bohol)
Distance	4.99km
Base Station Antenna Gain	6dBi
Destination Antenna Gain	6dBi
Avg. Bandwidth	2.37 Mbps

The trials showed that with less obstruction (i.e. trees), there is an increase in the average bandwidth speed at the reception.



# The Earthquake Tubigon, Bohol Experience

As of April 2014, TVWS already served 20,000  
Fisherfolk Families



# 16,000 Rural Health Clinics

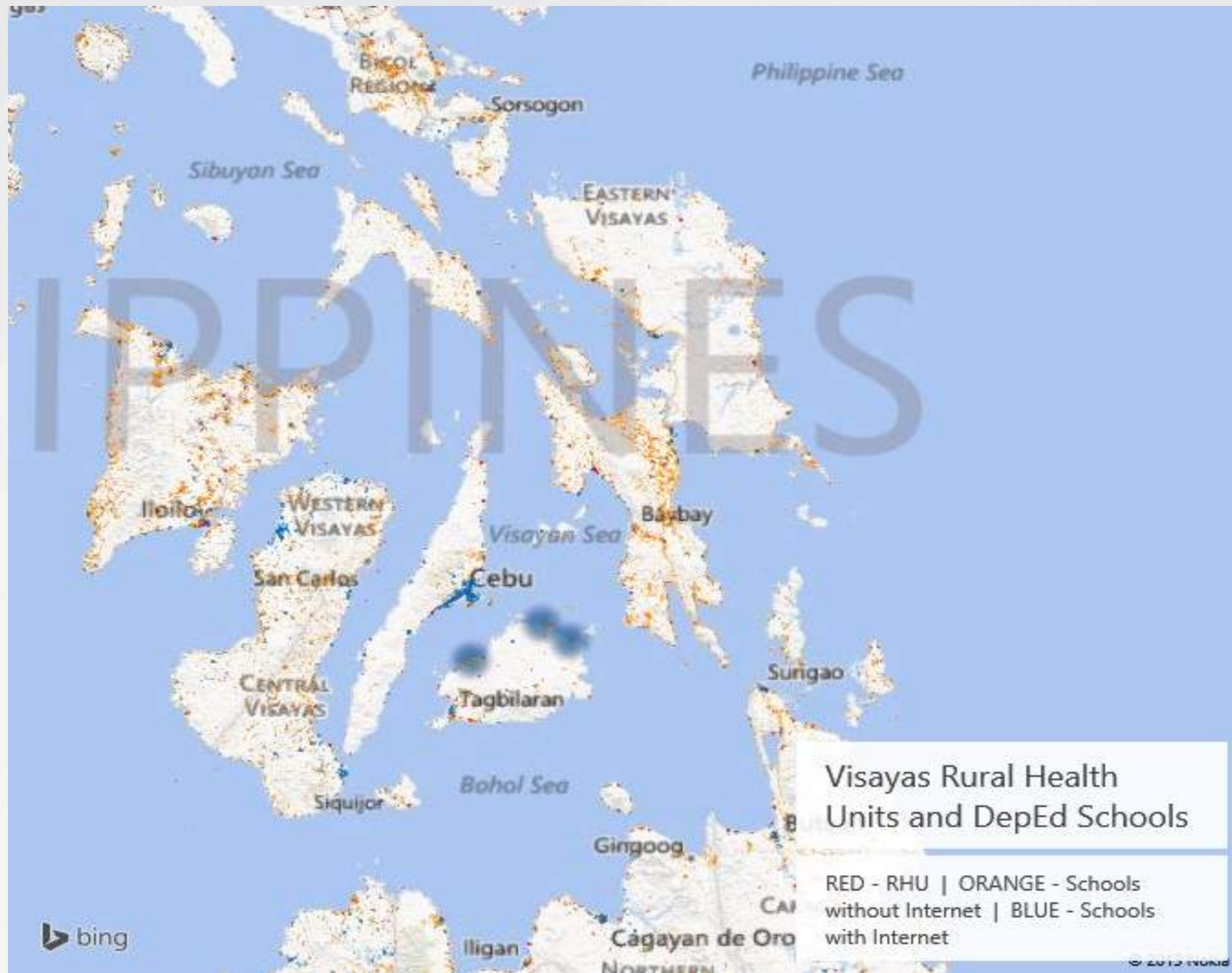
# 16,000 Rural Health Clinics



# 16,000 Rural Health Clinics



# 16,000 Rural Health Clinics



# 16,000 Rural Health Clinics



# The Earthquake Tubigon, Bohol Experience

## ICT for Health

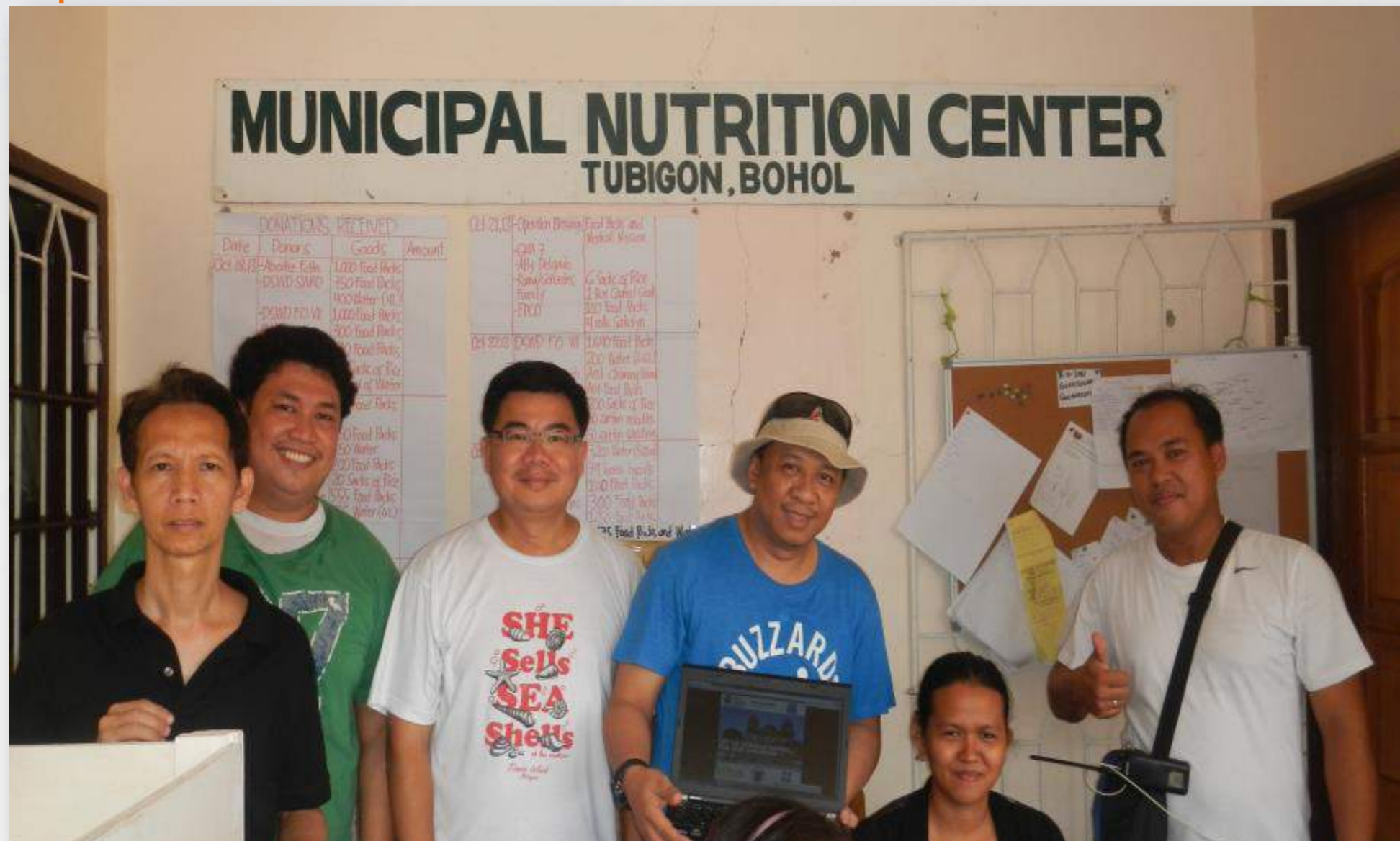
- Primary healthcare delivery, access to specialists
- Health management, health care access for all



using RxBox and Skype

# The Earthquake Tubigon, Bohol Experience

## Saving Lives through TVWS after the Bohol Earthquake





# The Philippine Experience for Disaster Response Tacloban

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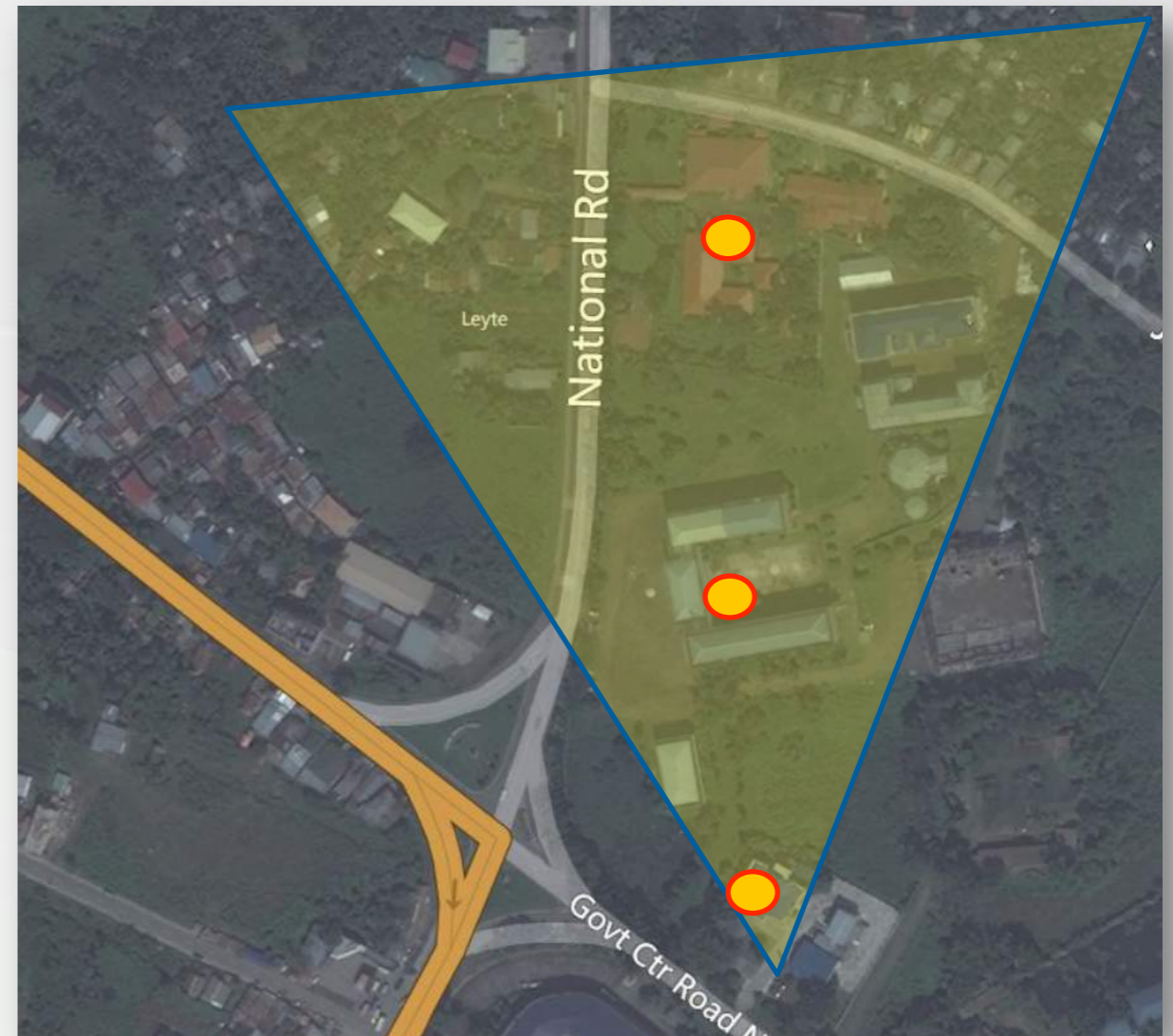
1 Base Station, 2 CPE's

# The Philippine Experience for Disaster Response Tacloban

## TVWS Deployed 7 days after Haiyan

The three marked points were connected:

1. the Base station was the DOST Regional Office (bottom) where the VSAT was located. The backhaul was a satellite connection provided by WIT.
  2. CPE 1 – Philippine Science High School Office (center), approx. 500m away, the primary users were the administrative staff of PSHS
  3. CPE 2 – PSHS Campus Dormitory (top), approx. 1000m away, where the first set of users were the Bombero Unidos, a humanitarian group from Spain which sent a team of relief workers to Leyte. They were headquartered at the dormitory for several weeks.
- The internet connection was used to communicate with other NGOs and with their home base in Spain. When they left, the dormitory was used as temporary housing for the PSHS faculty and their families.
4. Internet connection was used in helping the faculty rebuild their lesson plans and instructional material in preparation for the re-opening of classes in mid-January.



# The Philippine Experience for Disaster Response Tacloban

## VSAT and TVWS Set-up at DOST 8



# The Philippine Experience for Disaster Response Tacloban

## 3 Points of Connection



DOST Region 8 Office (showing solar-powered VSAT) where the base station was located



PSHS Administrative Building (*the CPE antenna is the white square in the center of the photo*).



PSHS Campus Dormitory

# The Philippine Experience for Disaster Response Tacloban

DOST 8 Regional Office – December 2013



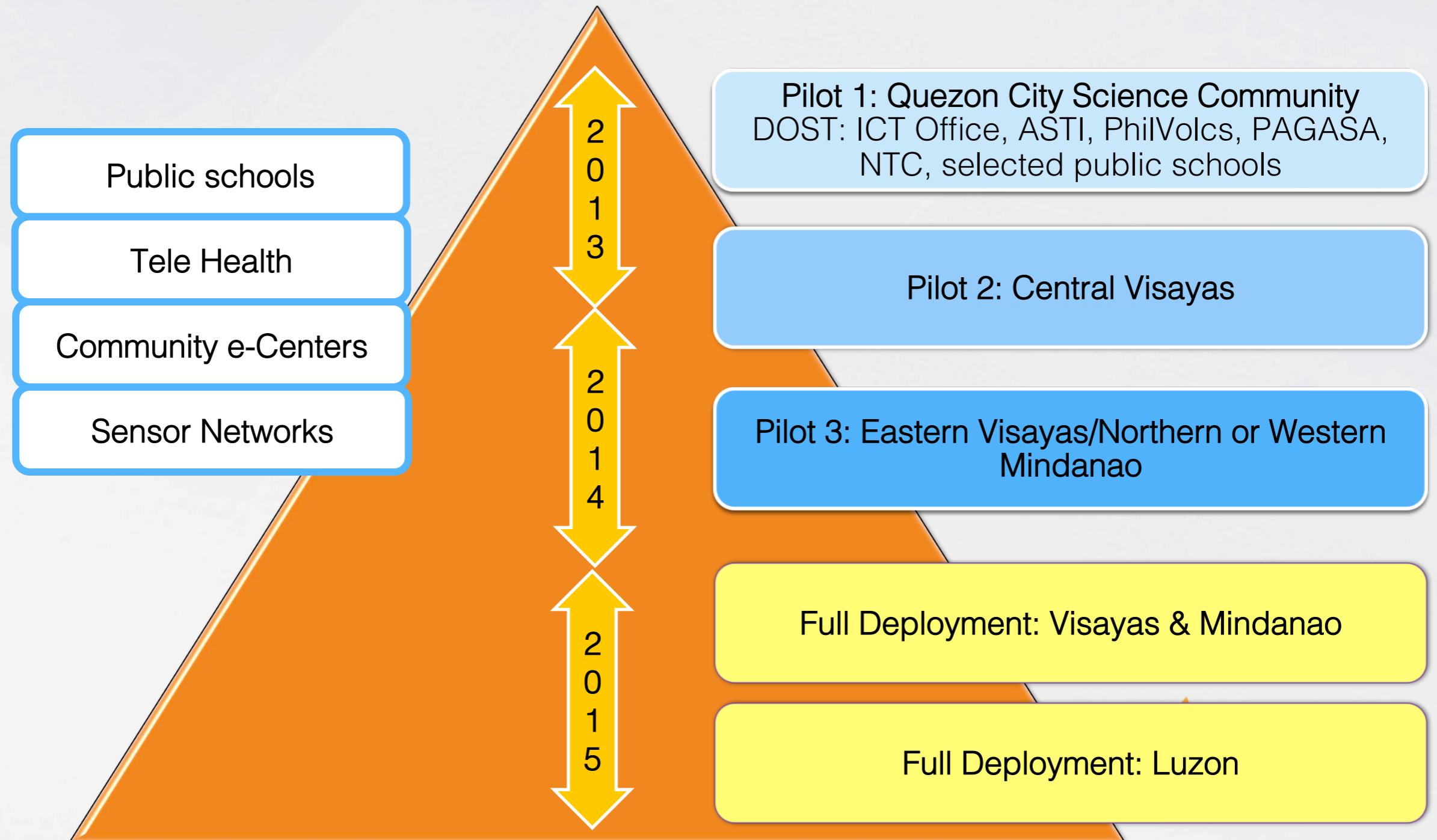
# The Philippine Experience for Disaster Response Tacloban

## Philippine Science High School – December 2013



# The Philippine Experience for Disaster Response Tacloban

## DOST – ICTO TVWS Roadmap



# TVWS for Inclusive Growth