SEA of Solutions

partnership week for marine plastic pollution prevention
11-14 november 2019

Towards the development of a Regional Model for Plastic Leakage

Kavinda Gunasekara, PhD

Geoinformatics Center

Asian Institute of Technology, Thailand

Who we are?

AIT
Asian Institute of Technology

GIC
Geoinformatics Center
Established in 1999

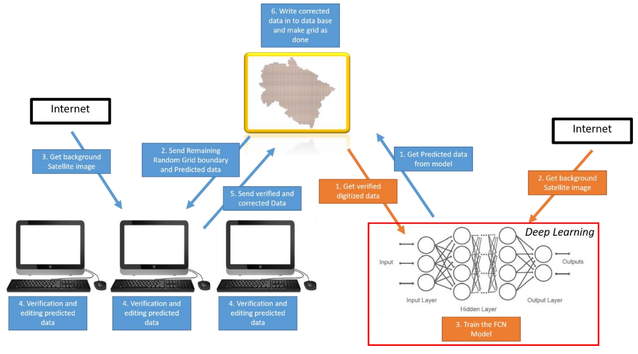
Our Expertise

- REMOTE SENSING & GIS
- ENVIRONMENT
- DISASTER MANAGEMENT
- TRAINING

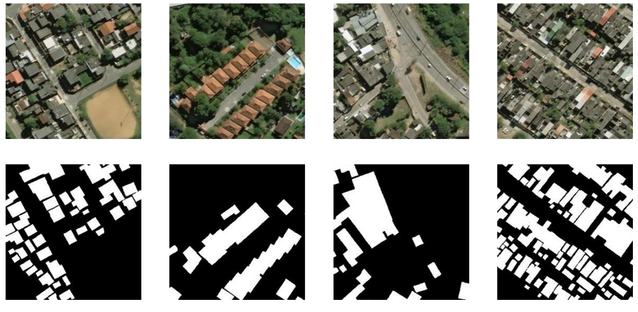
Recent advancements in GIC

to survive with disruptive technologies

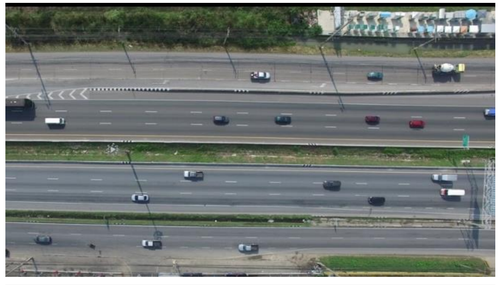
Adopting Deep Learning/AI technologies for our expertise

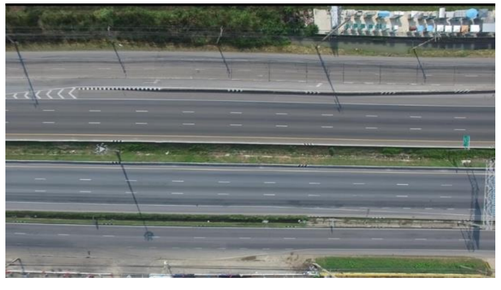


Model 3 – 97 % - overfitted



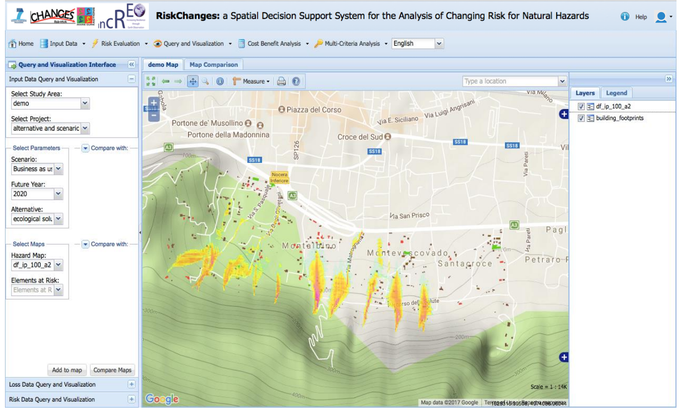
Development of Fixed-wing drones and algorithms for drone data



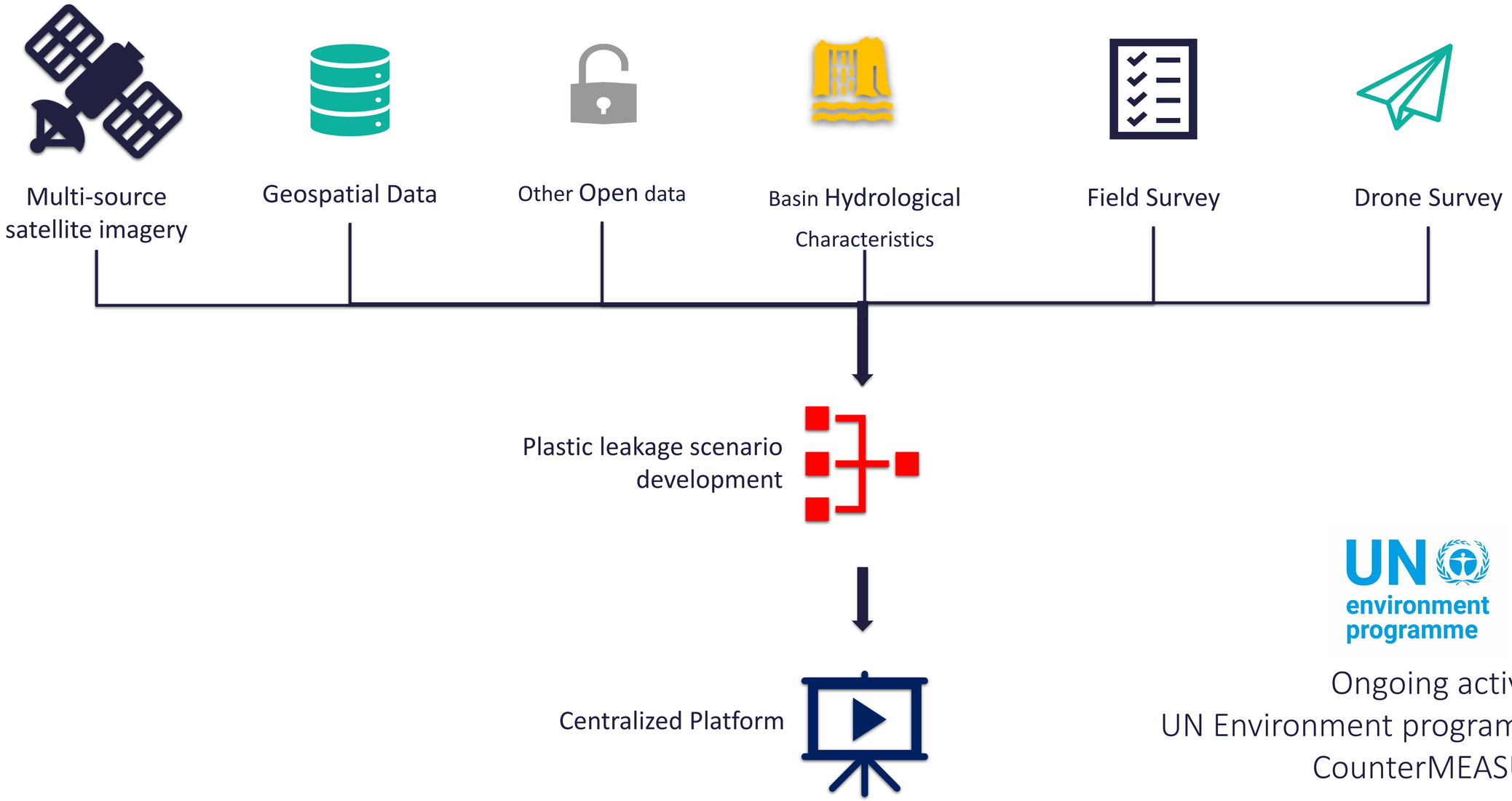


Development of cloud-based platforms

- Centralized platforms
- Multi-hazard risk assessment with ITC, Netherlands



Towards development of a Regional Model for Plastic Leakage



UN environment programme

From the People of Japan

Ongoing activities under UN Environment program initiatives: CounterMEASURE Project

Multi-source Satellite Data

Freely available GIS data/products

Satellite Rainfall/ local rainfall gauge data

Customer databases (ex. booking.com, etc.)

Drone survey (time-series)

360 images survey

DEM, river, etc.

Seasonality

Time-series data processing

Landuse (hybrid product)

Hydrological modeling

Yes

Flow data

No

Data Mining

Data processing

Example: capturing vegetation/activities on the Mekong river

river, road, admin boundary, etc.

Nightlight data

Runoff

Global data

Tourist hotspots

spatio-temporal movement of tourists

Drone orthomap

Inputs for PIRIKA

Crowdsourcing by AIT students

Machine Learning

Settlements

Industrial Zones

Inputs from Local Partners

Mass plastic concentration

Field survey data

Geodatabase

Intermediate data (secondary layers, proximity, etc.)

Scenario Development

Plastic Leakage Maps

Collected data from local partners

GIS data from local partners

GIS Platform (O-GIS)

Visualization

Raw data

Field work data

Intermediate data

Analysis results (scenarios)

Drone orthomap (time series)

Social media interface

360 photos

Information of awareness campaigns

Data collection tools/apps

Geoprocessing

Geodatabase

Reporting

Crowdsourcing

Storymaps

Processed data

Datasets from Indian partners

Legend

Data

Process

Intermediate outcome

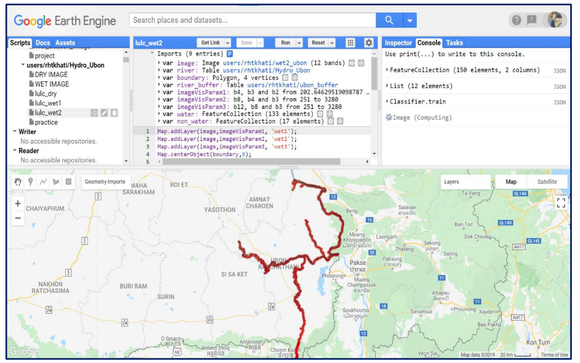
Outcome

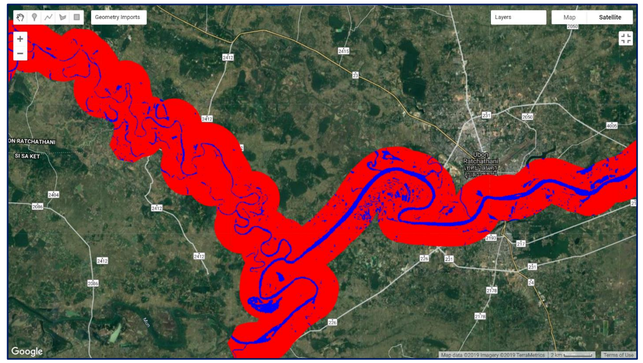
Input data/information from partners

River Beach Clean-up Activities

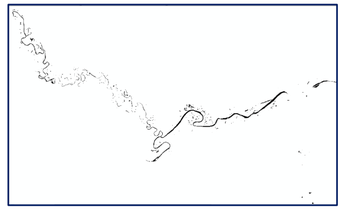
Seasonal Changes of River Beach

Scaling-up of detecting changes using GEE & Multi-source satellite data

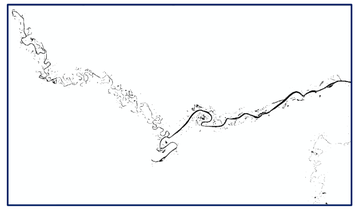




Multi-source satellite imagery



(Dry season)

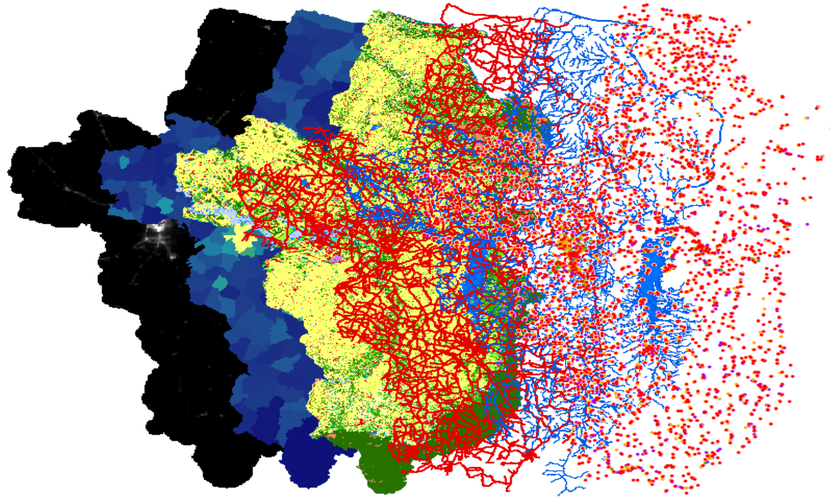


(Wet season)

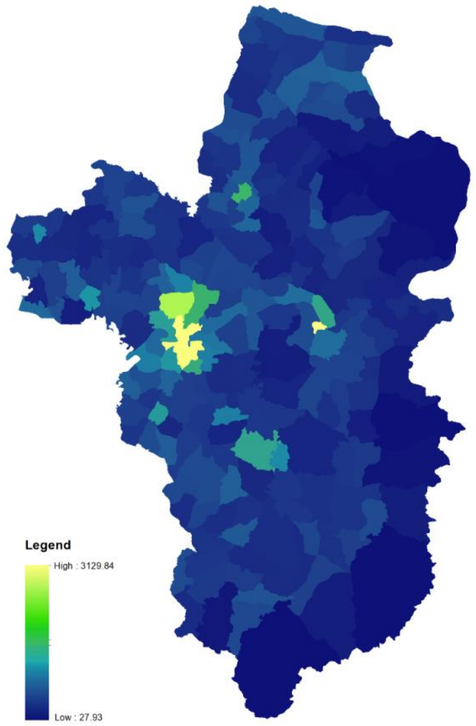
Fine-scale of population density mapping

Geospatial Data

Independent Variables



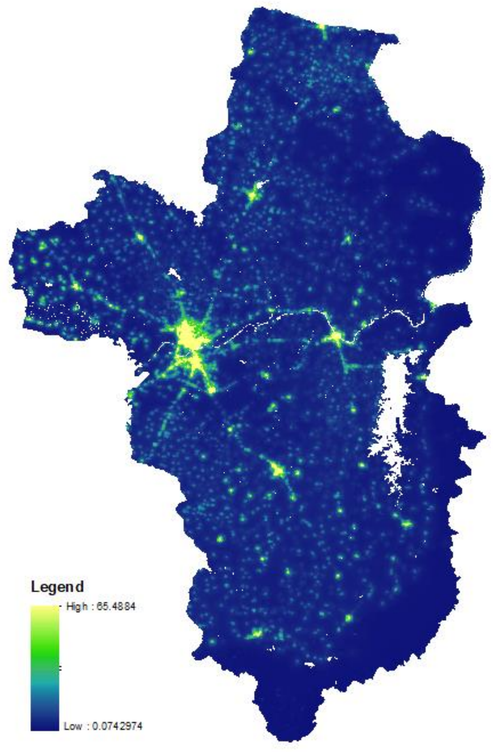
Dependent variable



Census population

Random Forest Algorithm

Output

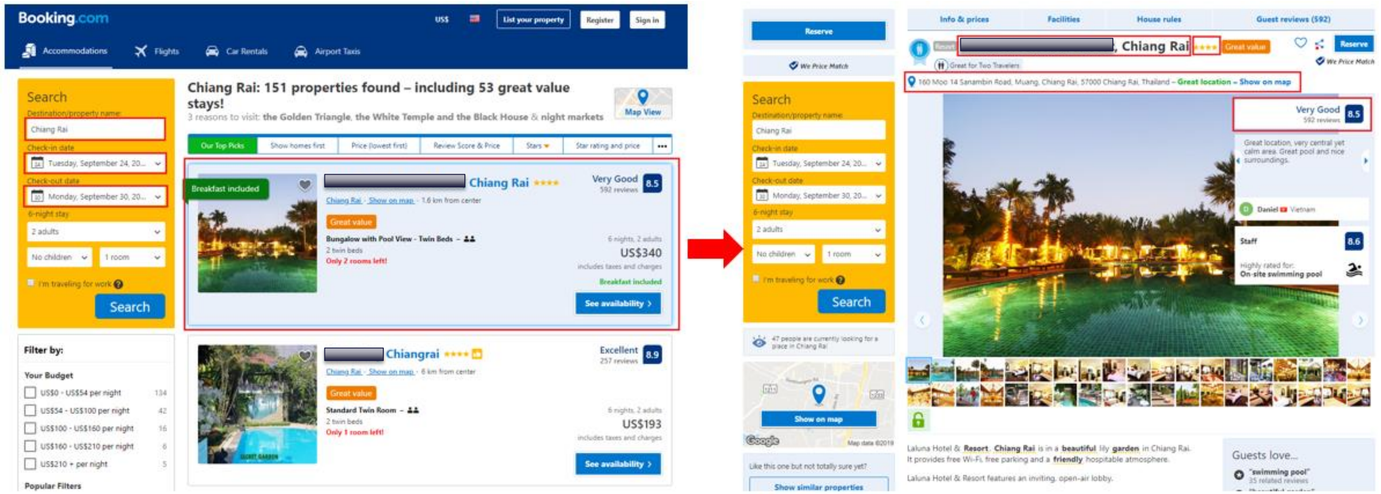


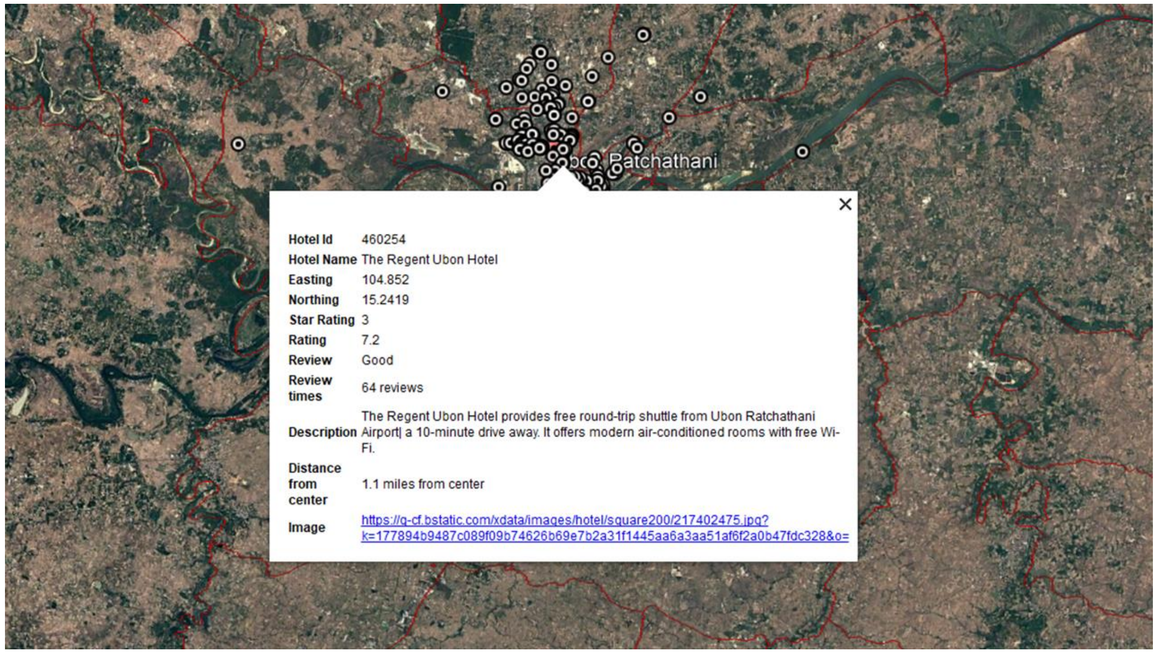
Fine-scale population density

Customer Database Mining

Hotel/restaurants locations

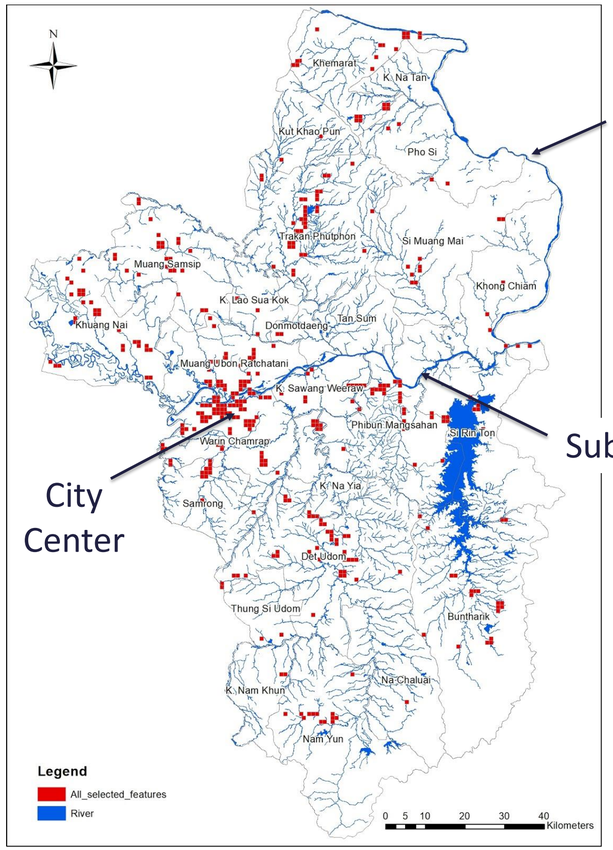
Other Open data





Name	Address	Location (Lat,lng)	Rating	Review	No. of review	Customer rating	Room type	Demand	Price	Website
Pal	366 trirat road tambor	19.90772947,99.8286	null	Superb	170 reviews	9.2	Superior King Room	Only 1 room	US$274	https://www.booking.
Sai	220 Moo 24 Sankhong	19.89505073,99.8174	2 stars	Superb	458 reviews	9.1	Twin Room	Only 1 room	US$192	https://www.booking.
Baa	879/2 Jetyod Road,. M	null	1 stars	Exception	1,405 review	9.6	null	null	null	https://www.booking.
Na	661 Uttarakit Road, Mi	19.91045294, 99.8354	4-star h	Superb	2,515 review	9.1	null	null	null	https://www.booking.
Bar	50 Moo 13, Radbumru	19.88999959,99.8312	2-star h	Fabulous	174 reviews	8.9	Superior Double or T	Only 1 room	US$176	https://www.booking.
Ho	rai	240 Soi 5 Moo 2 Ban H	19.90876075,99.7794	4 stars	Fabulous	257 reviews	8.9	Standard Twin Room	Only 1 room	US$174	https://www.booking.
Na	hiang	697/4 Sri Kerd Road, S	null	null	Fabulous	942 reviews	8.7	Deluxe Suite	There's only	US$335	https://www.booking.
Mo	tel	648/6 Uttarakit Road,	19.91053546,99.8363	5-star h	Exception	241 reviews	9.6	Double Room with F	null	US$517	https://www.booking.
The	Hou	482 M.4 , Mae Kok Rd.	19.92104702,99.8396	5 stars	Fabulous	272 reviews	8.9	Deluxe Double or Tv	null	US$390	https://www.booking.
Ho	angra	147 Moo13 Phaholyot	19.88878281,99.8289	3 stars	Superb	436 reviews	9.1	Deluxe Double Roor	Only 1 room	US$295	https://www.booking.
Cha		699 Kornrat Village M	19.89322502,99.8172	3-star h	Very good	188 reviews	8.4	Deluxe Twin Room	null	US$171	https://www.booking.
sle	ng rai	null	19.90367476,99.8357	null	Superb	714 reviews	9.2	null	null	null	https://www.booking.
Lal	Resor	160 Moo 14 Sanambin	19.89487955,99.8267	4 stars	Very good	591 reviews	8.5	Bungalow with Pool	Only 2 room	US$340	https://www.booking.
Wi		893 Phaholyothin Roa	19.90371685,99.8334	4-star h	Very good	598 reviews	8.2	Superior Twin Room	Only 4 room	US$252	https://www.booking.
The	ng Ra	199, Moo 13, Sansai, N	19.88017200,99.8330	5-star h	Very good	22 reviews	8.4	Deluxe Double Roor	null	US$373	https://www.booking.
J2 H	ng Ra	338 M.8 Ban Du, 5710(	19.97548084,99.8508	null	Exception	7 reviews	9.7	Deluxe Double Stud	null	US$92	https://www.booking.
Ma	Rai	23/1 Rop Wiang,Muar	19.90852741,99.8530	3-star h	Fabulous	175 reviews	8.9	Twin Room with Bal	Only 2 room	US$166	https://www.booking.
Ma		30/33 Moo 14, Sankho	19.89757096,99.8209	4-star h	Very good	680 reviews	8.3	Deluxe Double or Tv	Only 1 room	US$335	https://www.booking.
The	athar	1129 Kraisorasit Rd., V	19.91783432,99.8268	5 stars	Superb	279 reviews	9.2	Deluxe Double or Tv	Only 3 room	US$509	https://www.booking.
The	ng Ra	292/13 Moo 13, Robwi	19.88834710,99.8357	4-star h	Very good	328 reviews	8.3	Superior Twin Room	Only 3 room	US$259	https://www.booking.
Baa	sort	47/6 Moo 12 Soi prasa	19.90239784,99.8437	3 stars	Very good	520 reviews	8.1	Superior Double or T	Only 1 room	US$182	https://www.booking.
Par	Hill R	481 Moo 24, Tumbon I	19.88948299,99.8196	null	Fabulous	279 reviews	8.6	Family Bungalow	Only 1 room	US$311	https://www.booking.
Dia	Chiar	74/6 M.18 T. Robwien	19.90124528,99.8366	4-star h	Good	686 reviews	7.7	Standard Twin Room	Only 1 room	US$212	https://www.booking.
A-S	lley, C	60/14 Moo 2, Ta-Sud, I	20.06382735,99.8649	4 stars	Fabulous	291 reviews	8.9	Premier Chalet	There are or	US$494	https://www.booking.
Baa	uesth	221/1 Moo 19, Paholy	19.91648769,99.8421	2 stars	Very good	617 reviews	8.3	Standard Double Ro	Only 6 room	US$61	https://www.booking.
Le	ang R	610 Phaholyothin Roa	19.90649858,99.8349	4-star h	Superb	563 reviews	9.3	Deluxe Double Roor	Only 4 room	US$487	https://www.booking.
Baa	ouse	879/2 Jetyod Road,. M	19.90439022,99.8321	2-star h	Good	595 reviews	7.9	Double or Twin Roo	Only 1 room	US$67	https://www.booking.
NA		111 Ruamchittawai Rc	19.89813853,99.8310	4-star h	Superb	46 reviews	9	Superior King Room	Only 3 room	US$291	https://www.booking.

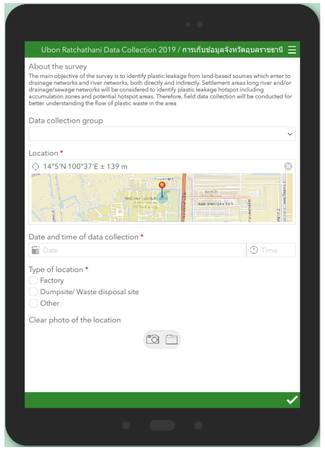
Field Data Collection

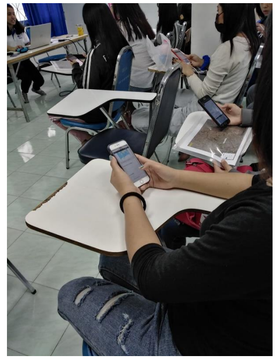


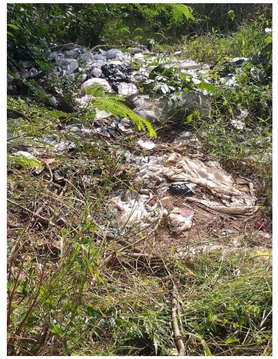
Mekong River

Sub River

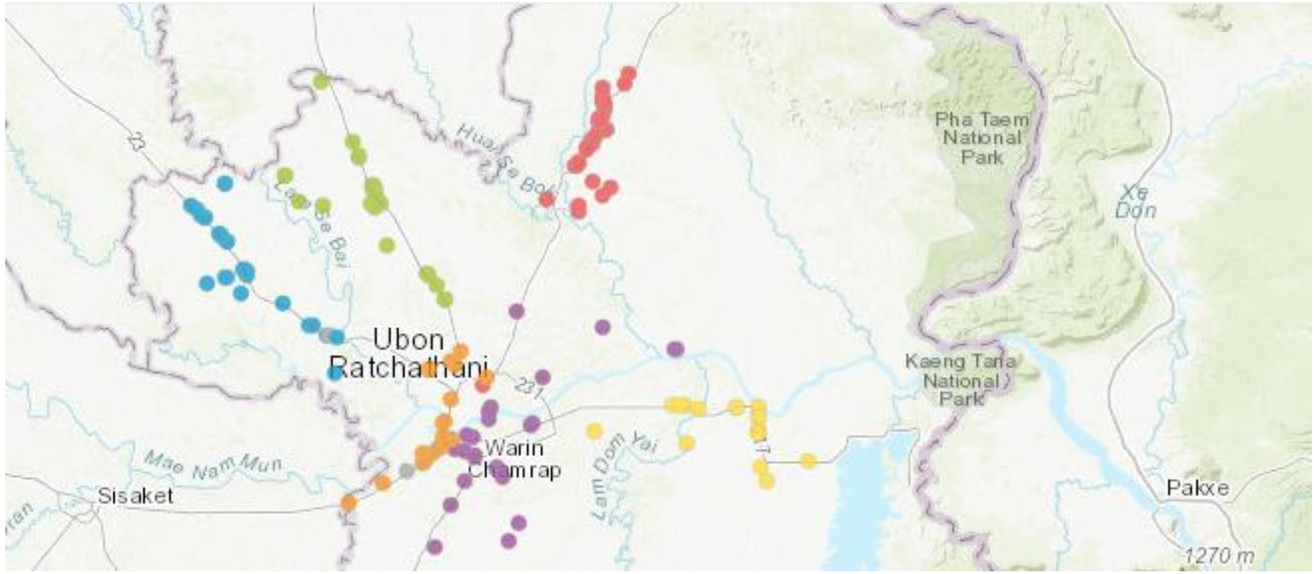
City Center







Field Survey



Meeting with Irrigation department and visual inspection at Mei Sai(Ruak River and Irrigation)

- Date: On Saturday, 23 September 2019
- Activity
  - Meeting with Irrigation Division
  - Visual Inspection

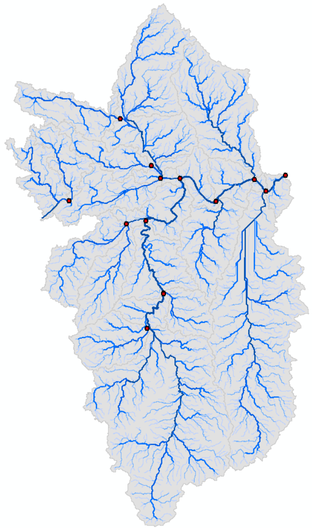
Mapping of sub-river basin base on its characteristic

- Scale parameter
- Topographic parameter
- Drainage network parameter
- Shape parameter

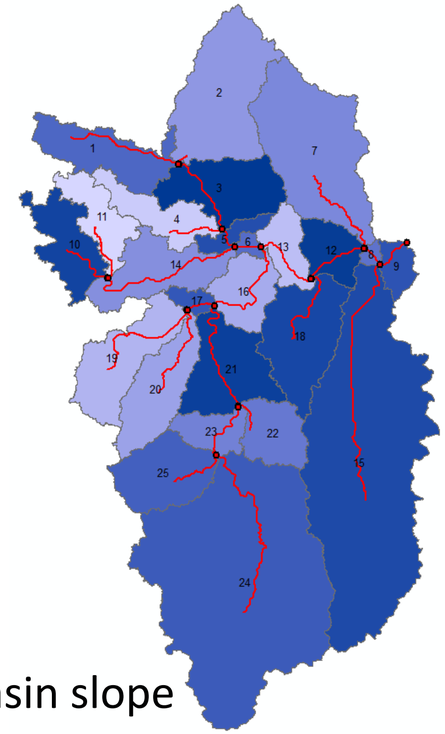
Basin Hydrological Characteristics

Geospatial Data

Multi-source satellite imagery



Stream network

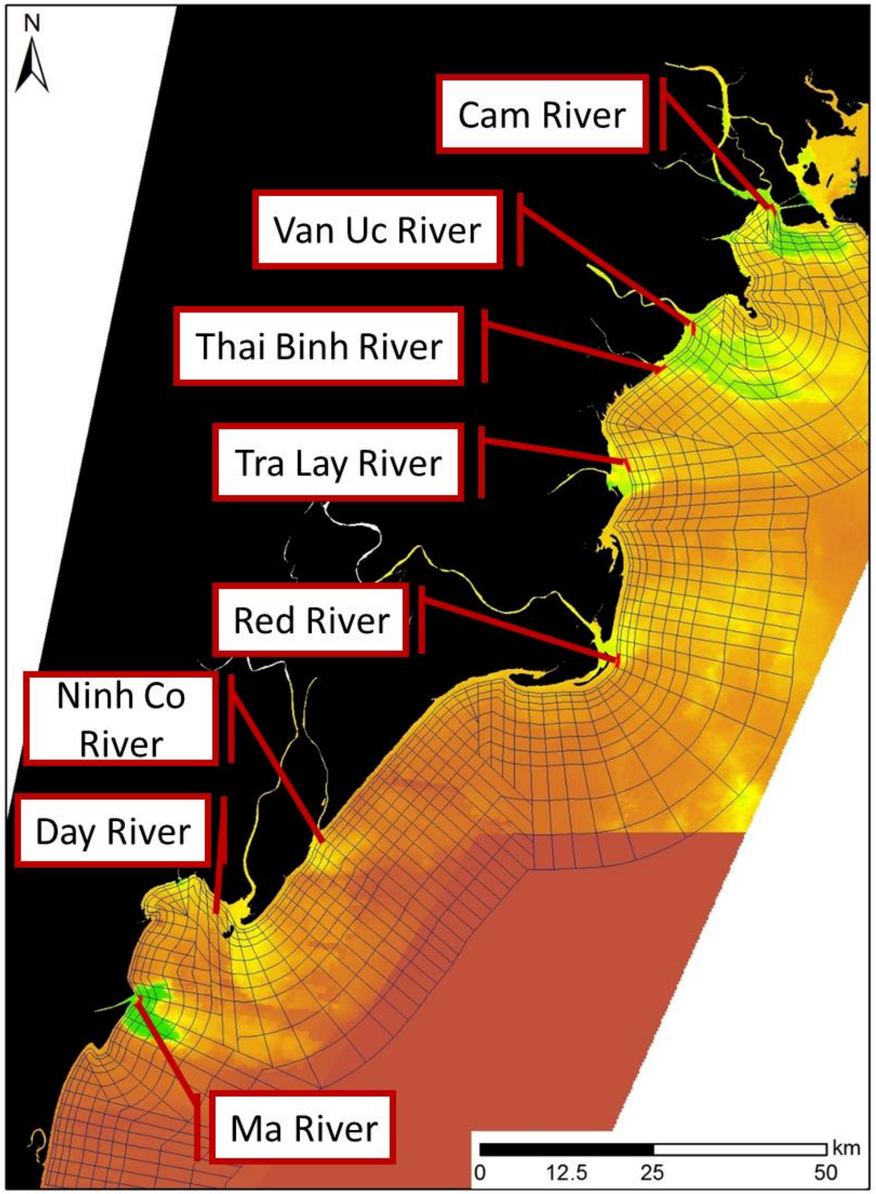


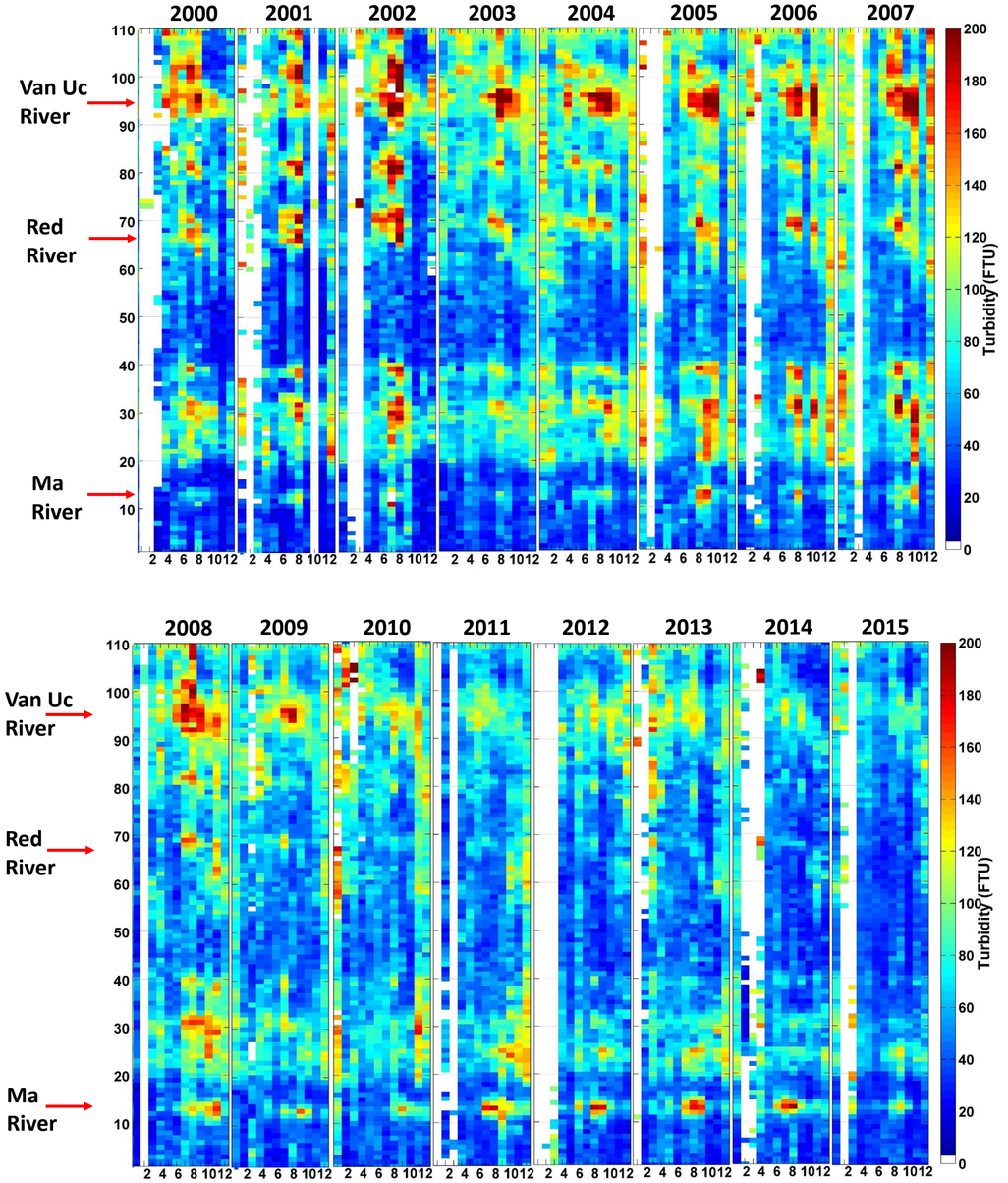
Basin slope

Satellite Based Rainfall

Seasonal rainfall discharge capacity

Spatial Temporal River discharge patterns captured by MODIS Satellite data





Tajima, Y. and **Gunasekara, K.** (2018).

River Beach Clean-up & Drone Survey

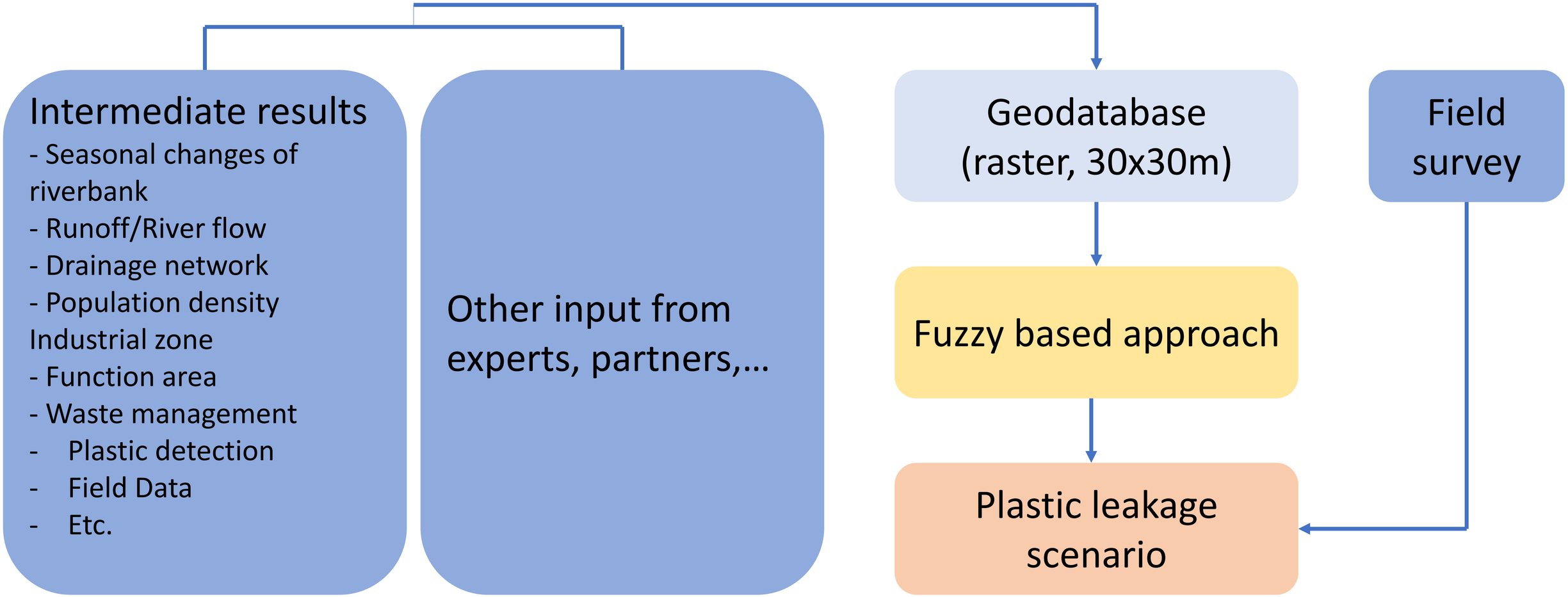
60m altitude

100m altitude

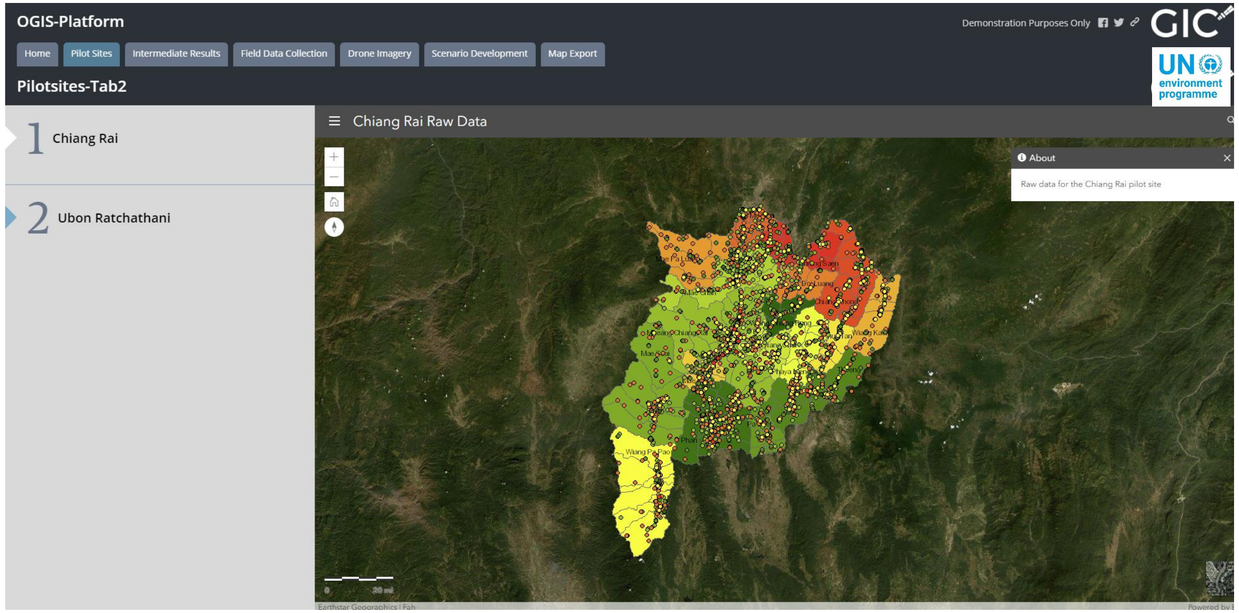
Drone survey data at 100m altitude & ground truth photos

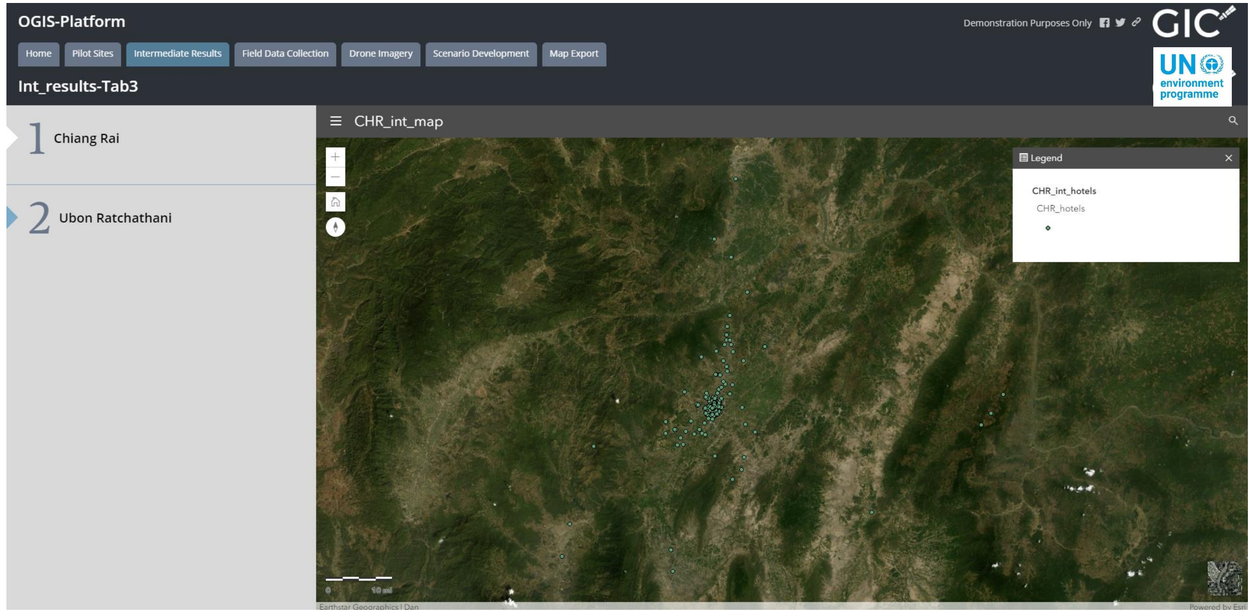
Drone survey data at 100m altitude & ground truth photos

Scenario development



GIS Platform (OGIS-Platform)


OGIS-Platform
Demonstration Purposes Only
Home
Pilot Sites
Intermediate Results
Field Data Collection
Drone Imagery
Scenario Development
Map Export
Pilotsites-Tab2
1 Chiang Rai
2 Ubon Ratchathani
Chiang Rai Raw Data
About
Raw data for the Chiang Rai pilot site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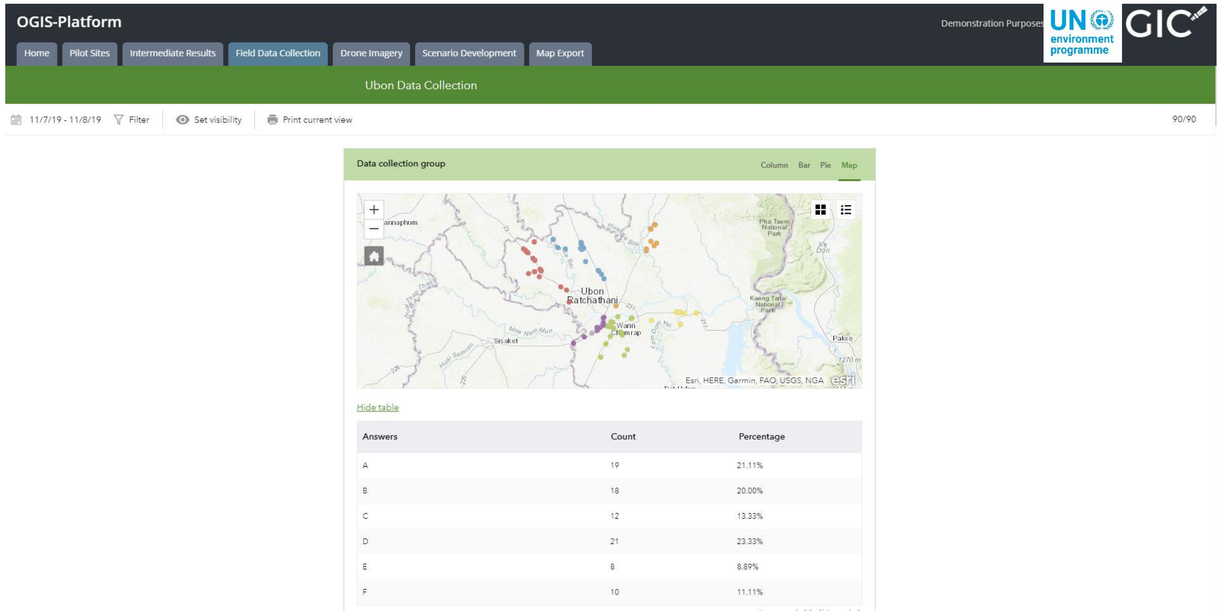
Int_results-Tab3
1 Chiang Rai
2 Ubon Ratchathani
CHR_int_map
Legend
CHR_int_hotels
CHR_hotels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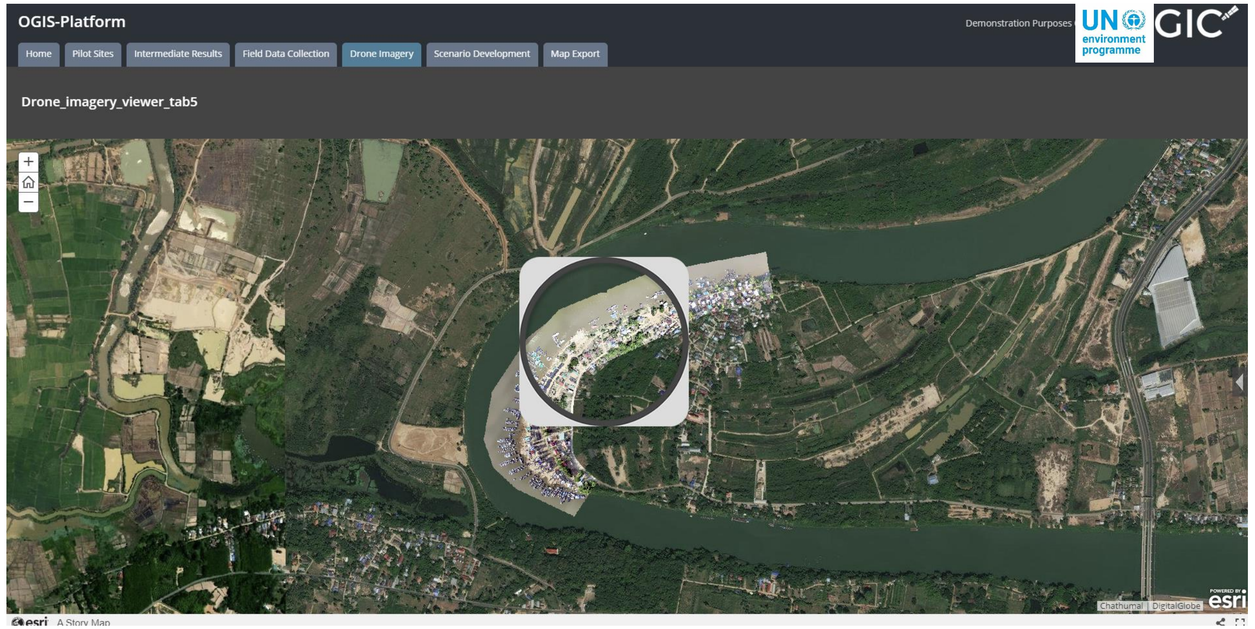
Scenario Development
Map Export
Ubon Data Collection
11/7/19 - 11/8/19
Filter
Set visibility
Print current view
90/90
Data collection group
Column
Bar
Pie
Map
Ubon Ratchathani
Esri, HERE, Garmin, FAO, USGS, NGA
Hide table
Answers
Count
Percentage
A 19 21.11%
B 18 20.00%
C 12 13.33%
D 21 23.33%
E 8 8.89%
F 10 11.11%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Drone_imagery_viewer_tab5
A Story Map