

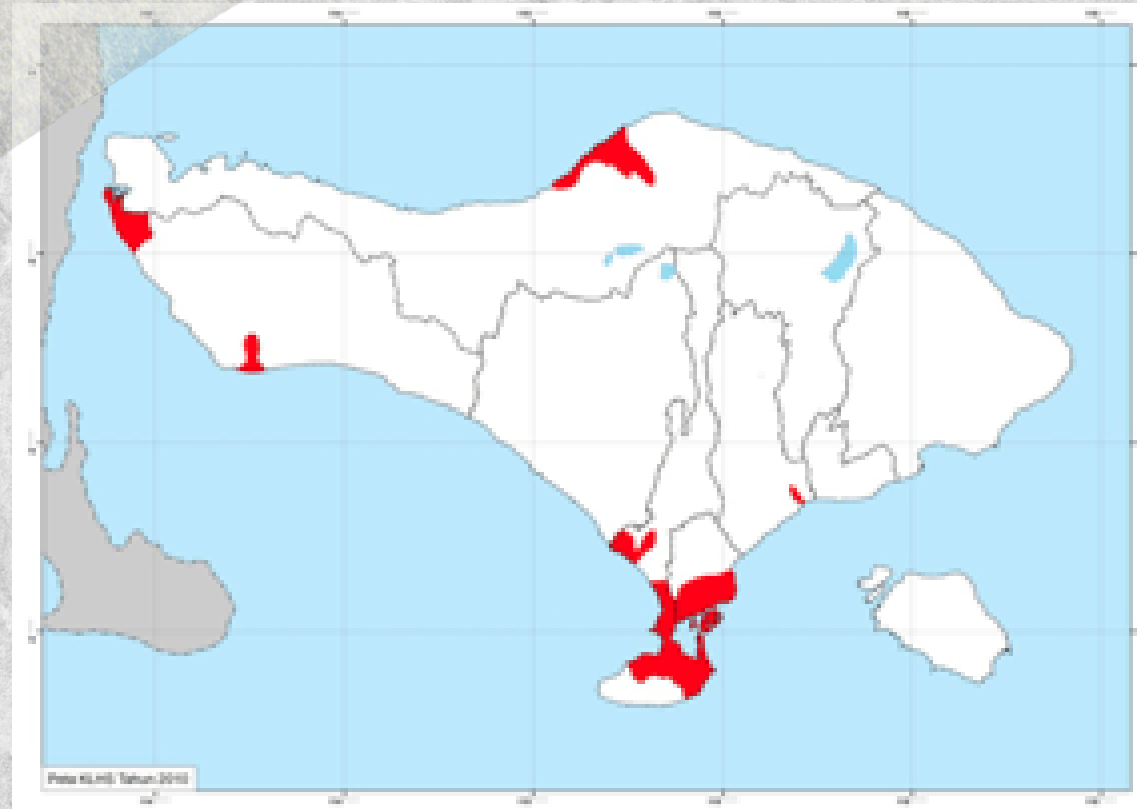
BALI STATE POLYTECHNIC  
IDEP SELARAS ALAM FOUNDATION  
2018



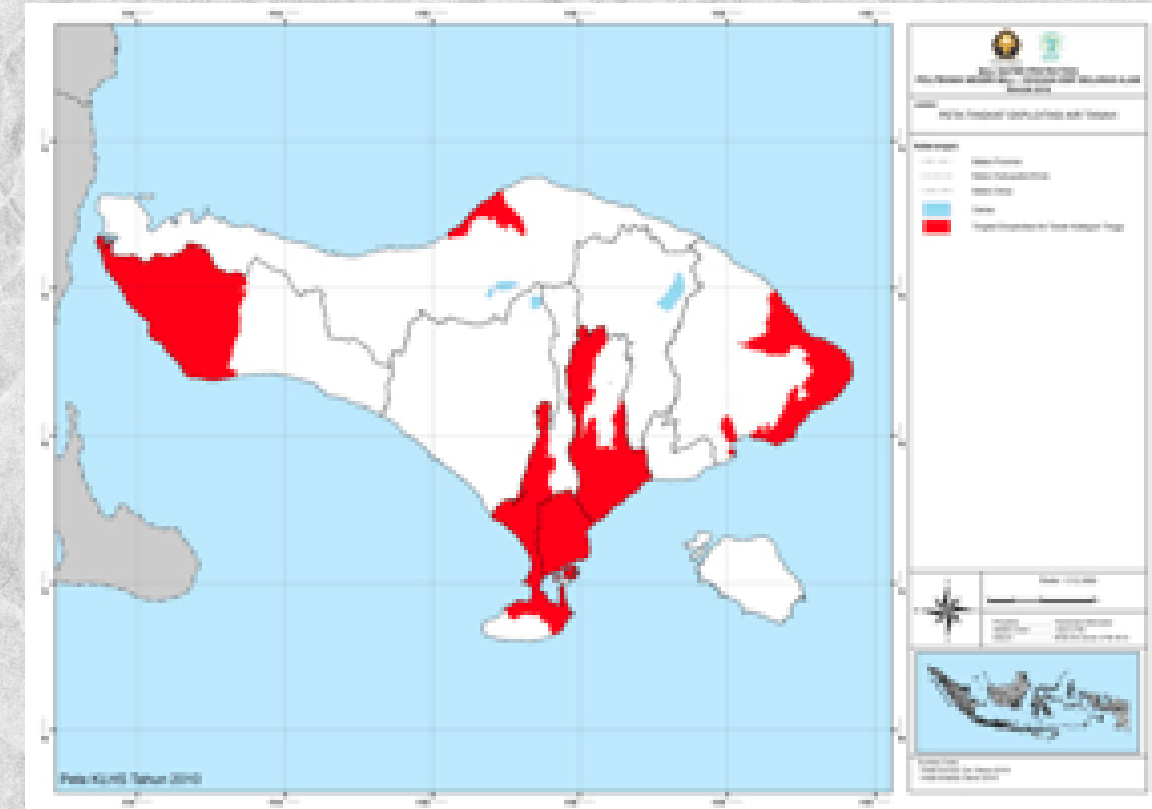
# BALI WATER PROTECTION



# BACKGROUND



**EXPLORATION & EXPLOITATION OF  
GROUNDWATER IN HIGH CATEGORY**



**INDICATION OF SEA WATER INTRUSION**

- There are indications that sea water intrusion has occurred in 13 regions (points) in the Province of Bali and groundwater exploration in the high category in several areas of the Province of Bali, resulting in a water table degradation
- There is no clear data to support the statement above
- There is no concrete reference used as a basis for measuring the water table degradation



# OBJECTIVE

- To find out the current groundwater quality especially in the area with high category of water exploration.
- To find out how far the water intrusion that is happening today as well as to check the validity of the current data that are been released.
- To find out the current ground elevation level that can be used further as a reference for subsequent studies of groundwater level degradation due to excessive exploration.
- To make a map of potential recharge well area
- Make a water balance to illustrate the comparison between potential and water needs in a certain period of time
- To make a mechanism system of groundwater monitoring



# SCOPE OF ACTIVITY

## EARLY STAGE

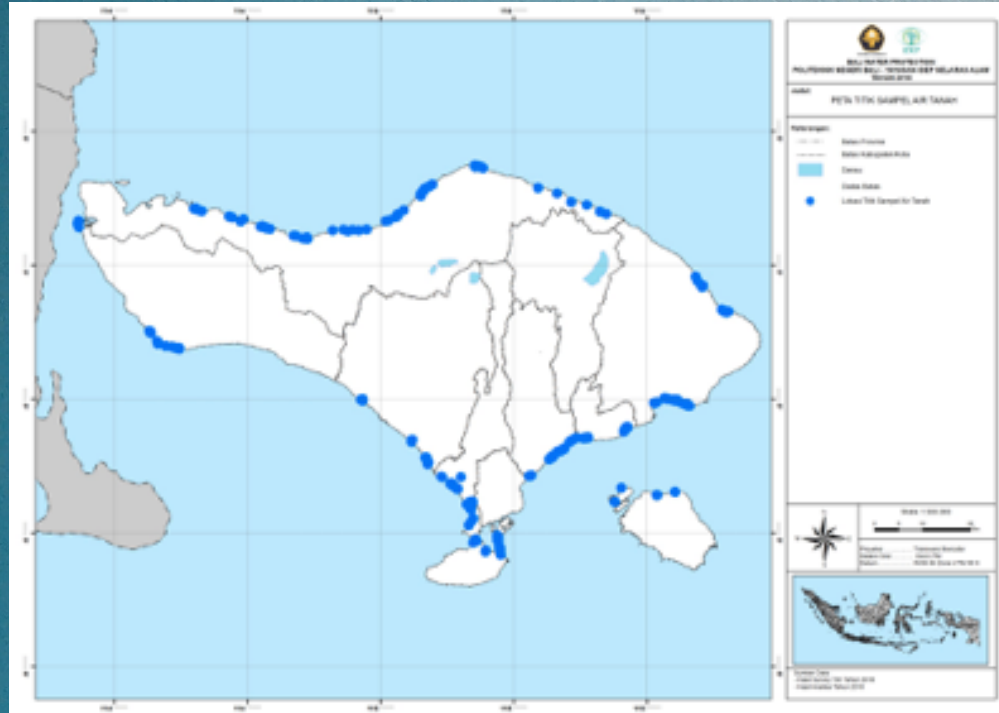
- To trace back to 13 (thirteen) critical point areas, according to the 2010 Bali Strategic Environmental Assessment (SEA)
- This initial survey included 1 (one) survey point in Nusa Lembongan and Nusa Penida
- Determine the location of water sampling
- Water sampling  
DATA: location, water table level, distance from the beach
- Water quality test - Parameter : Chlorine, pH, Hardness, salinity
- Boring Test
  - to find out the soil layers
  - specify water table level
  - sampling for permeability tests
- To record the potential of ground and surface water throughout Bali (secondary data)

- To create a blueprint well design with small, medium and large diameters
- To develop a monitoring system or method to measure the amount of recharge water and the effect on the local water surface of the built recharge wells
- To make a Recharge Well Prototype (from the results of previous studies)
  - Shallow well (4 meters), 4 pipes dia. 30 cm  
location: Kerambitan Village, Tabanan
  - Medium well (12 meters), 8 pipes dia. 4"  
location: Desa Panglipuran, Bangli
  - Deep well (50 meters), 4 pipes dia. 4"  
location: Bongkasan Pertiwi Village, Badung

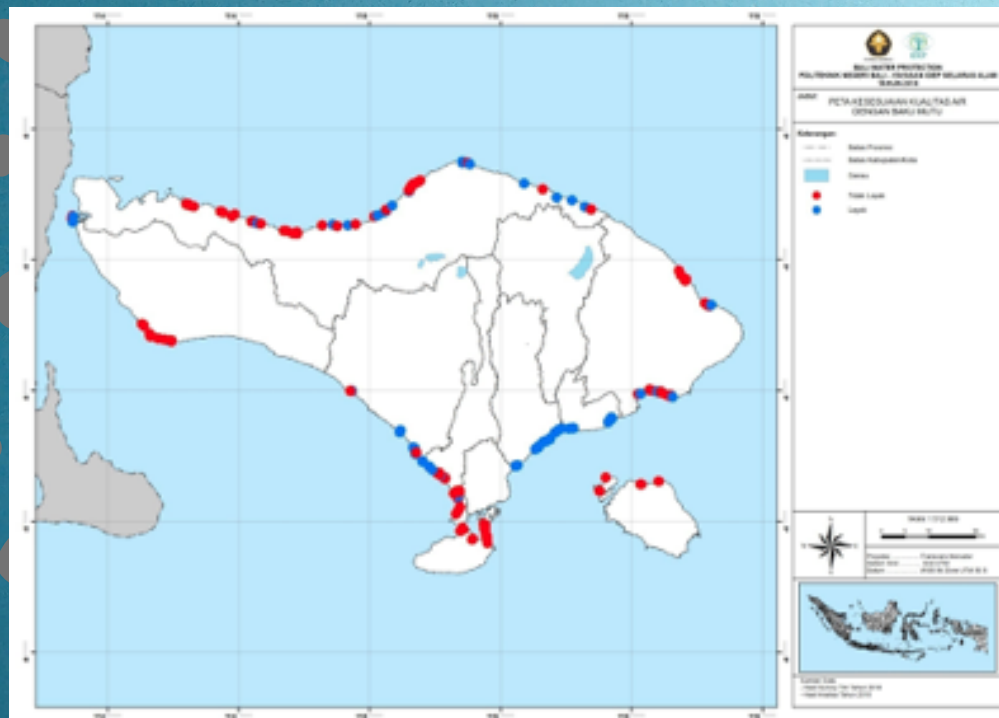


# RESEARCH RESULT

Result of water quality test referring to Minister of Health decree No. 907/MENKES/SK/VII/2002



**WATER SAMPLING POINT**



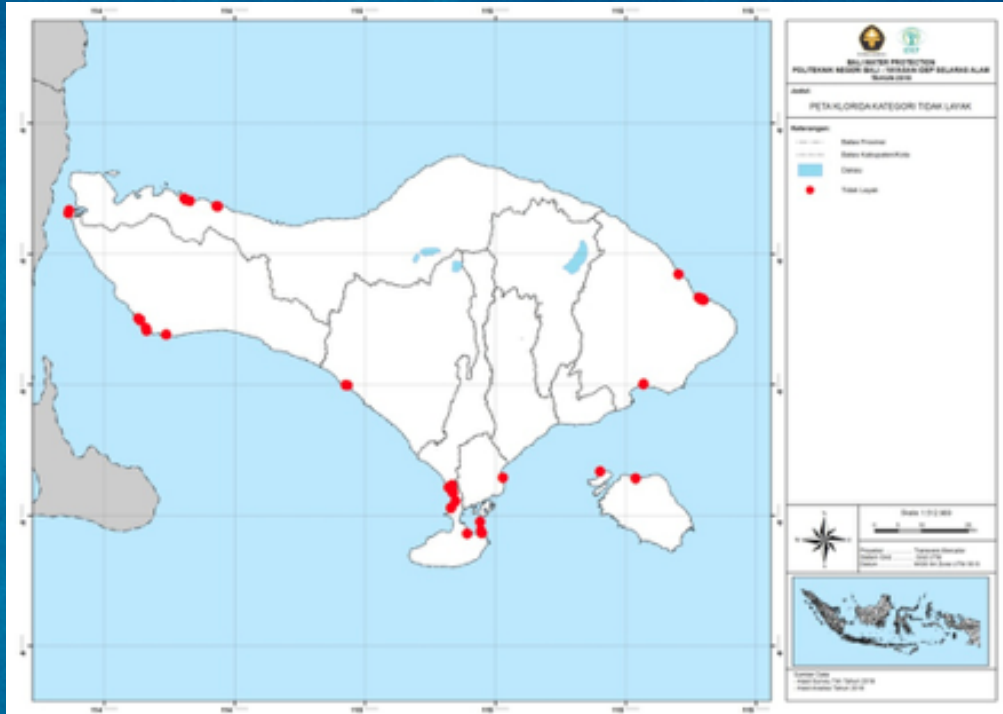
**COMPATIBILITY WITH QUALITY STANDARD**

- The red points show that the water quality is not compatible with quality standard. while the blue points show the opposite
- The results showed that almost all the districts surveyed had none of the water quality that met the quality standards in accordance with Minister of Health Decree. Non-compliance with quality standards is the result of testing the content of chlorine and hardness

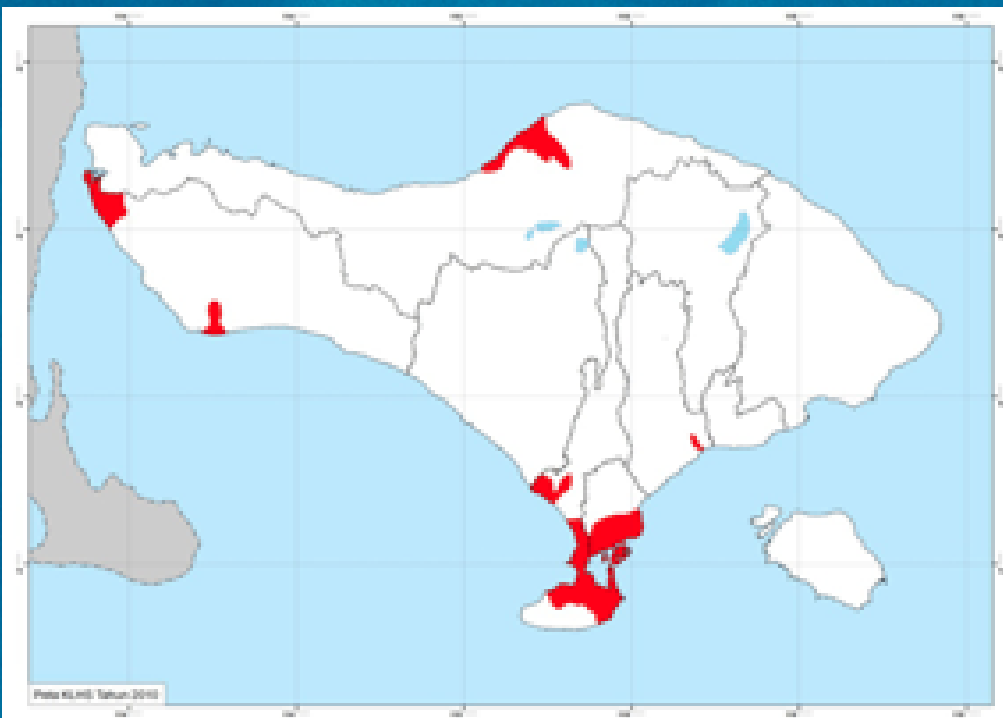


# RESEARCH RESULT

Comparison of BWP Research results with Strategic Environmental Assessment (SEA) 2010



**BWP RESEARCH  
IN SEA WATER  
INTRUSION**



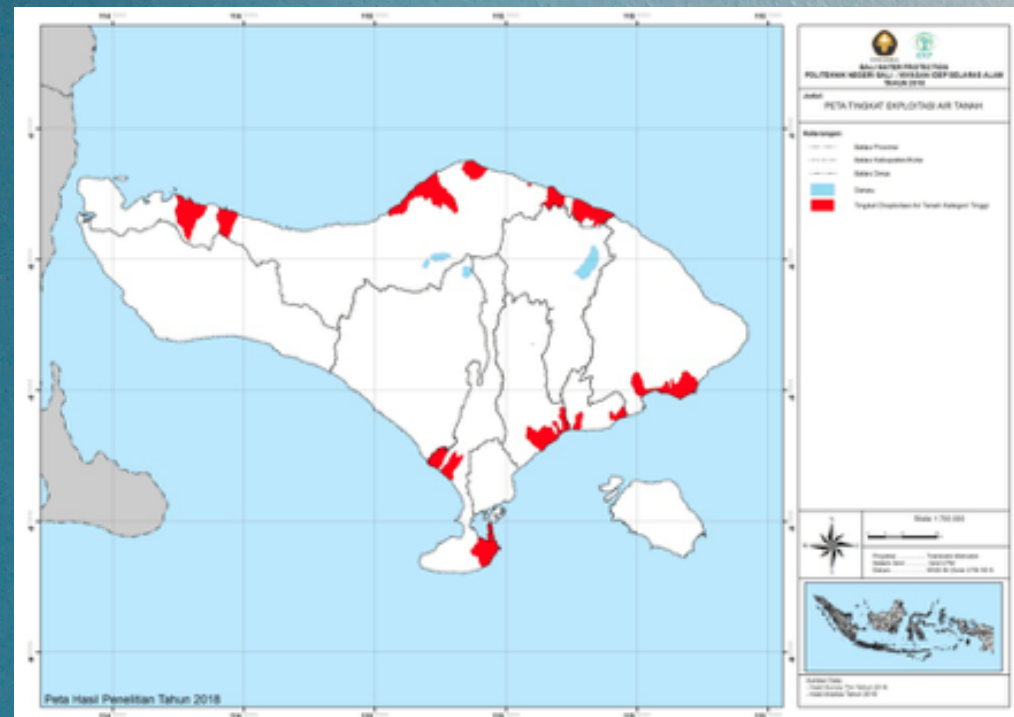
**SEA RESEARCH  
IN SEA WATER  
INTRUSION**

- Areas with ineligible categories for the results of chlorine testing are in the regencies of Badung, Tabanan, Jembrana, Buleleng and Karangasem. This means that in certain places in the five districts sea water intrusion has occurred
- The SEA 2010 report did not include Tabanan and Karangasem Regencies as areas that encountered sea water intrusion. Whereas based on research, the two districts encountered intrusion. It means that, the results of research by BWP shows that the intrusion area has expanded
- On the contrary, the results of BWP research in Gianyar Regency did not experience intrusion while in the 2010 SEA Report, Gianyar Regency was included in the area that experienced intrusion.

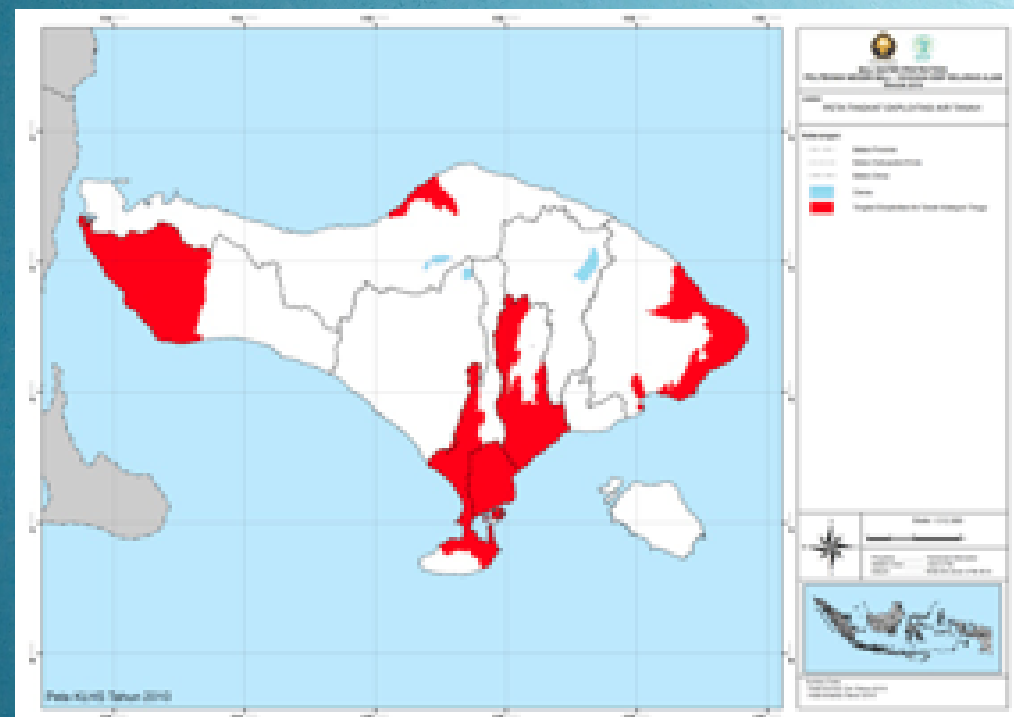


# RESEARCH RESULT

Comparison of BWP Research results with Strategic Environmental Assessment (SEA) 2010



**BWP RESEARCH  
IN GROUNDWATER  
EXPLORATION**



**SEA RESEARCH  
IN GROUNDWATER  
EXPLORATION**

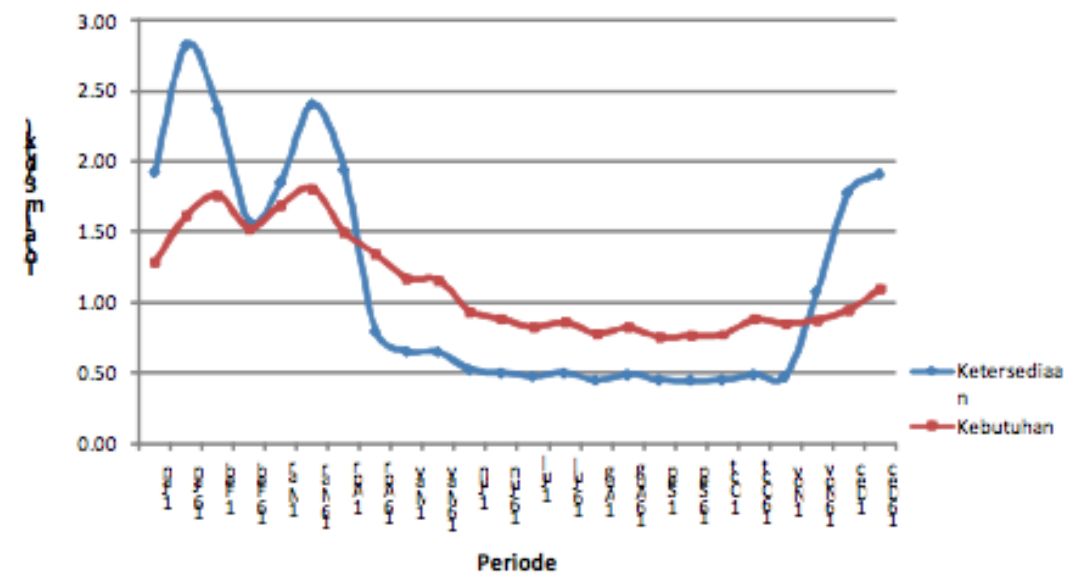
BWP research on groundwater exploration shows results that are consistent with the 2010 SEA Report



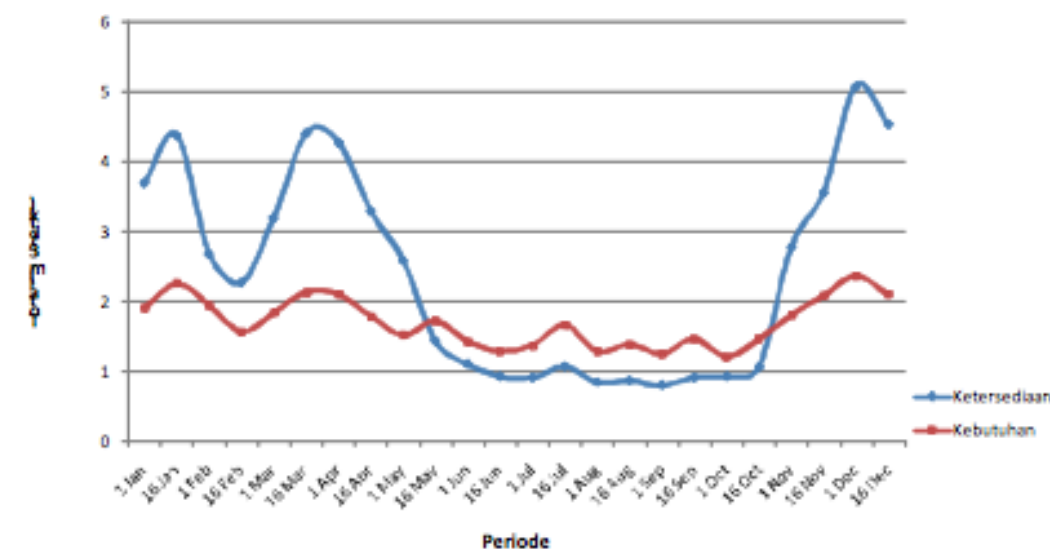
# WATER POTENTIAL VS NEED

Balance of Water Potential Availability with Water Needs in total by SEA research in 2014

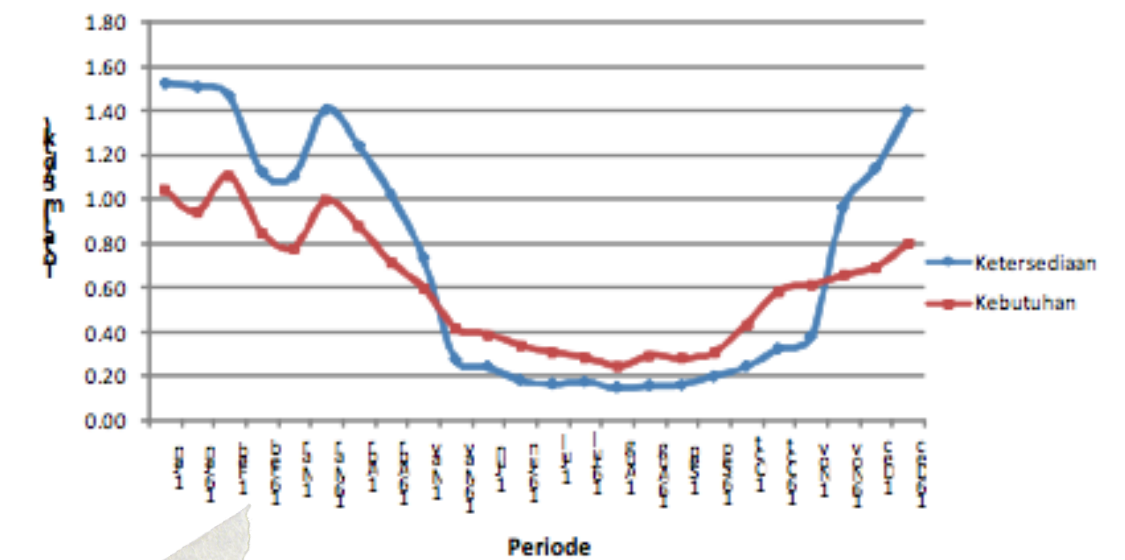
North Zone - Existing Water Balance



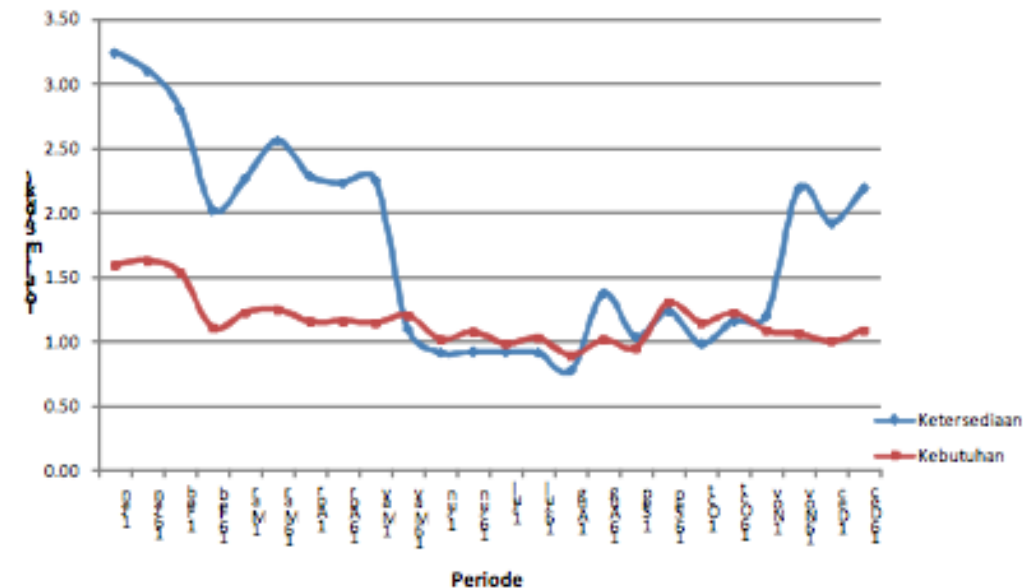
Sarbagita Zone - Existing Water Balance



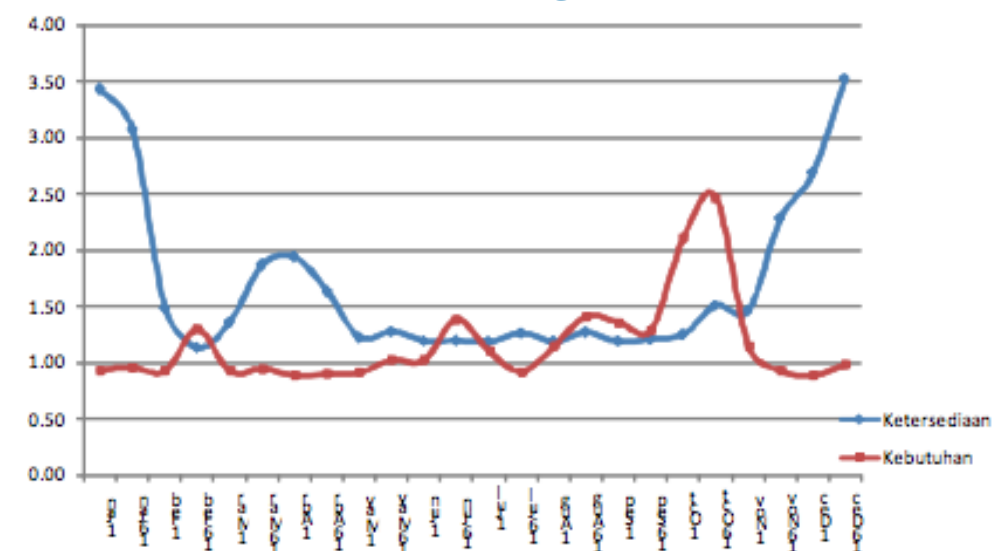
Middle Zone - Existing Water Balance



East Zone - Existing Water Balance



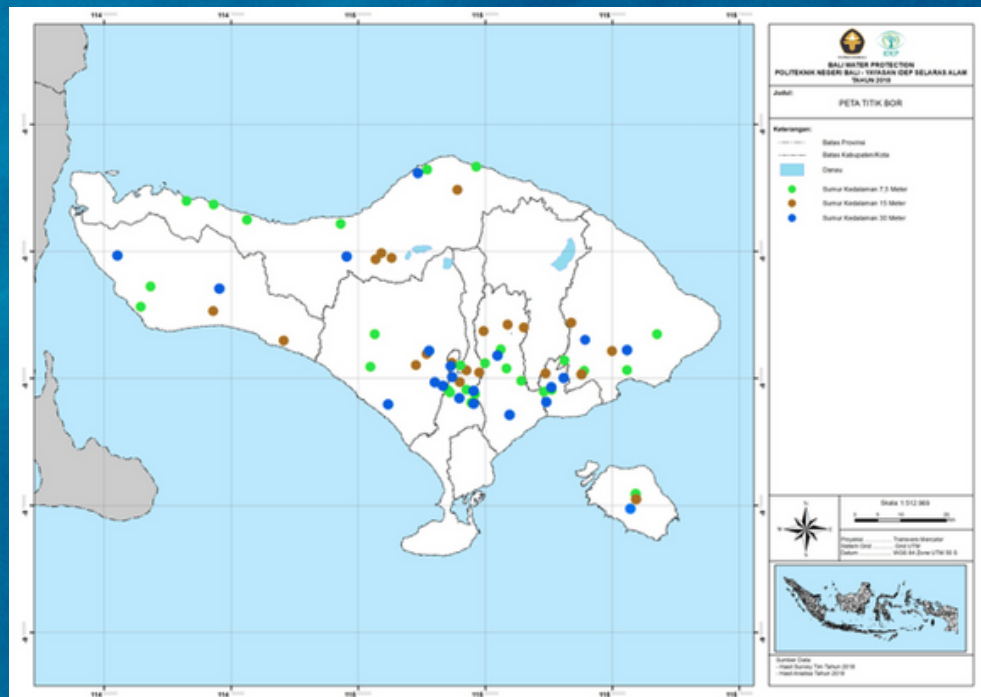
Middle Zone - Existing Water Balance



The graphics illustrate that each zone experiencing a drought during dry season. while in the rainy season each zone has a surplus of water. This means the water surplus is not maximally utilised for a water reserves in dry season.



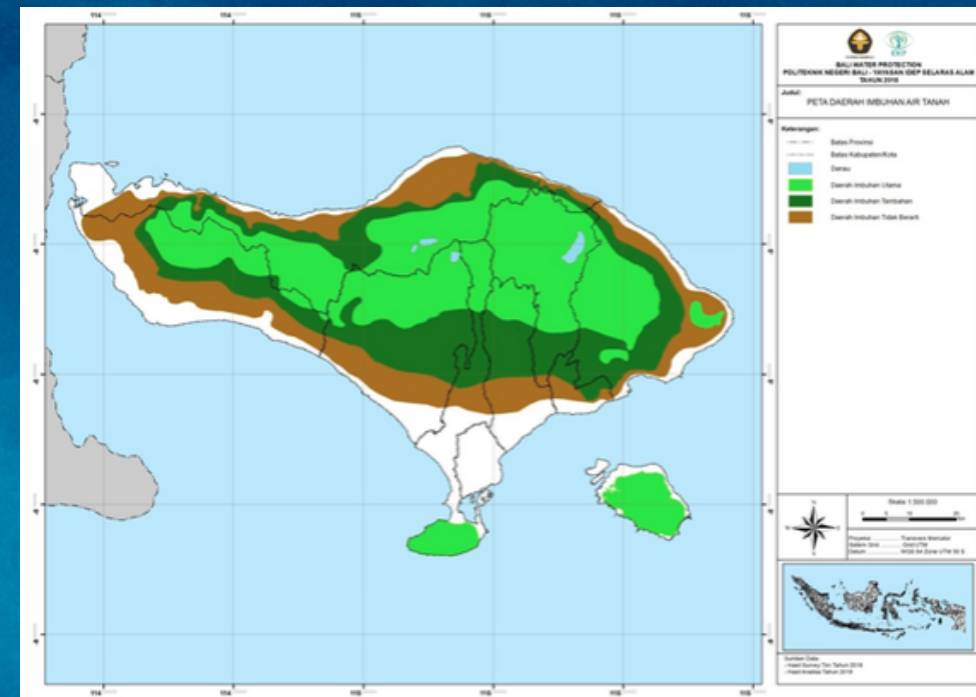
# DETERMINING THE RECHARGE AREA AND MONITORING WELL



DRILL POINT POSITION

The drilling purposes:

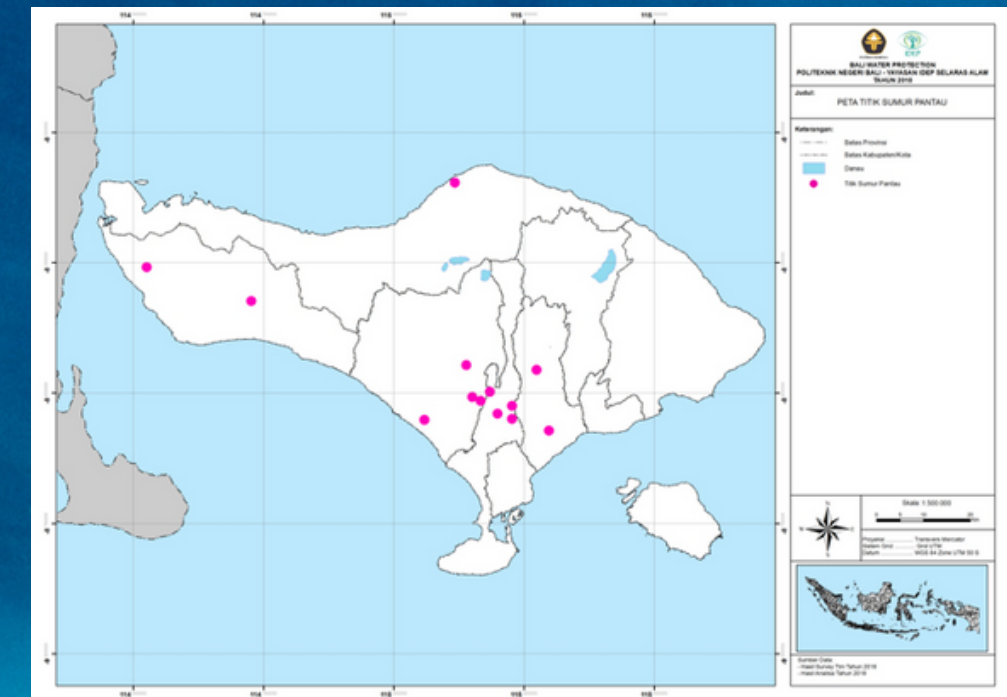
- To know the soil permeability
- To know the type of soil
- As a principle to determine Recharge Area



RECHARGE AREA

The combination of the slope buckling and drilling methods has resulted in a map of the recharge area. Classify into 3 zones:

- Priority recharge area (green)
- Additional recharge area (dark green)
- Insignificant recharge area (brown)



MONITORING WELL POSITION

The monitoring well purposes:

To create a mechanism monitoring system as a reference to find out the amount of water recharged & the impact towards the groundwater level



# RECHARGE WELL PROTOTYPE

In an attempt to introduce the physical form of a recharge well & as a part of introducing save water movement



Deep Recharge Well

Location: Bongkasa Pertiwi

4 x dia. 10 cm, depth 50 meter



Shallow Recharge Well

Location: Kerambitan – Tabanan

4 x dia 30 cm, depth 4 meter



Medium Recharge Well

Location: Penglipuran – Bangli

8 x dia 10 cm, Depth 12 meter



# RECOMMENDATION

- More detailed, comprehensive and sustainable research is needed on the quality and quantity of ground water
- take actions to restrain the rate of sea water intrusion so as not to enter any further into the land area
- restore the groundwater in areas that have experienced sea water intrusion & recharge areas by making a recharge wells
- More serious efforts need to be made to establish and maintain primary recharge area. Managed centrally by level I regions and consistently apply regional regulations on spatial planning
- Prohibit the use of ground water for industrial use in areas with major recharge categories and limit its use to meet domestic needs
- Data related to the utilization and availability of ground water should be open and used as public consumption

- Optimizing the use of surface water to meet water needs and making groundwater only as a reserve
- Greening the conservation area, multiplying the building of reservoirs, weirs and other water reservoirs in the recharge areas to accommodate excess water during the rainy season
- Increase the number of monitoring wells, and spread evenly, especially in areas with high population growth and rapid development of tourism
- Limitation of groundwater exploration by increasing ground water taxation
- PDAM wells in the instructional area (if any) has to be stopped
- Companies that explore groundwater are required to make several recharge wells with recharge capacity in direct proportion to the amount of water taken