

ITRI

Industrial Technology
Research Institute

The fast deployment method of widespread low-cost and portable sensors for national ambient air monitoring

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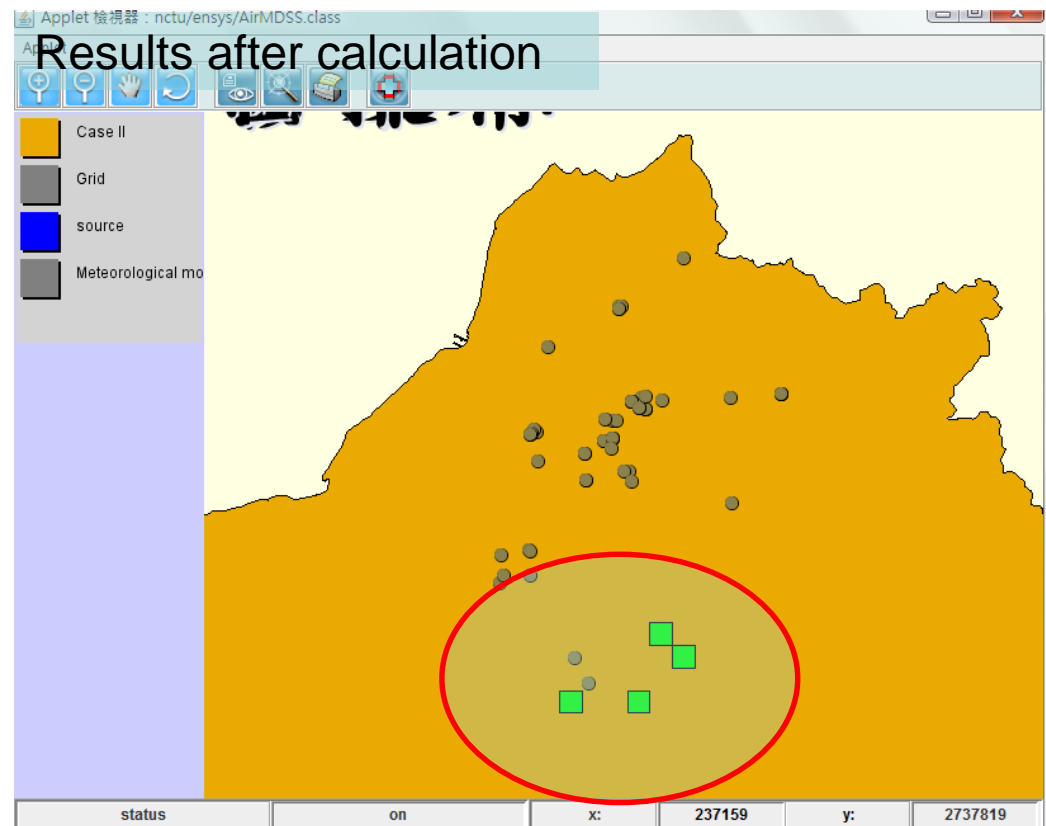
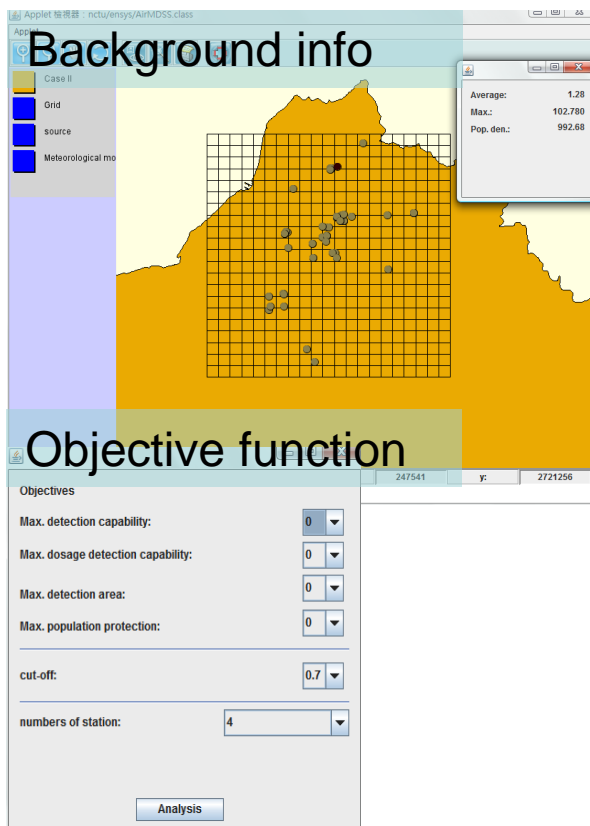
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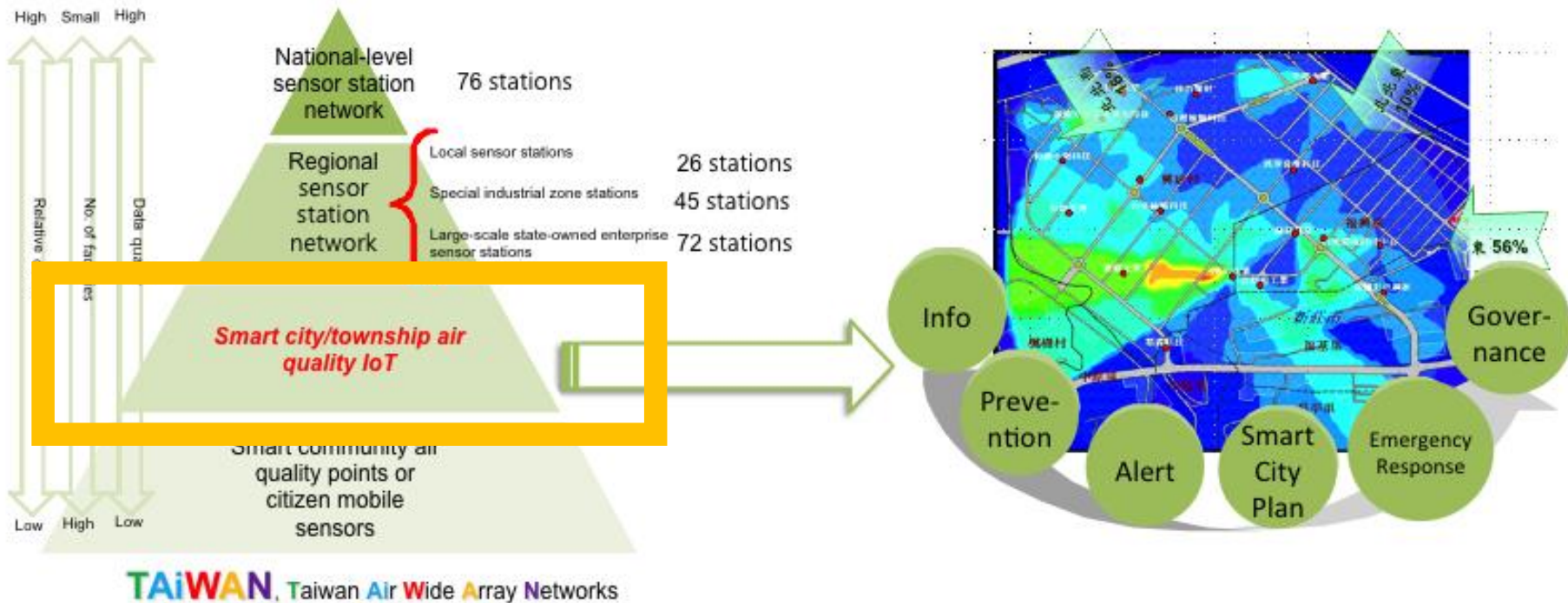
September, 2018

Conventional siting...

Web-based Decision Support System for Environmental Facility Siting (My Phd thesis, 2011)



The Environmental IoT Plan in Taiwan



- **10,200** sensors deployed in the end of the year **2020**
- The **sensors** and the **budget** are deployed and allocated in **22 counties**
- I was the project manager in **2017**

The Challenges



Budget



Priority



Time

About Taiwan



22 counties

23.4 million people

Area of 36,000 km²

649/km²

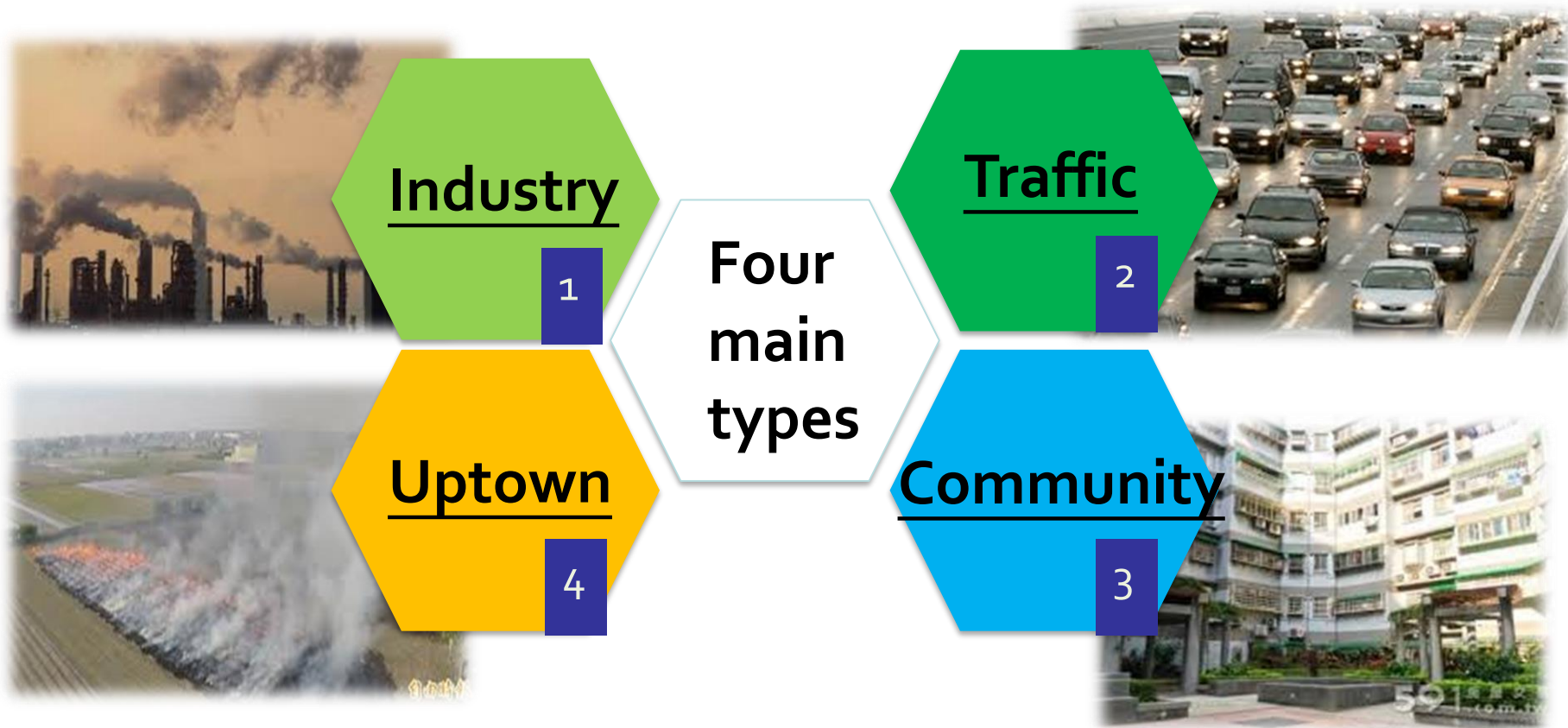
PM_{2.5}, multiple sources

The Fast Deployment Method

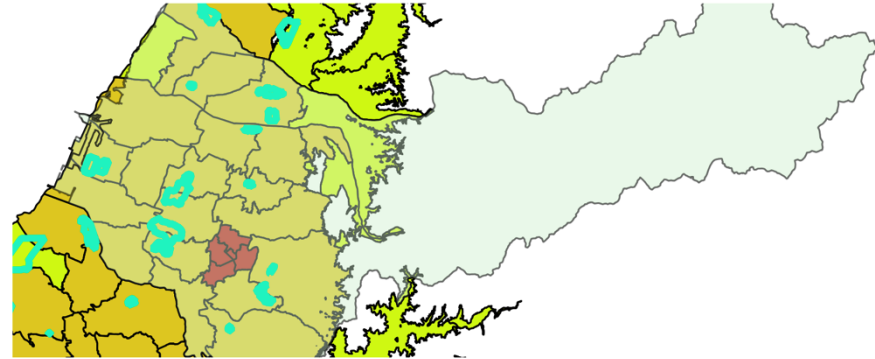
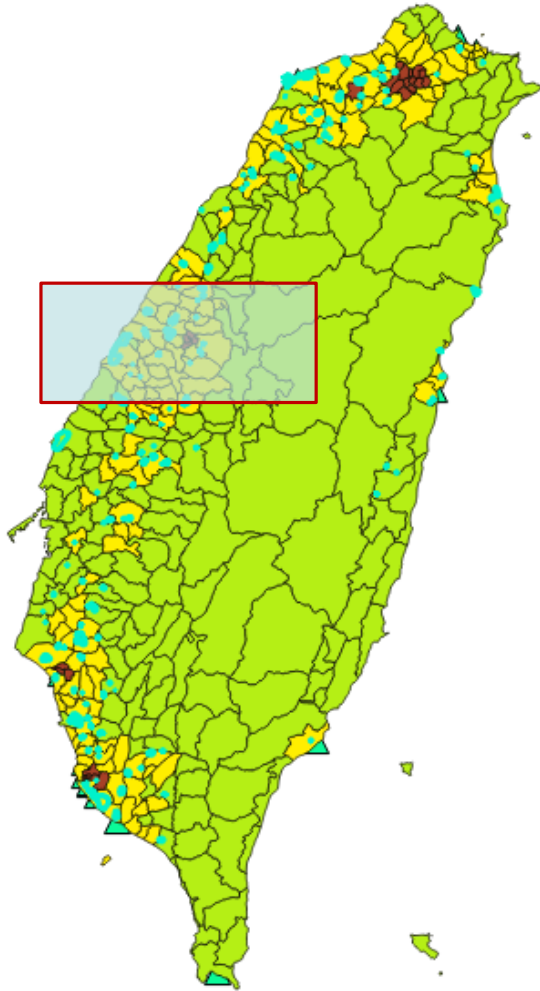
1. Decide the **objectives**
2. Find and build up the **spatial data**
3. Eliminate **unnecessary** areas
4. Define the deployment **density**





QGIS®
trademark

1: Decide the objectives for monitoring

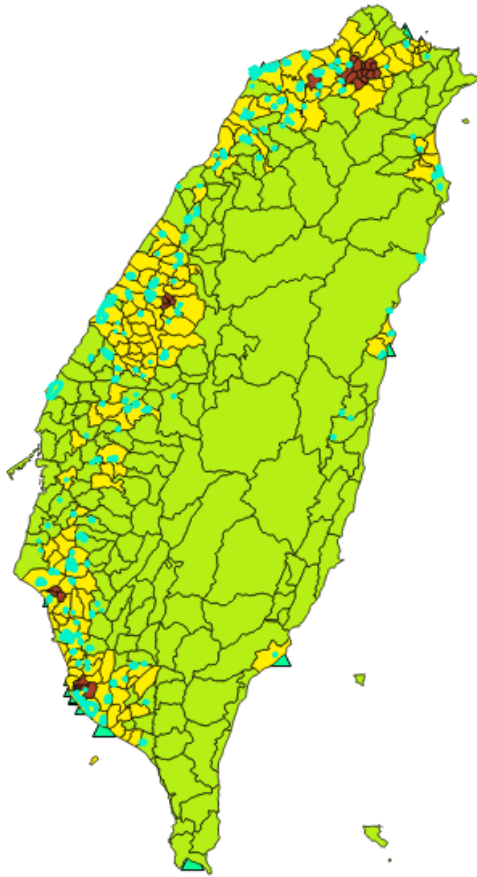


2: Find and build up the spatial data



-  Industrial areas
-  Busy traffic areas
-  Community near the industrial areas
-  Uptown areas

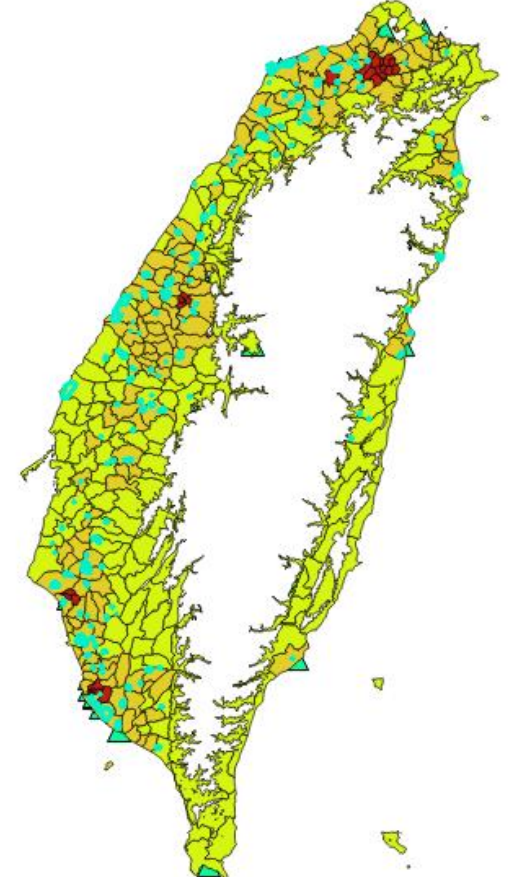
3: Eliminate the unnecessary areas



Base map



500m-up mountainous area



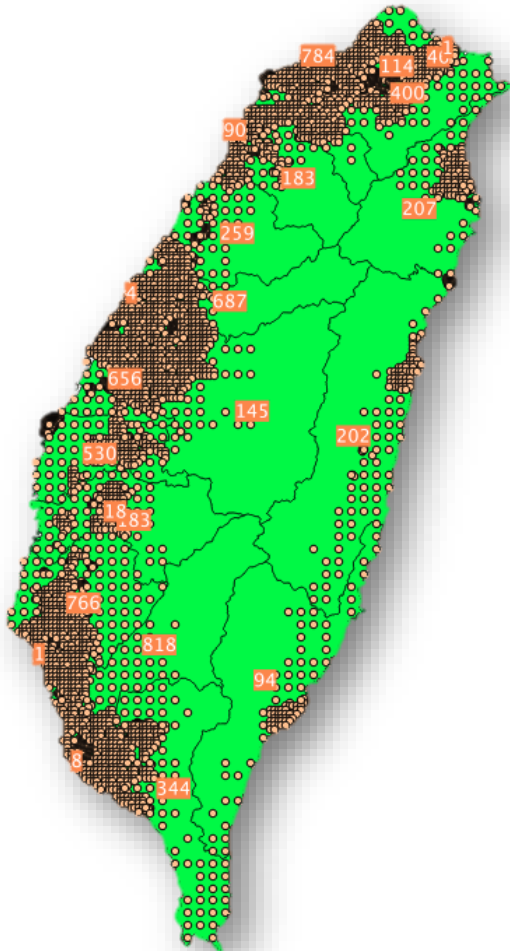
The actual siting area for the case

4: Define the deployment density

The image shows a QGIS map with a Processing Toolbox window open. The toolbox is titled 'point' and lists several tools. The 'Regular points' tool is highlighted with a blue bar. To the right of the toolbox, three colored boxes illustrate different deployment densities: a red box labeled '300m', a yellow box labeled '1500m', and a light green box labeled '5,000m'. The map shows a distribution of points corresponding to these densities, with a blue box highlighting a specific area.

Industrial/Traffic: 300m
Community: 1,500m
Uptown: 5,000m

Results

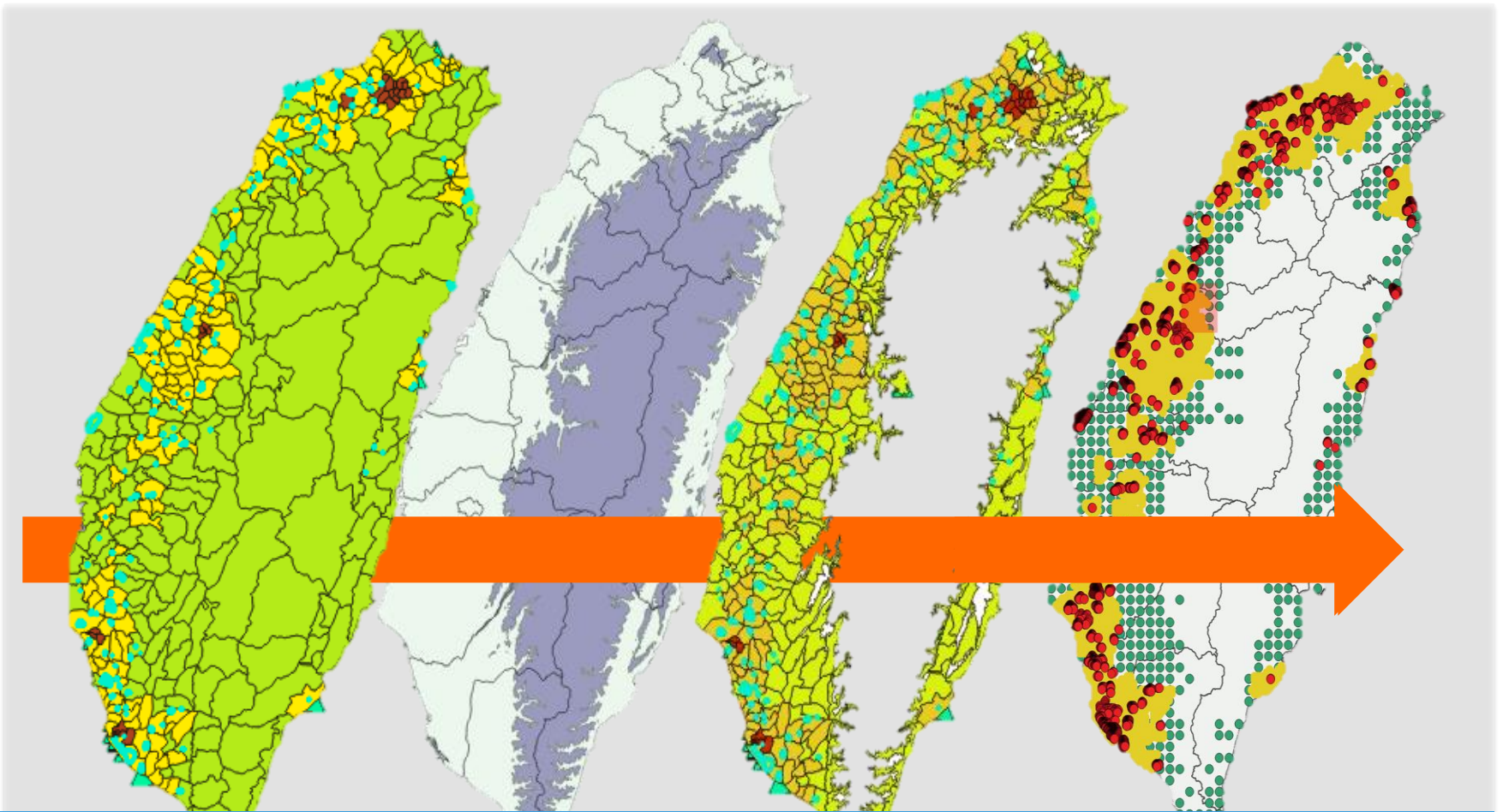


- Industrial type: **4,790**
 - Traffic type: **708**
 - Community type: **3,935**
 - Uptown type: **767**
- (Just the suggestion for TEPA, not final version)

- The **allocation** for counties
- The **priority** issue
- The process is **time-saving**

Conclusion

- A **policy tool** for budget planning
- For **limited-time** decision making
- Always eliminate the **unnecessary areas** first
- What's **next**?
 - Modify the **allocation**
 - Redefine the **objectives**
 - Conventional siting



Thank You!

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