

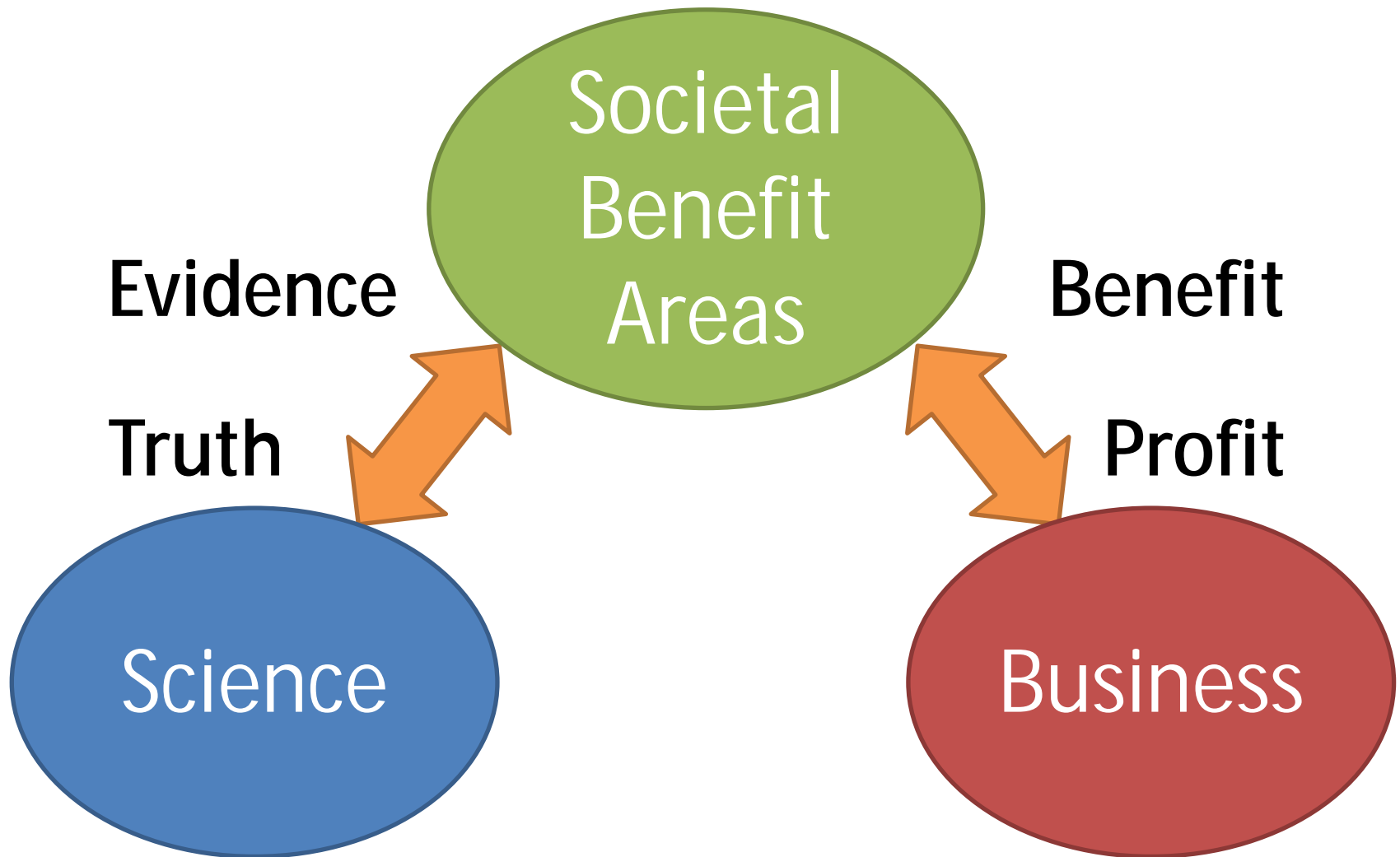
# Contribution of Data-Centric Science to Societal Benefit Areas – Toward Better Actions in Agriculture, Biodiversity, and Disasters

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<http://agora.ex.nii.ac.jp/~kitamoto/>

# Societal Benefit Areas (SBA)



# GEOSS

(Global Earth Observation System of Systems)

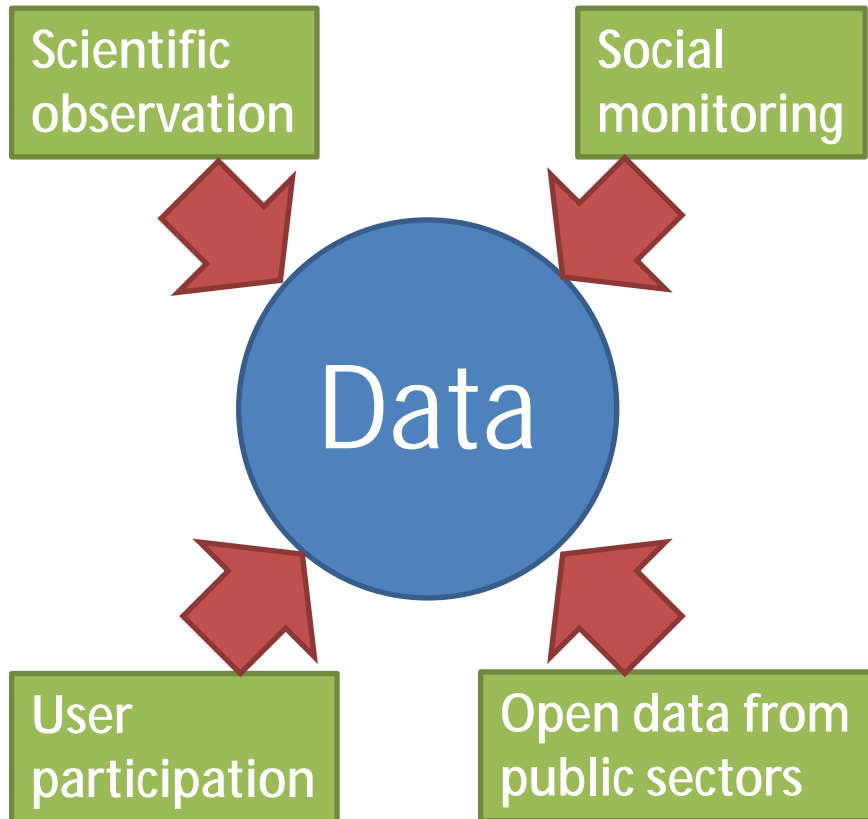


<http://www.earthobservations.org/geoss.shtm>

9 SBA: **disasters, health, energy, climate, water, weather, ecosystems, agriculture, biodiversity.**

- Environmental observations and information for decision making.
- Cross-cutting approach: multitude of complex and interrelated issues simultaneously.

# How Data Grows?



- Data collection from multiple sources.
- Observation by new channels.
- Promotion of user participation.
- Open data from public sectors.

# Digital Typhoon

<http://agora.ex.nii.ac.jp/digital-typhoon/>

The screenshot shows the Digital Typhoon website interface. At the top, there's a search bar and site map. The main header reads "Digital Typhoon: Typhoon Images and Information". Below this, there's a navigation menu with "Home", "Earth", and "Digital Typhoon" options. A notice bar contains various links like "Feedback", "Wallpaper", "Movie", "Kids", "RSS / Atom / Media RSS", "OpenSearch", "For Mobile Phone", "For PDA", "For Google Earth", "For iPod", "For Twitter", "For Digital Photo Frame", "Applications", "Social Typhoon", "Typhoon Front", "Typhoon Visual Report", "Typhoon Imagination", "Eycphoon", "Twphoon", "Typhoon Now!", "Typhoon Memories", and "Typhoon Memories".

The main content area is divided into several sections:

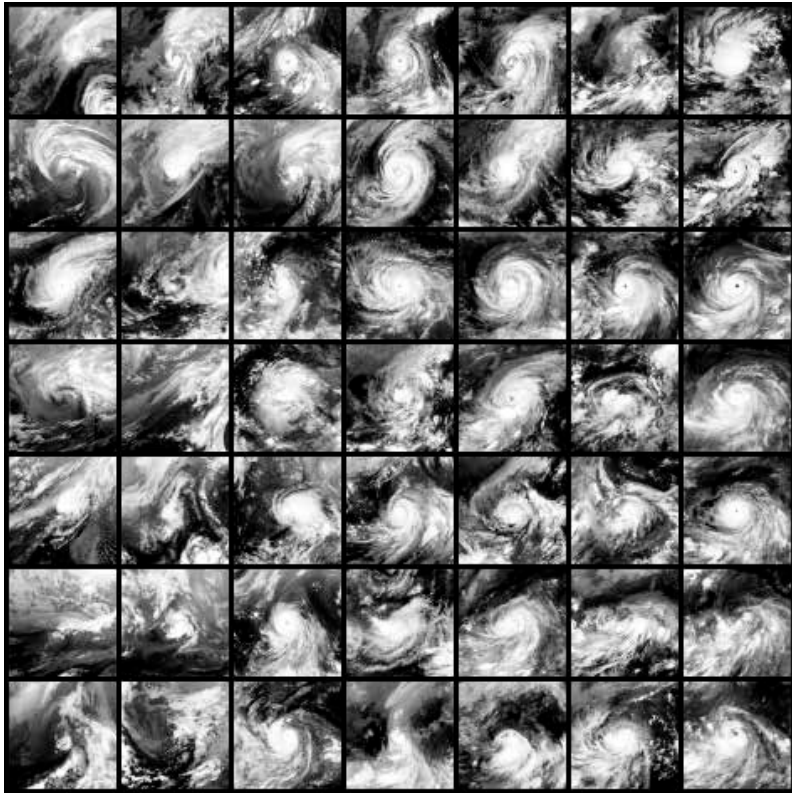
- Real-time Typhoon Information:** This section displays three columns of typhoon images and data for the years 2010, 2010, and 2010. Each column shows a satellite image, a typhoon ID (e.g., MT10060100), a name (e.g., 201006 (WNP)), and coordinates (e.g., [162.0, 6.18-8]).
- Number of Typhoons:** This section shows the number of typhoons for the current year (8) and the average (14.3) from 1951 to 2008.
- Latest Typhoon Information:** This section lists recent typhoon events, including Typhoon 201006 (LONPHOON) (2010-08-20), Typhoon 201007 (KOMPASU) (2010-08-01), and Typhoon 201008 (NANTHUN) (2010-08-21).
- Typhoon Database:** This section provides search options: 1. Search by Metadata, 2. Search by Date / Season, 3. Search by Name / Number, 4. Search by Map, 5. Search by Place (Lat / Lon), 6. Search by Pressure, 7. Search by Wind, 8. Activity Calendar, and 9. Typhoon Timeline.
- Meteorological Satellite Images:** This section shows a satellite image of Earth from 2010-09-01 11:00 UTC.

- Heterogeneous sources are integrated and indexed in near real-time.
- Past data can be searched in the context of the current situation.
- Scientists and citizens use the websites for work, business, hobby.

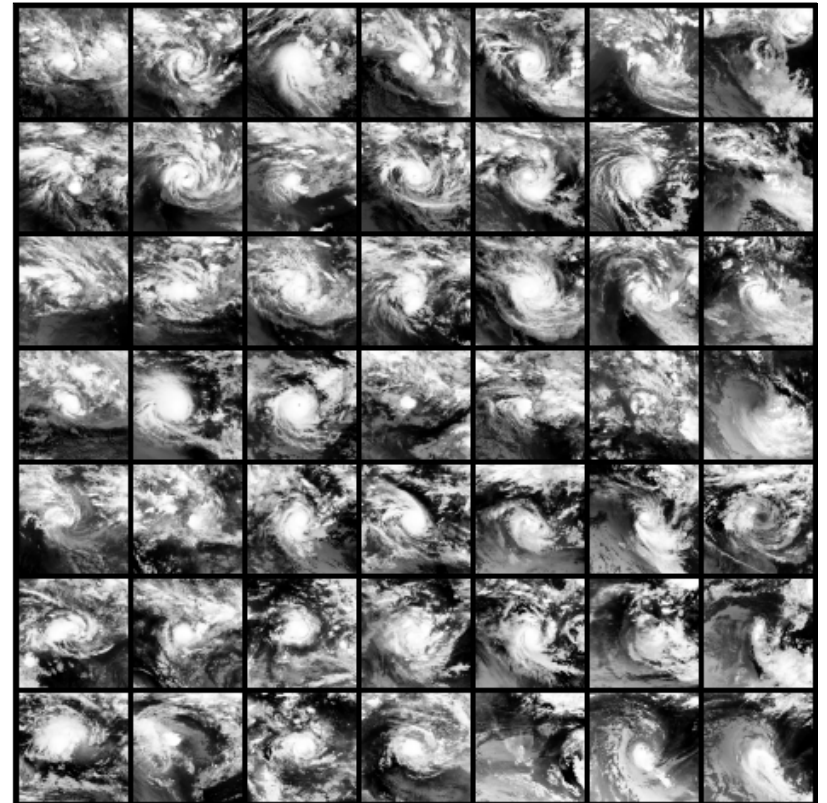
One of the most famous typhoon information Website. About 30 million page views per year.

# Typhoon Image Collection

Since 1978, about 138,000 images for NH, and 35,000 images for SH.

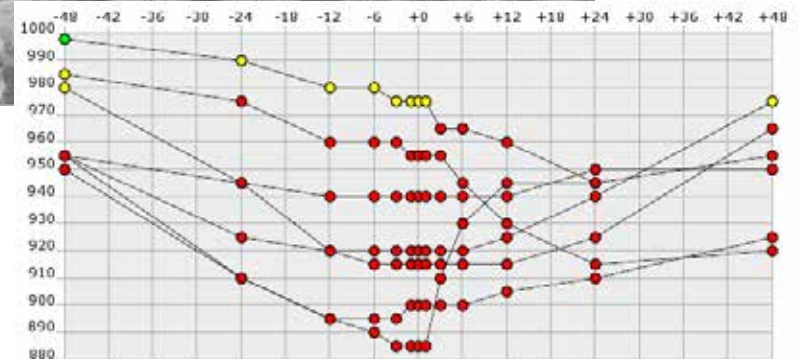
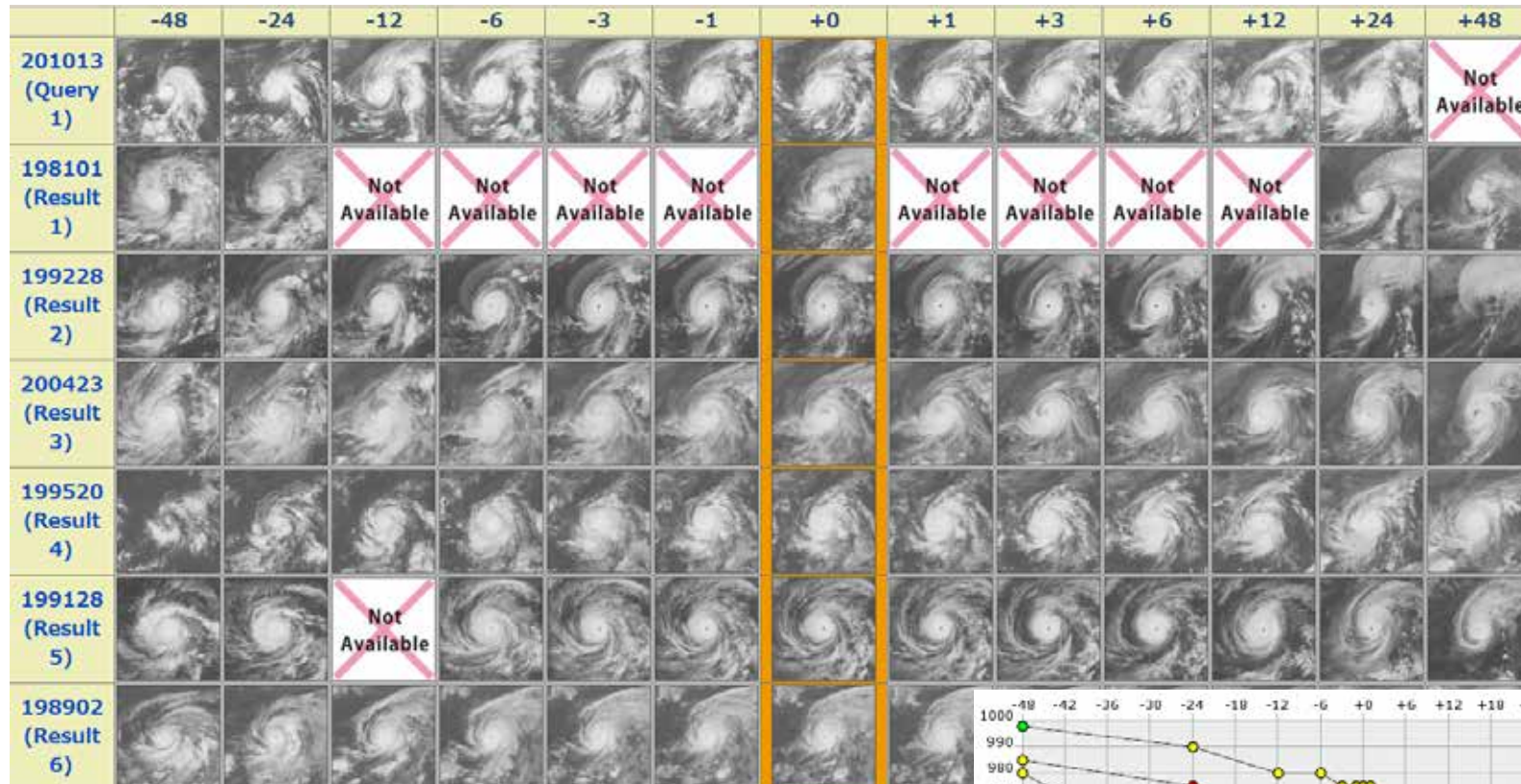


Northern Hemisphere



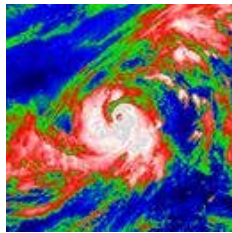
Southern Hemisphere

# Search by Image Similarity

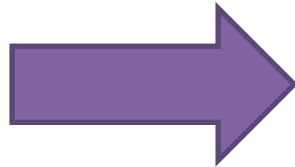


# Search by Situation

Decision is often made based on experiences from past similar events. How to search similar events?



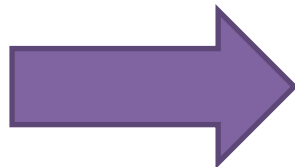
Satellite image



Find similar typhoon cloud patterns in the past.



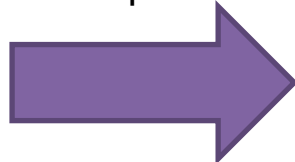
News article



Find similar news text or events in the past.



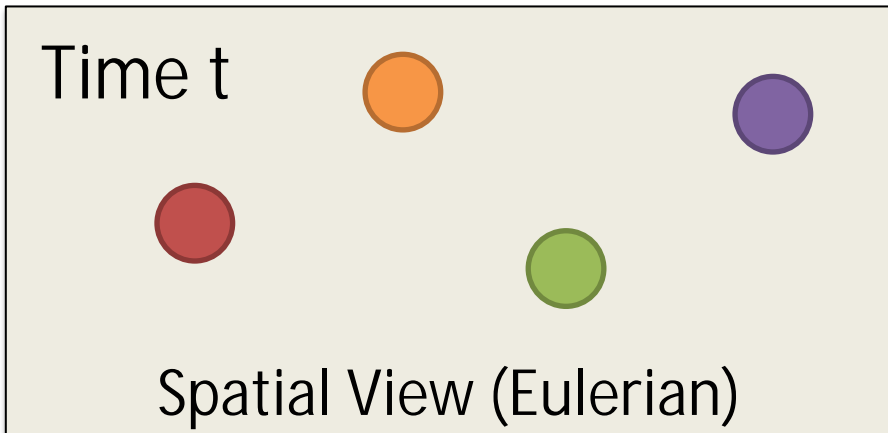
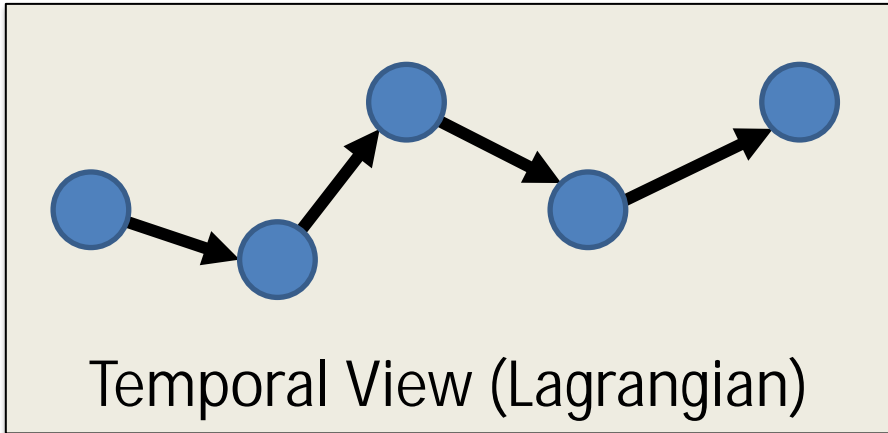
Rain pattern



Find similar precipitation patterns in the past.



# Human in the loop

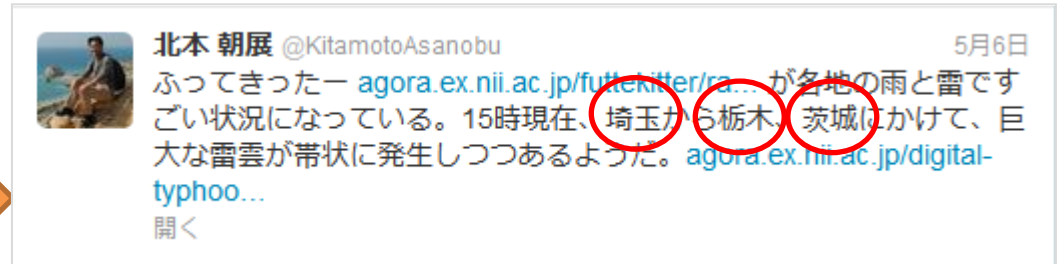


- **Human Probe:** human activity (with mobility) is monitored by sensors.
- **Human Sensor:** human acts as an intelligent sensor for reporting events.

# Social Weather Monitoring



Search by  
keyword



Social data

Toponym-based geotagging  
by GeoNLP

(time, latitude, longitude, situation)



Comparison of social and scientific  
streams in terms of precipitation

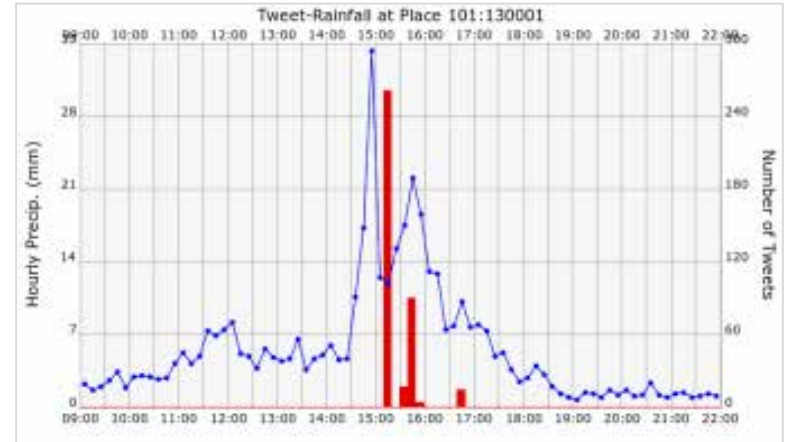
Scientific data



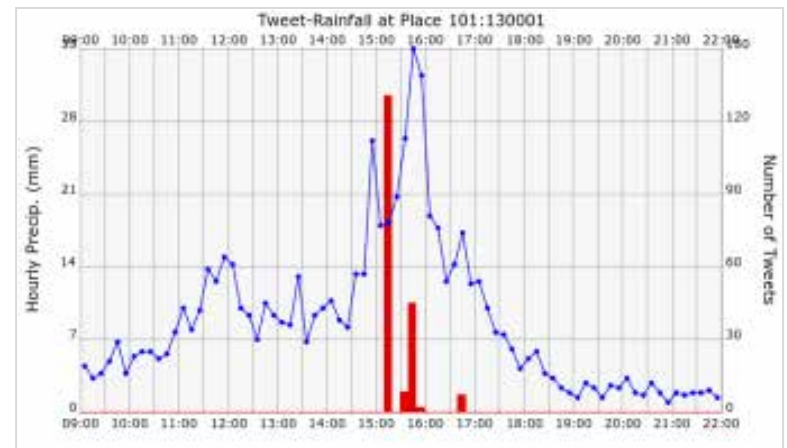
- Precipitation is easier to observe by the eye than weather in general.
- Weather radar can provide objective data or "ground truth."

# Futtekitter

<http://agora.ex.nii.ac.jp/futtekitter/>



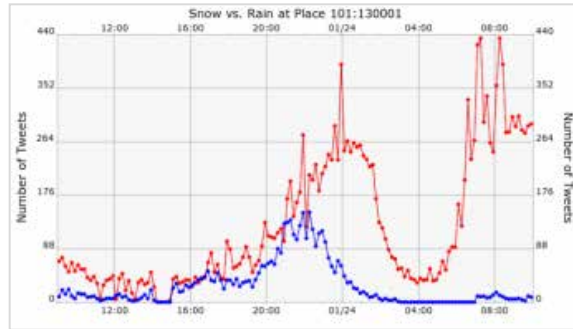
Rain tweets with retweets.



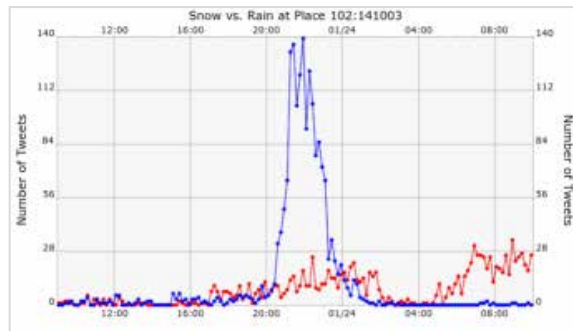
Rain tweets without retweets.

# Quality Control of Human Sensors

Tokyo



Yokohama



Hachioji



Scientific data

verification

situation

Social data

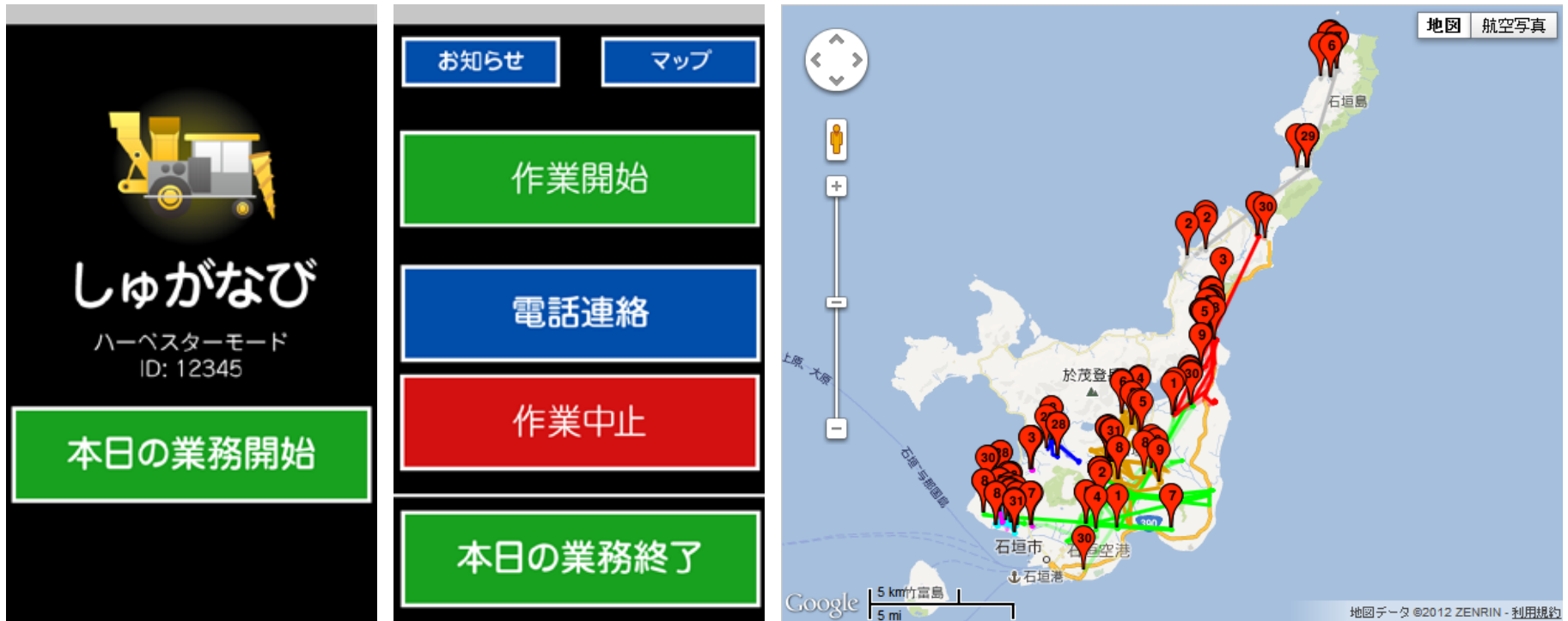
machine learning

# Monitoring Agriculture



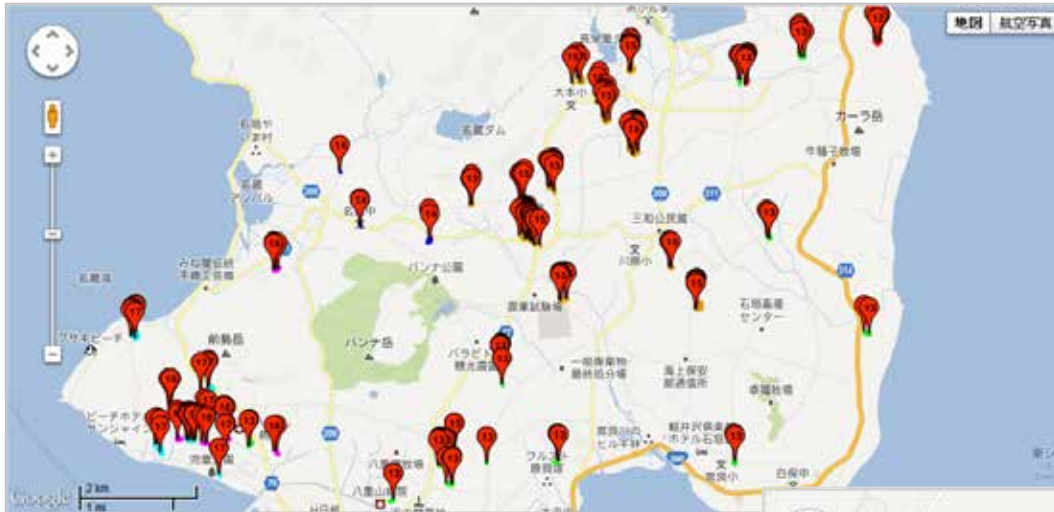
Collaboration with Dr. Tomoko Imoto at Titech, and Ishigakijima Sugar Manufacturing Co.

# Harvester Probe



- Android application "Sugarnavi" was used by several operators.
- Data is uploaded to the server every 3 minutes while harvesting.

# What's the Value of Data?

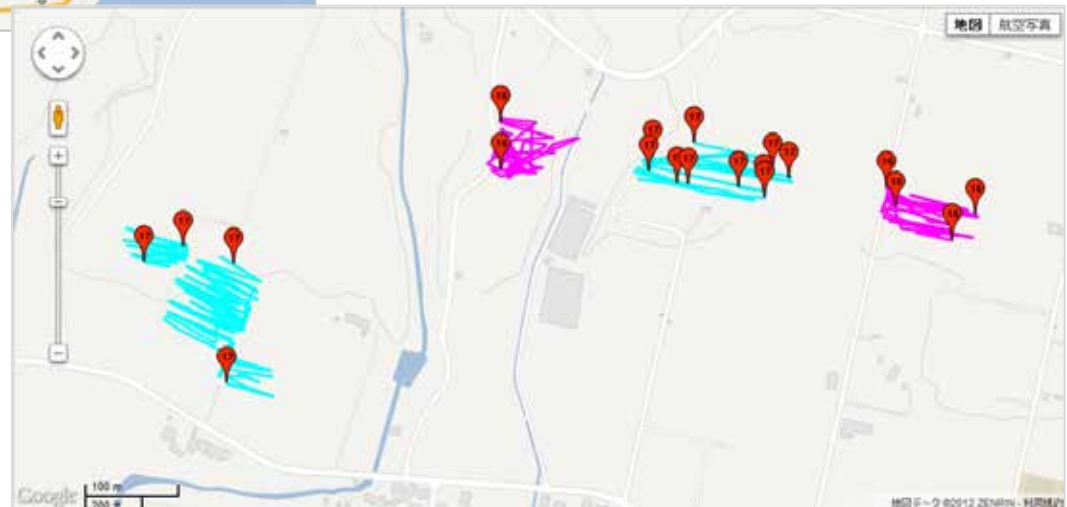


## Economic view:

How to optimize the operation of harvesters?

## Community view:

How to share these data among stakeholders for the benefit of society?



# Supporting Biodiversity Volunteers



Bumblebee, *Bombus terrestris*, introduced from Europe in 1991. National Invasive Alien Species Act of Japan, 2006.

- Participatory monitoring since 2006 in Hokkaido.
- Catch (and kill) and report to researchers.

Collaboration with Prof. Izumi Washitani at University of Tokyo under DIAS project




# Seiyou Status

<http://www.seiyoubusters.com/seiyou/>

Seiyou Status - Current status of invasive alien bumblebee *Bombus terrestris* by participatory monitoring in Hokkaido, Japan - Last updated: 2012-12-07

Participatory Monitoring for Invasive Alien Species

## Seiyou Status



- About *Bombus terrestris*
- About the monitoring activity
- How to join the activity?

セイヨウ情勢データ入力システム

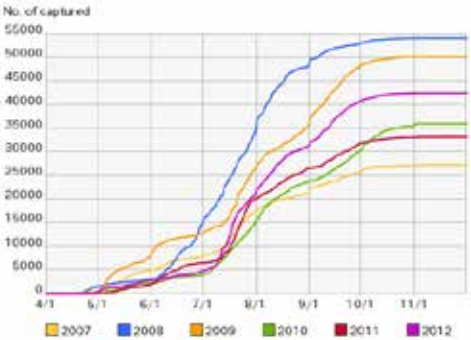
"Seiyou Status" is a website for providing the current status of invasive alien bumblebee *B. terrestris*. Captured and observed information about *B. terrestris* in Hokkaido, Japan, is gathered through participatory monitoring and is updated by Conservation Ecology Laboratory, University of Tokyo. [Detail...] [Japanese Version...]

**We started the activity for 2012. Thank you for your participation. Please refer to our 2011 annual report on the achievement of the activity in 2011.**


最新情報はこちら  
セイヨウ情勢ブログ  
Letters from participants and messages from the staff (in Japanese)

### Summary of 2012

No. of captured



■ 2007 ■ 2008 ■ 2009 ■ 2010 ■ 2011 ■ 2012



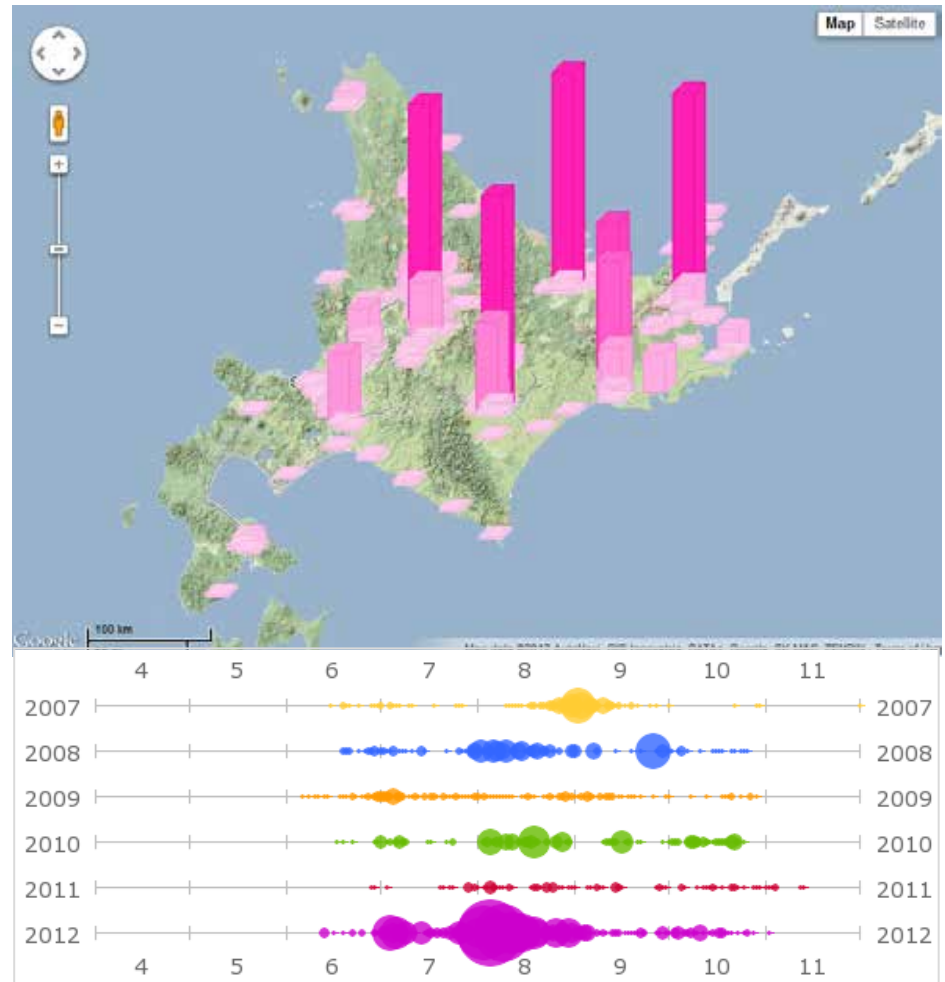
Seiyou (Alien) Map Native Map

### Latest status of 2012

Municipality with <i>B. terrestris</i>	39
Volunteers	292
Observed <i>B. terrestris</i>	49,608
Observed native bumblebees	3,925
Captured <i>B. terrestris</i> (total)	42,968
Captured <i>B. terrestris</i> (queens)	5,265
Nests	12

### Annual reports

- 2011
- 2010
- 2009



# Gaming (Touch and Catch)

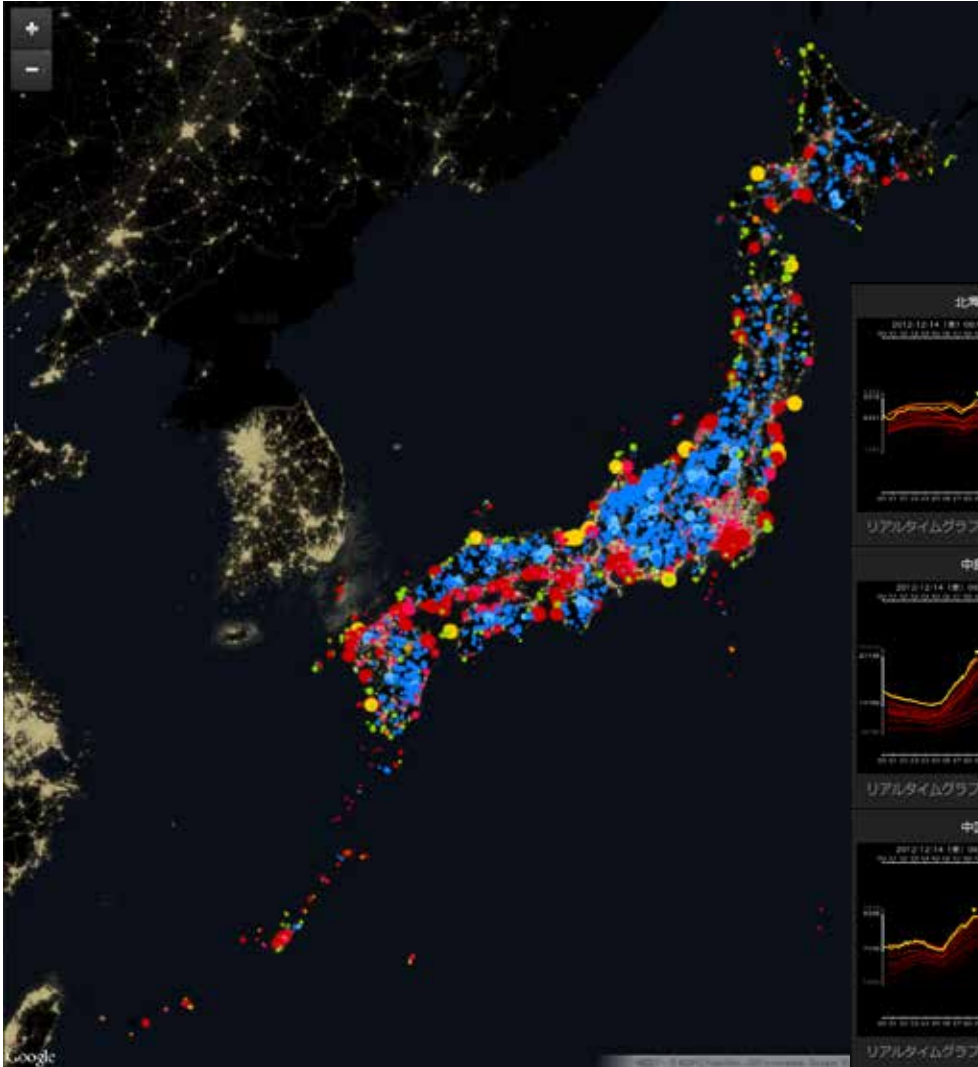
<http://www.seiyoubusters.com/touch-catch/>



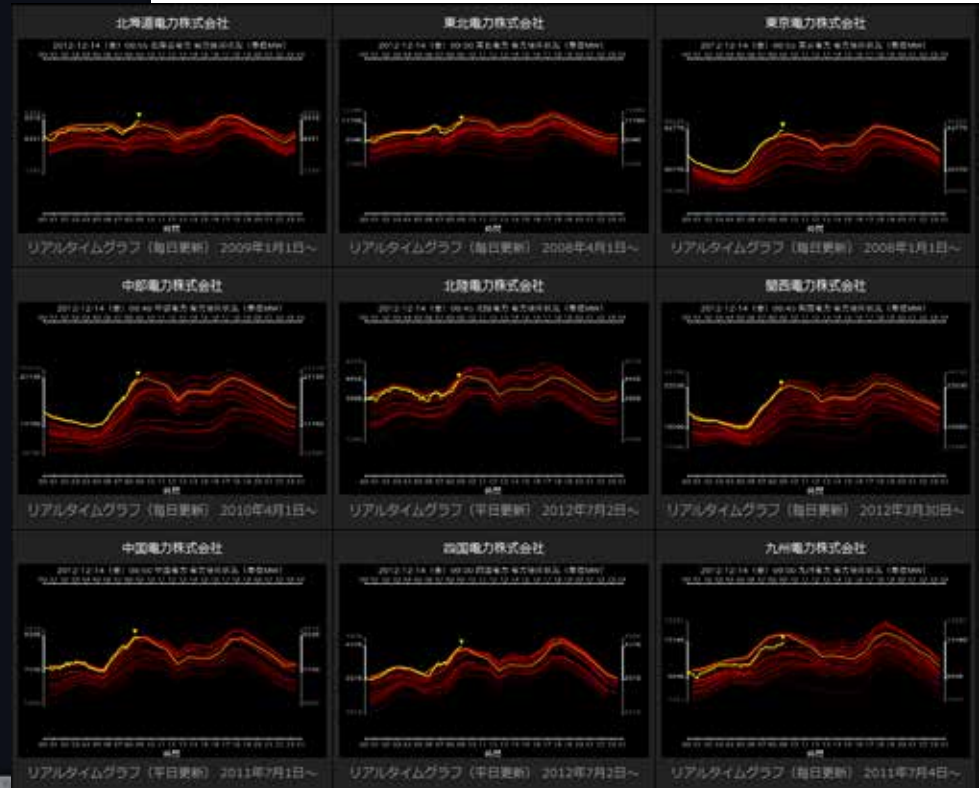
Using "serious game" to promote the activity and understand participants.

# Electrical Japan

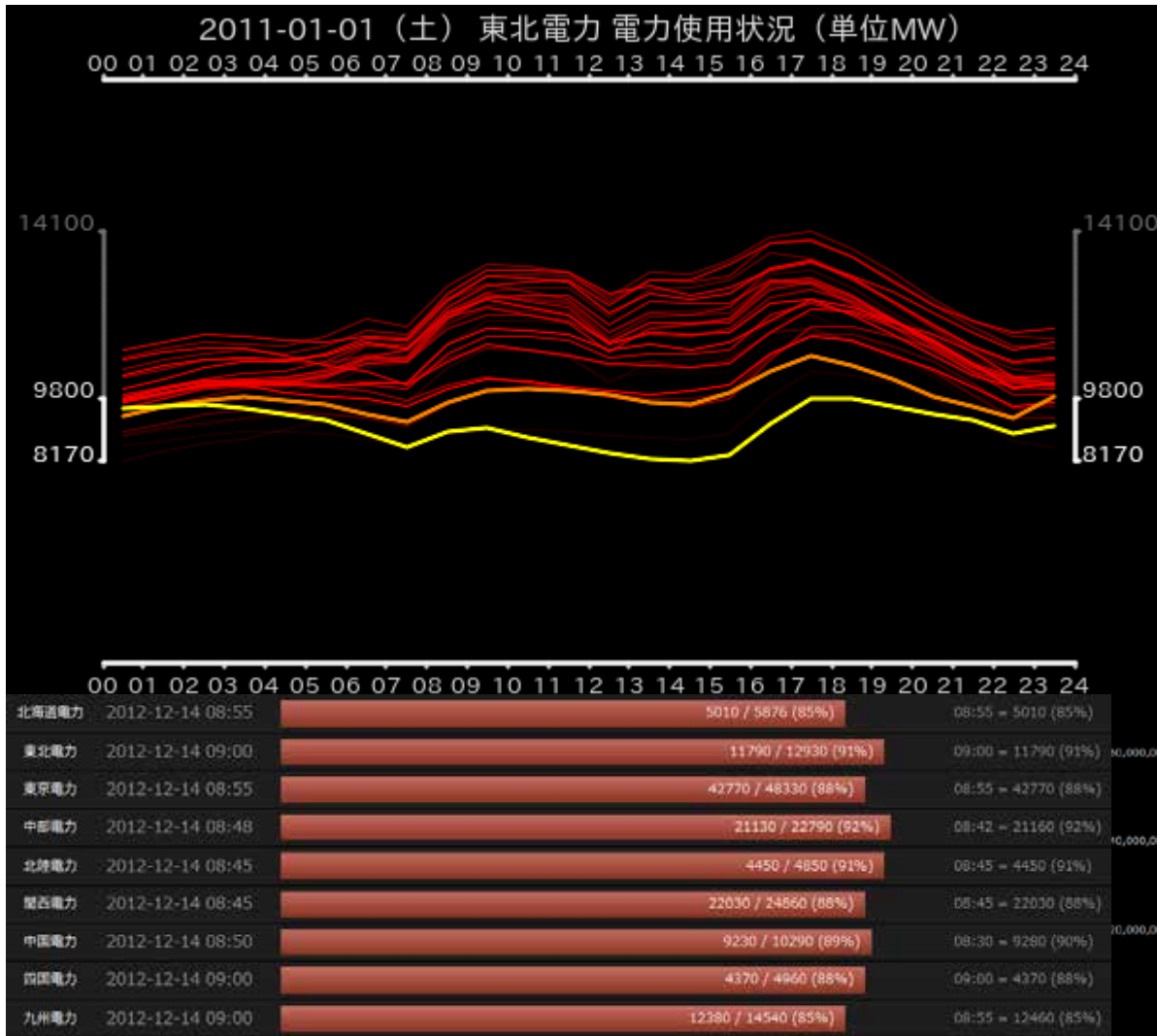
<http://agora.ex.ni.ac.jp/earthquake/201103-eastjapan/energy/electrical-japan/>



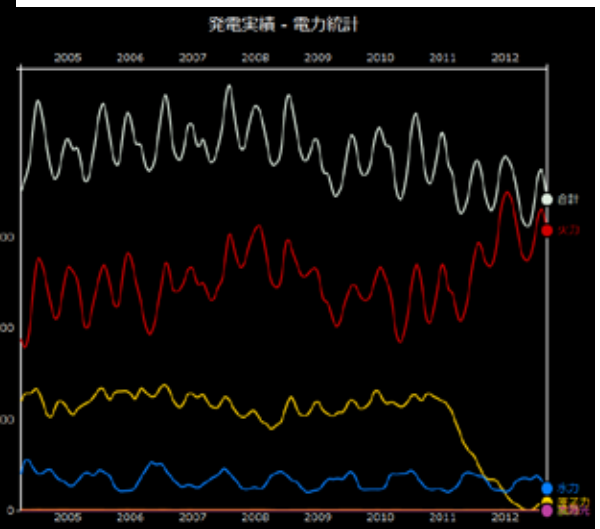
Using open data for better awareness on the status electricity consumption.



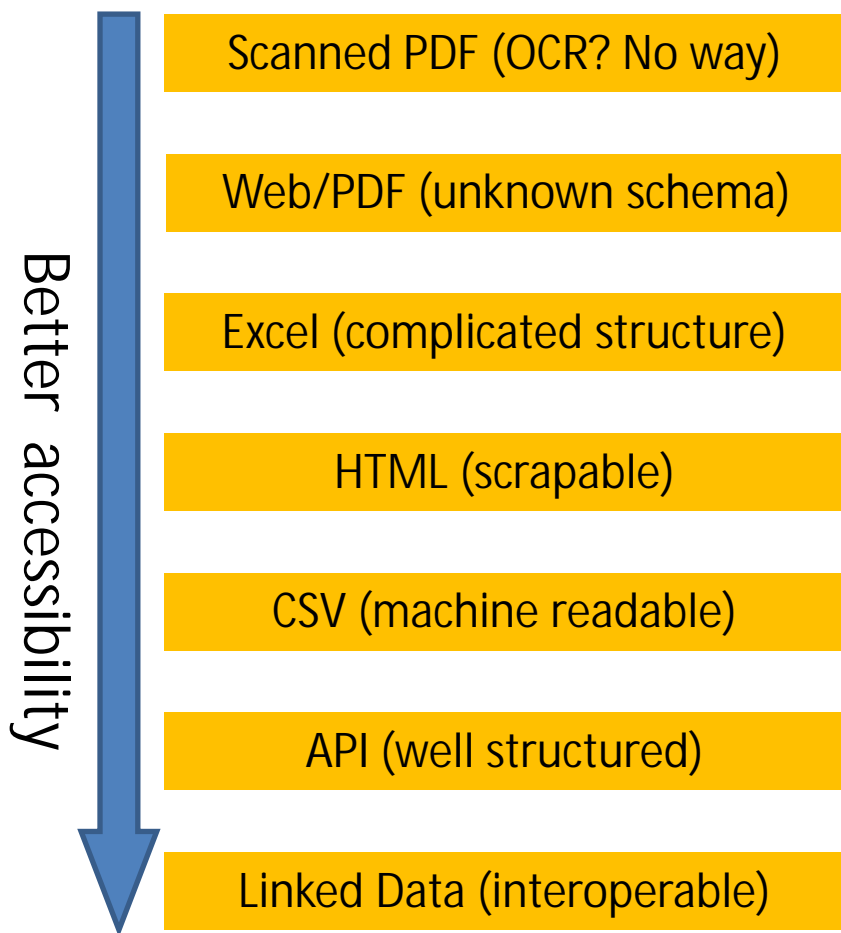
# Data Visualization to Journalism



From visualization to data journalism, and finally to evidence-based policy making.



# Accessibility and Open Data



- Public sectors release their data to the public (open government).
- Researchers and volunteers show new ways of data usage.
- More benefit with less cost?

# Summary

- SBA is based on two criteria: evidence (based on science) and benefit (profit or nonprofit).
- Data-centric science can contribute to SBA by suggesting better actions.
- Infrastructure such as open data has a vital role in data-centric science.

**More information**

**<http://agora.ex.nii.ac.jp/~kitamoto/>**