GNSS APPLICATION FOR JAKARTA FLASH FLOOD EARLY WARNING SYSTEM

Lin Yola

Center for Spasial Data and Analysis
School of Strategic and Global Studies, Universitas Indonesia
Dr. Lin Yola

Architect; Urban Planner
Lecturer at School of Strategic and Global Studies, Universitas Indonesia

Chairman. Center for Spatial Data and Analysis, SSGS Universitas Indonesia

Research and Publication: Climatically Responsive Urban Configuration, Urban Energy, IT Development and Application in Urban Spatial Analysis, Publica Policy and Strategic Global Studies, Green architecture and Urban Development
• GNSS Technology and Application for in Spatial Analysis for Urban Studies Department, SSGS Universitas Indonesia

• Collaboration with Innovations, Technology and Social Change Research Cluster; urban traffic study, air pollution study, water transportation system, urban development and emission increase, toll and non toll navigation study, etc


• LAUNCHING OF CENTER FOR SPATIAL DATA AND ANALYSIS (CSDA) & INTERNATIONAL GNSS WEBINAR SERIES - GNSS APPLICATIONS FOR ACADEMICS, COMMERCIAL, AND POLICY MAKERS (SSGS UI, 10 SEPTEMBER 2020). https://www.csda.sksg.ui.ac.id/site/

• INTERNATIONAL WEBINAR SERIES 4 WITH THE THEME "INFORMATION TECHNOLOGY AND INNOVATION IN FACING STRATEGIC AND GLOBAL CHALLENGES" (SSGS UI, 16 OCTOBER 2020). https://www.csda.sksg.ui.ac.id/site/


• SSGS UI HYBRID GNSS INTERNATIONAL WEBINAR & TRAINING, 18 – 19 March 2022. https://www.youtube.com/watch?v=m5oOcCb9O08
Agenda

• GNSS Application for Jakarta Flash Flood Early Warning System
• Integrated Water Transportation Navigation System for Indonesia coastal area
Flash floods occurred in almost throughout the Indonesian capital of Jakarta during the rainy season due to the overnight rain.

Dumps 400 millimeters (15 in) of rainwater, causing the main rivers to overflow.

In 2020, Jakarta flood caused at least 66 people have been killed, and 60,000 displaced in the worst flooding in the area since 2007.

There is urgent need of a strategic solution to overcome this problem, at least during the disaster time to mitigate the social and economic risk and lost.
Jakarta’s authority has initiated to provide the flood warning tool, in form of loud speaker

Four Units of this Technology has been installed in six location of slum riverside area

However, it has some issues;

1. **Very high cost tool**, its valued USD 260,000 for 6 sets. So its only could be installed for few sets
2. **Faulty and Error Technology**. Surrounding residents complained that the loud speaker sometimes didn’t work properly during disaster time, or sometimes it event rang noisy when not needed.
3. **It’s a stand alone technology, not a system**, it provides the flood evacuation warning only, not the flood detection
4. **Limited warning coverage area**. It serves only radius 500 meters.
THE SOLUTION

INTEGRATED SYSTEM
Serves both flash flood detection (GNSS MADOCA) and warning alert (QZSS EWS & Spresense). It also connects authority, residence within the disaster area, and public.

HIGH ACCURACY & FAST MESSAGE
The technology applies the accurate and precise data for the fast disaster response

LOW COST
Affordable technology so it could be installed in more monitored coverage area

SERVICE FOR ALL
The database serve all parties; authorities, affected residents, public and private players.

APPLICABLE TO MOST DISASTER AREA
When completed, it could be applied to most area with flash flooding issues

MORE OPTIONS OF WARNING DEVICE
It provides warning in more options; manual (warning siren) and digital (android)
FLOOD EARLY WARNING SYSTEM

1. Buoy GNSS MADOCA
   - GNSS data sent to local monitoring station by real time using internet

2. Local monitoring station
   - Monitoring and controlling station
   - Slum residents and warning alerts
   - River or beach area

3. QZSS control
   - Real time GNSS data from field to send to QZSS Japan control office

4. SONY Spresense
   - Sending real time EWS message from QZSS to Spresense

5a. Android notification
    - Online application notification so it could reach wider users in a fast process

5b. Siren evacuation alert
    - Siren for on site users for direct alert (final call evacuation) and those whom doesn’t own android

The system works by monitoring water levels and sending real-time data to the GNSS system. This data is then sent to the local monitoring station, where it is used to predict and manage flood risks. The data is also sent to QZSS control for further processing and notification through a smartphone application. The siren evacuation alert system is used to alert on-site users and those who do not have smartphones.
COMPONENTS OF FLASH FLOOD EARLY WARNING SYSTEM

// GNSS MADOCA PPP
The GNSS receiver to install in the solar panel buoy placed on the water surface to measure river level rise.

// LOCAL MONITORING STATION
The river level rise data is monitored by local monitoring station for controlling and maintenance.

// QZSS CONTROL OFFICE
The team that will manage the EWS data message.

// SPRESENSE DEVICE
EWS message receiver and decoding from QZSS.

// SIREN EVACUATION WARNING
Evacuation alert through the on site siren for residents.

// ANDROID SIREN EVACUATION WARNING
Evacuation alert through the digital application installed in android for larger users.
INTEGRATED WATER TRANSPORTATION NAVIGATION

1. GNSS data sent to local monitoring station by real time using internet
2. local monitoring station
3. QZSS control
4. SONY Spresense
5. android notification

- real time GNSS data from field to send to QZSS Japan control office
- Sending real time EWS message from QZSS to Spresense
- linked to land transportation
- real time navigation data from water transportation
- online application notification so it could reach wider users in a fast process

- commercial boats
- Fishermen boat
- Land users
- Water transportation
- monitoring and controlling station
FEASIBILITY

USER/COMMERCIAL

TECHNICAL/EXPERTS

COLLABORATION

SOCIETY IMPACT
thank you

lin.yola@ui.ac.id