

“Prevention of 4 Disasters and Their Single Recovery Networks based on Internet-of-Things with Airborne Capability (PATRIOT-41R-Net)”
[Year 1 of 2 Years]



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Meeting of Progress Report 2019 ASEAN IVO FORUM
Manila, 20-21 November 2019

Prevention of 4 Disasters and Their Single Recovery Networks based on Internet-of-Things with Airborne Capability (PATRIOT-41R-Net)

Background :

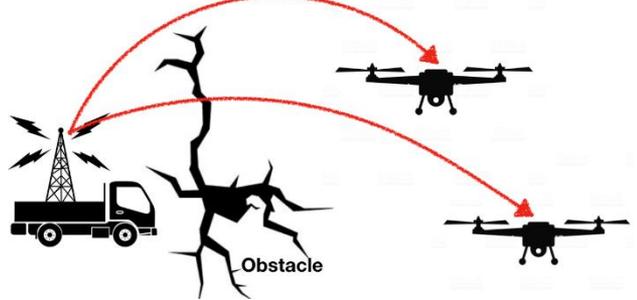
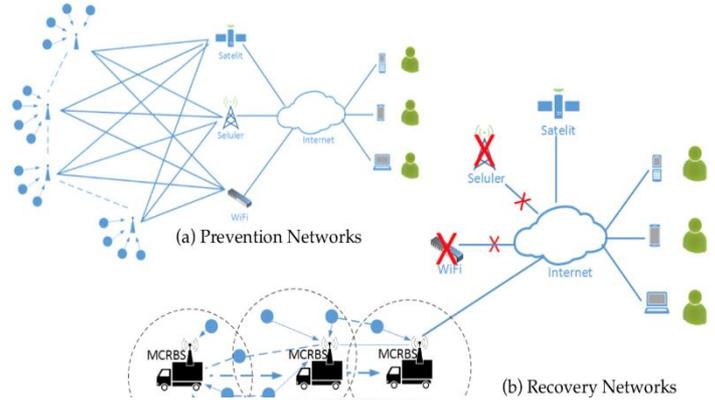
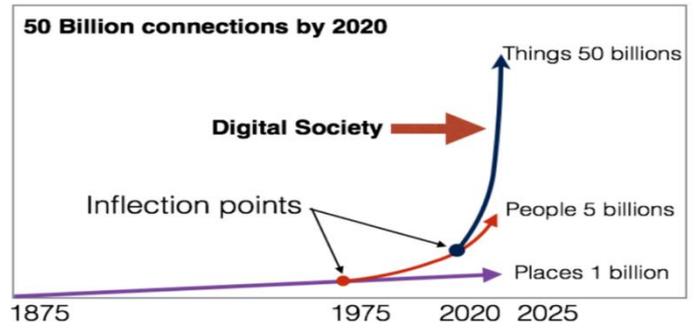
- After the disaster, telecommunication networks cannot be recovered soon and are suffering from difficulties of covering large areas.
- The rescue team and mobile base station are suffering from difficulties in finding the victims although the victim's mobile phones are active but is out-of-network range.

Targets:

- This PATRIOT-41R-Net project makes an experiment, especially on drone and/or HAPS, at Padang City, Sumatera, Indonesia.
- APPS for smartphone and SMS services.
- Patent and publications for real-field experiment and real-field parameters in high reputed IEEE magazines or similar.

Speaker:

Asct. Prof. Dr. Eng. Khoirul Anwar (Telkom University, Indonesia)



Project Members :



1. Asct. Prof. Dr. Eng. Khoirul Anwar (Telkom Univ., Indonesia)
2. Dr. Ashwin Sasongko (Telkom Univ., Indonesia)
3. Asct. Prof. Brian Kurkoski (JAIST, Japan)
3. Dr. Dao Trung Kien (Hanoi Univ. of Science and Tech., Vietnam)
4. Dr. Norul Husna Ahmad (UTM, Malaysia)
5. Dr. Attaphongse Taparuggsanagorn (AIT, Thailand)

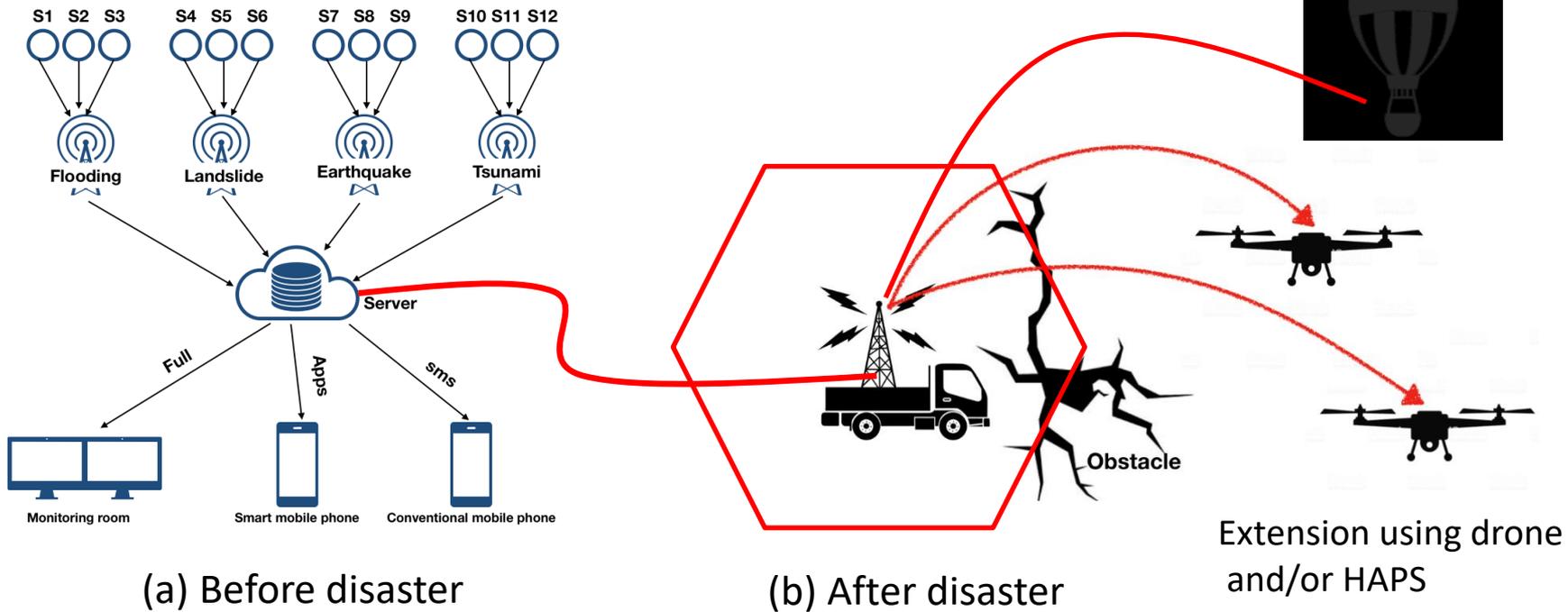
New Members:

6. Dr. Suryo Adhi Wibowo (Telkom University, Indonesia)
7. Nur Indah (Telkom University, Indonesia)
8. Arini Fitri (Telkom University, Indonesia)
9. Obed Rhesa Ludwiniananda Handoko (Telkom Univ, Indonesia)
10. Dr. Hazilah Mad Kaidi (UTM, Malaysia)
11. Assoc. Prof. Dr. Liza Abdul Latiff (UTM, Malaysia)
12. Dr. Rudzidatul Akmam Dziauddin (UTM, Malaysia)
13. Syed Aamer Hussain (UTM, Malaysia)

Project Duration :

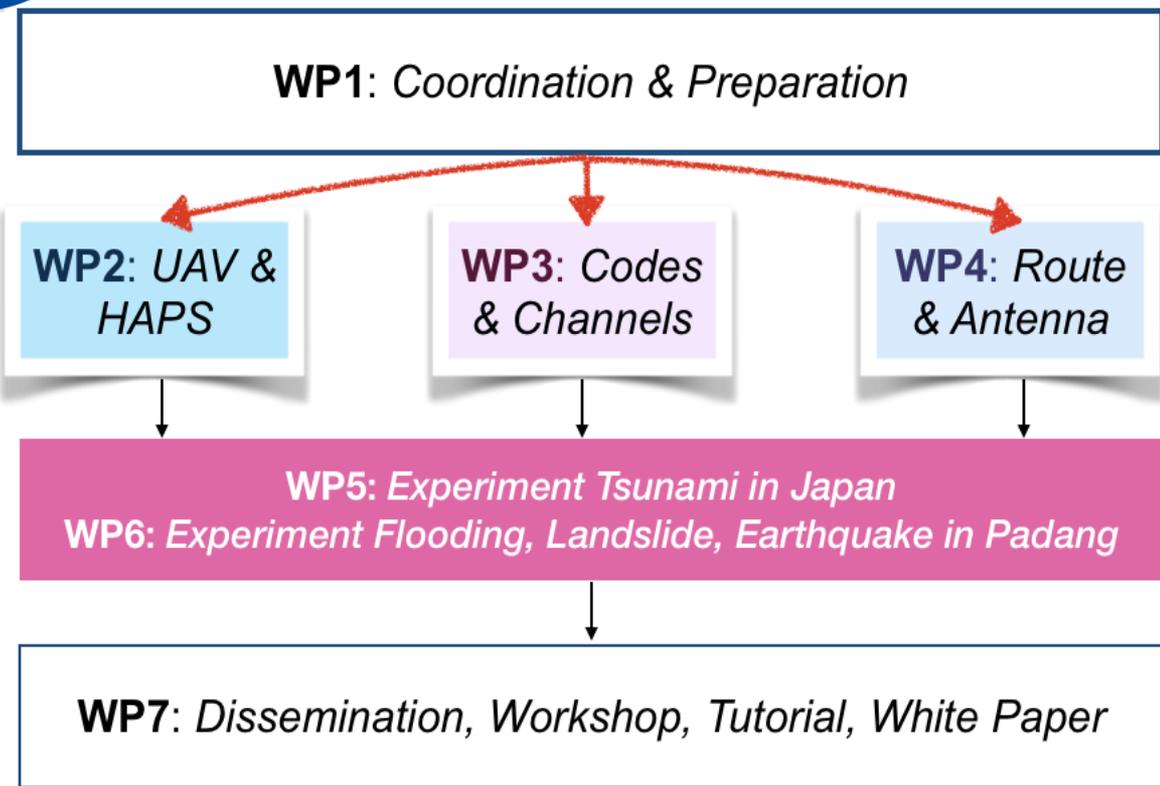
24 Months (July 2019 – June 2021)

Technology and Work Package (WP) Structure



- Network (a) monitors for damage prevention considering 4 disaster conditions: flooding, landslide, earthquake, tsunami.
- The rescue team and mobile base station use airborne capability provided by:
 - (i) Drone
 - (ii) High altitude platform system (HAPS)
 - To extend (1) network coverage and (2) find the victims having mobile devices emitting signals.

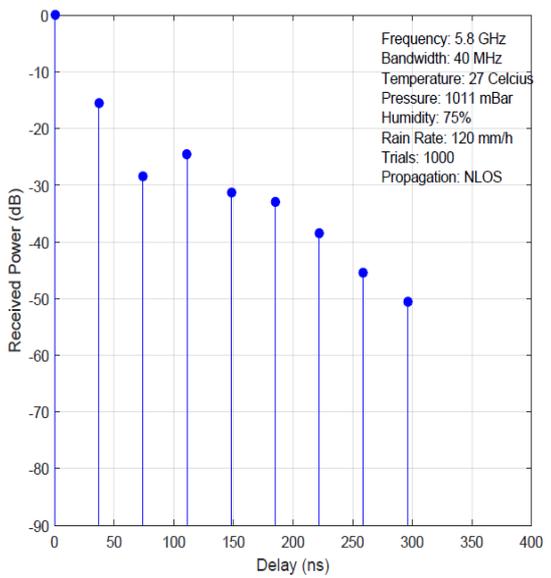
Work Packages (WP) Allocations *)



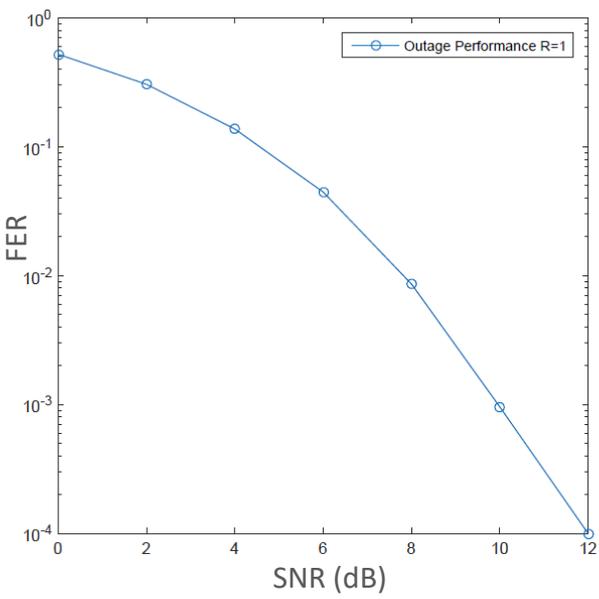
- WP1: Coordination and Preparation (TelU, July 2019 – Jun 2021)
- WP2: Experiment MCRBS, UAV Channels and HAPS (TelU, AIT, Jul – Oct 2019)
- WP3: Experiment Rateless Coding for UAV Channels (JAIST, TelU Jul – Dec 2019)
- WP4: Experiment for Routing and Antenna Dev. (UTM, TelU, July – Dec 2019)
- WP5: Experiment for Tsunami in Japan (Tel-U, JAIST, HUST, Jan – Jun 2020)
- WP6: Experiment for Flooding, Landslide, Earthquake in Indonesia (TelU, AIT, July – Dec. 2020)
- WP7: Dissemination, Workshop, Tutorial, Whitepaper (ALL, Mar-Jun 2021)

*) Agreed in Kick-Off Meeting 2019, Bandung, July 23, 2019.

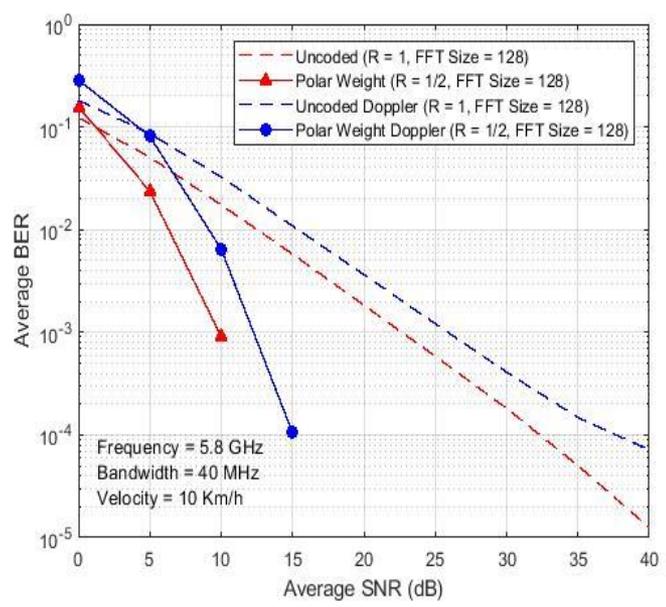
Current Progress 1 (July - November 2019)



(a)

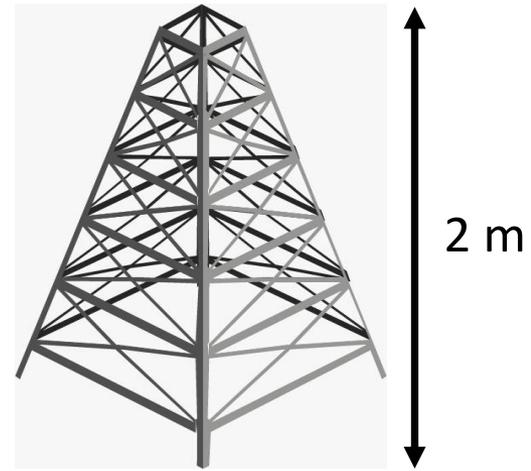


(b)

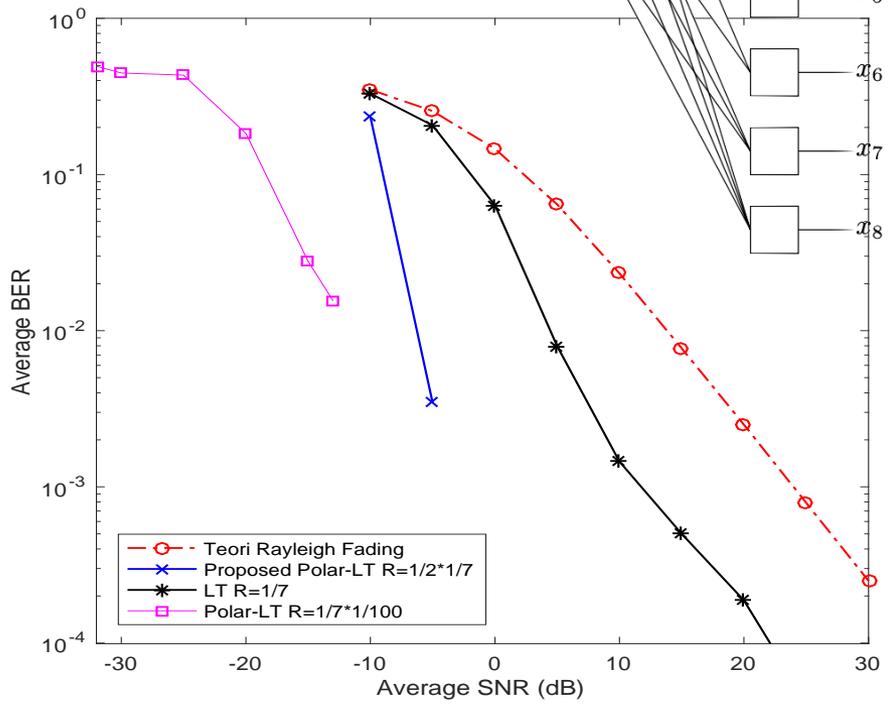
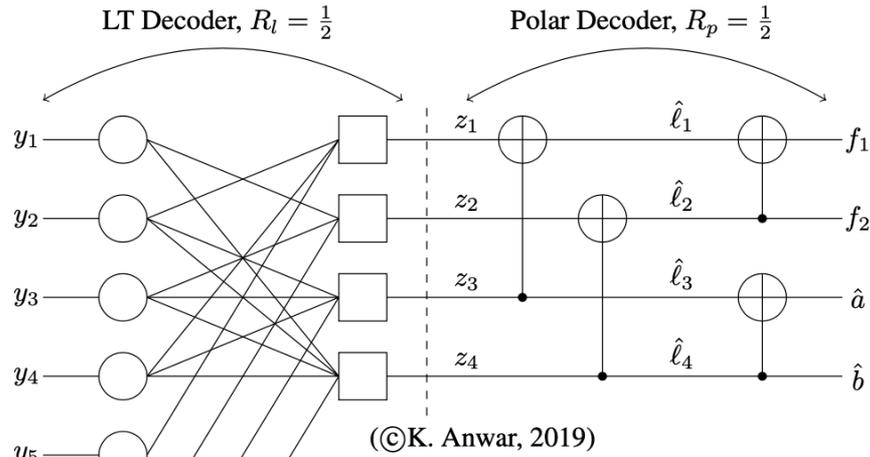
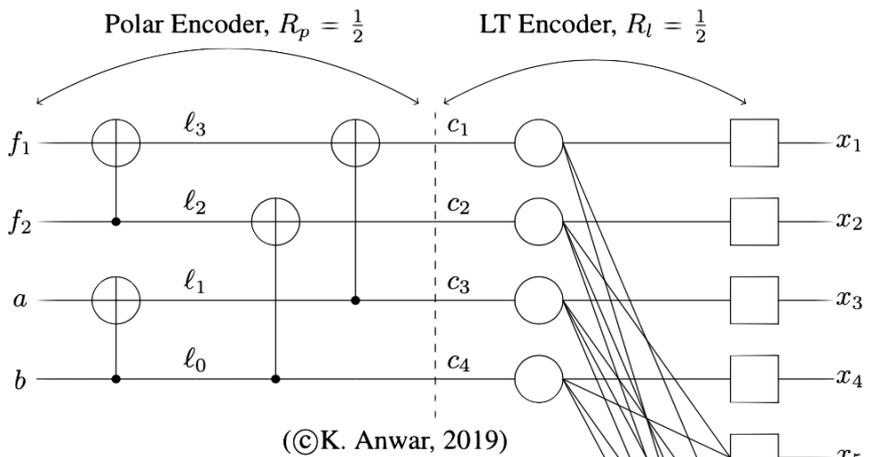


(c)

a. Power Delay Profile (PDP) for height of 0-10 m, b. Outage performance, (c) BER with Doppler



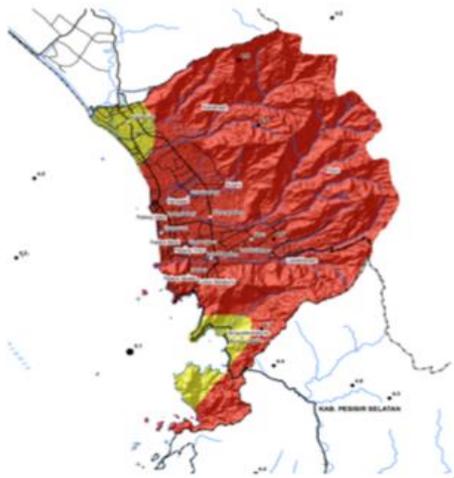
Current Progress 2 (July - November 2019)



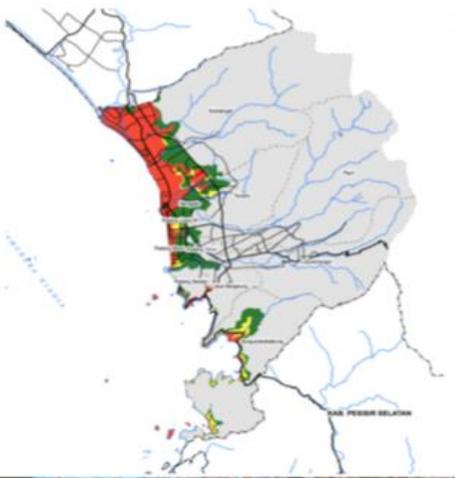
- Rateless Polar-LT codes have been designed for UAV and HAPS communications.
- Initial results confirmed that the proposed codes work well in minus SNR.
- Improvement is needed as well as the implementation to USRP and flying them to HAPS or drone.

Current Progress 3: 27 Locations of Experiment

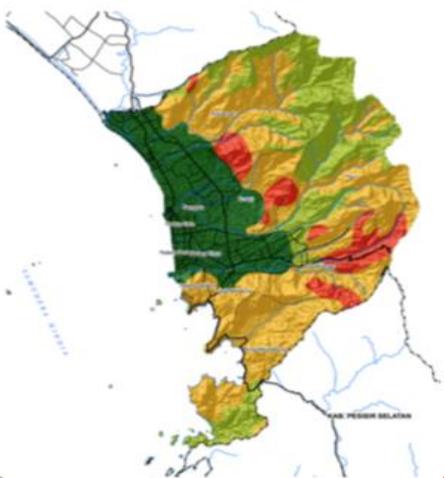
Earthquake



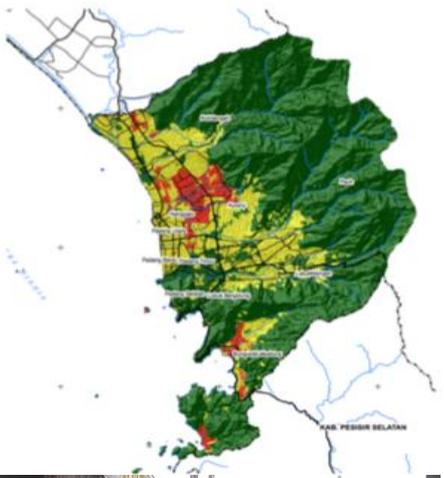
Tsunami



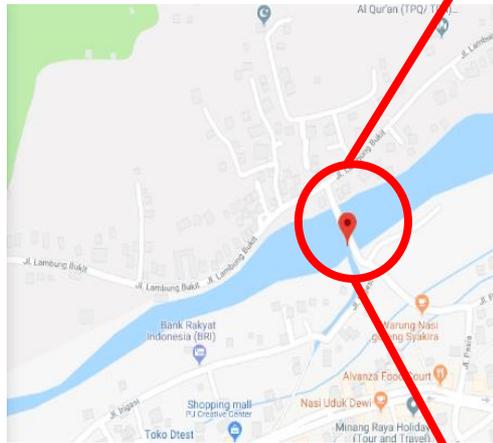
Landslide



Flooding



No.	Sensor	Locations	Number of sensors
1.	Tsunami	1. Muaro Batang Anai 2. Teluk Bayur 3. Muaro Batang Kuranji 4. Muaro Penjalinan 5. Pelabuhan Bungus	6
2.	Gempa	6. Air Pacah 7. Gor H. Agus Salim 8. UNP 9. Lubuk Kilangan	4
3.	Banjir	10. Nanggalo 11. Pintu Air Gunung Nago 12. Rawang Mata Air	5
	Banjir Bandang	13. Batu Busuk 14. Limau Manis Selatan 15. Timbalun	
4.	Longsor	16. Bukit Gado-gado 17. Panorama Sitingau Laut 18. Gates	12
Jumlah			27



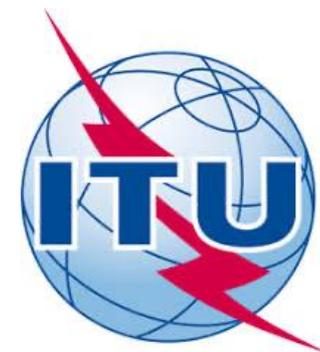
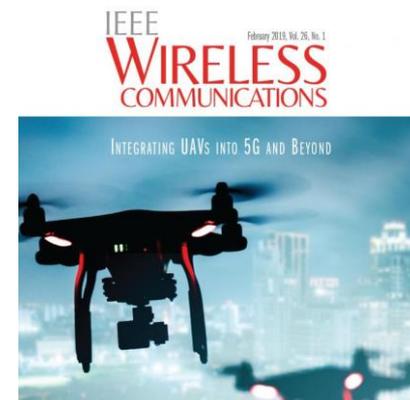
Published in Conference Papers:

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
1.	Extrinsic Information Transfer (EXIT) Analysis for Short Polar Codes	Fauzil Mufassa and Khoirul Anwar	Telkom University	3 rd International Symposium on Future Telecommunication Technologies (SOFTT2019)	18-20/10/2019	UTM, Kuala Lumpur, Malaysia
2.	Biconical Antenna for Mobile Base Station for Post Disaster Area Wireless Communications	Dammar Adi Sujiansyah, Khoirul Anwar and Aloysius Adya Pramudita	Telkom University	SOFTT 2019	18-20/10/2019	UTM, Kuala Lumpur, Malaysia
3.	Cellular Communications-based Detection to Estimate Location of Victims Post-Disaster	Tides Anugraha, Khoirul Anwar and Sigit Jarot	Telkom University	SOFTT 2019	18-20/10/2019	UTM, Kuala Lumpur, Malaysia

To-be Submitted to Journal Papers:

No:	Paper title:	Author names	Affiliation	Journal name:	The publisher of the Journal	The volume number and Pages
1.	Simple Irregular Tornado Codes for Internet-of-Things Communications	Khoirul Anwar	Telkom University	IEEE Trans on Wireless Comm.	IEEE	To be submitted (this month)
2.	Wireless Access Networks Based on Coded Random Access for Simultaneous Multiple Natural Disasters Monitoring With Real Time Notifications	KHOIRUL ANWAR, WILLY ANUGRAH CAHYADI, SURYO ADHI WIBOWO, MUHAMMAD ARY MURTI, SONY SUMARYO, RATNA MAYASARI, and ASEP SUHENDI	Telkom University	IEEE Communications Magazine	IEEE	To be submitted (this month)

- With this PATRIOT-41R-Net project, the people can have **direct access to the level of danger** in their living places.
- People will be **well prepared** about when they should leave or when they should keep staying.
- Furthermore, the government can have **accurate information** about what is happening due to the full information access provided in their monitoring room → can **inform people** with decision supported by accurate information source.
- Lesson learned from **real-field experiment** and real-field parameters for ASEAN countries.
- Submitted to **recommendation/standardization in** Asia Pacific Wireless Group and ITU.
- The impacts of PATRIOT-41R-Net project may also go indirectly to the economy of ASEAN people, especially when 4 sensors are **massively produced** by manufacture of in each country.
- The successful of this project will also impact to the **change of public policy rules.**



- This PATRIOT-41R-Net project proposes Airborne capability using drone and/or HAPS for disaster recovery networks.
- Airborne capability is performed using drone and/or HAPS to: (1) extend the network coverage and (2) find the victims.
- The rateless Polar-LT codes are developed to make networks communications stable and reliable.
- The project considers UAV channel modeling for reference of experiment.
- WP2, WP3, and WP5 are to be experimented in Year 1.
- WP4 and WP6 are to be experimented in Year 2.

Future works: Roadmap of PATRIOT-41R-Net

Year 1: July 2019 – June 2020

- a. Kick-Off Meeting, Bandung, Indonesia
- b. Complete the Theoretical Derivations of the proposed technique.
- c. Evaluating the Theoretical Performances
- d. Writing Patents
- e. Publication I of First Year (WP of Telkom University)
- f. Performing WP1: Meeting I at KL, Malaysia
- g. Progress Report Meeting of Year 1
- h. **Experiment of WP2: MCRBS**
- i. **Experiment of WP3: Coding**
- j. **WP1: Meeting II at Bangkok, Thailand**
- k. **Experiment of WP5: Tsunami, Researcher Exchange to NICT and JAIST, Japan (TelU, JAIST, HUST)**
- l. Publication II of First Year (Joint with Other Teams)

Year 2: July 2020 – June 2021

- a. **Experiment of WP4: Routing (UTM, TelU)**
- b. Meeting III at Vietnam
- c. Writing Patents
- d. **Experiment of WP6: Indonesia (TelU, AIT)**
- e. Publications of the Year 2
- f. Meeting IV at Vietnam
- g. Experiment of HAPS
- h. Progress Report Meeting of Year 2
- i. Meeting V at Indonesia
- j. **WP7: Tutorial/ Workshop/ Whitepaper**
- k. Writing A Final Report



*) underline: has been completed.