P2EI-WEALTH (Physiological and Psychological Edge Intelligence WEArable LoRa HealTH) **System for Remote Indigenous Community and Disaster Recovery Operation**

Background :

1. The indigenous people and the rescue operators in remote and dangerous vicinities cannot profit from the use of intelligent wearable health support system due to limited connectivity
2. Current wearables have multiple measurements from Physio and Psychological sensors but not supported by edge-intelligence to be analyzed together
3. Current wearables are for individual purposes and not for common monitoring and intervention purposes

Targets :

1. Working P2EI-Wealth Prototype using LoRA connected to a portable data center
2. Edge Intelligence model for the physio and psychological measurements and correlation establishment
3. Test and analysis using **2 use cases**
    1. Remote indigenous area (Tasik Chini, Malaysia)
    2. Disaster recovery operation (Quezon City, Philippines)

Speaker :
Project Leader - Asma Abu-Samah
Wireless Lab, Universiti Kebangsaan Malaysia (UKM)

P2EI-WEALTH (Physiological and Psychological Edge Intelligence WEArable LoRa HealTH) System for Remote Indigenous Community and Disaster Recovery Operation

Project Members :

Full Name	Department, Institution, Country
Asma Abu-Samah *	Universiti Kebangsaan Malaysia, Malaysia
Rosdiadee Nordin	Universiti Kebangsaan Malaysia, Malaysia
Nor Fadzilah Abdullah	Universiti Kebangsaan Malaysia, Malaysia
Mohd Radzi Ab Rahim	Universiti Kebangsaan Malaysia, Malaysia
Reginald Juan Magpantay Mercado	GTek Entreprise, Philippines
Xarxes C. Alejos	GTek Entreprise, Philippines
Jennifer C. De La Cruz	Mapua University, Philippines
Glenn V. Magwili	Mapua University, Philippines

Project Duration : 18 Months (01/06/2022 – 30/11/2023)

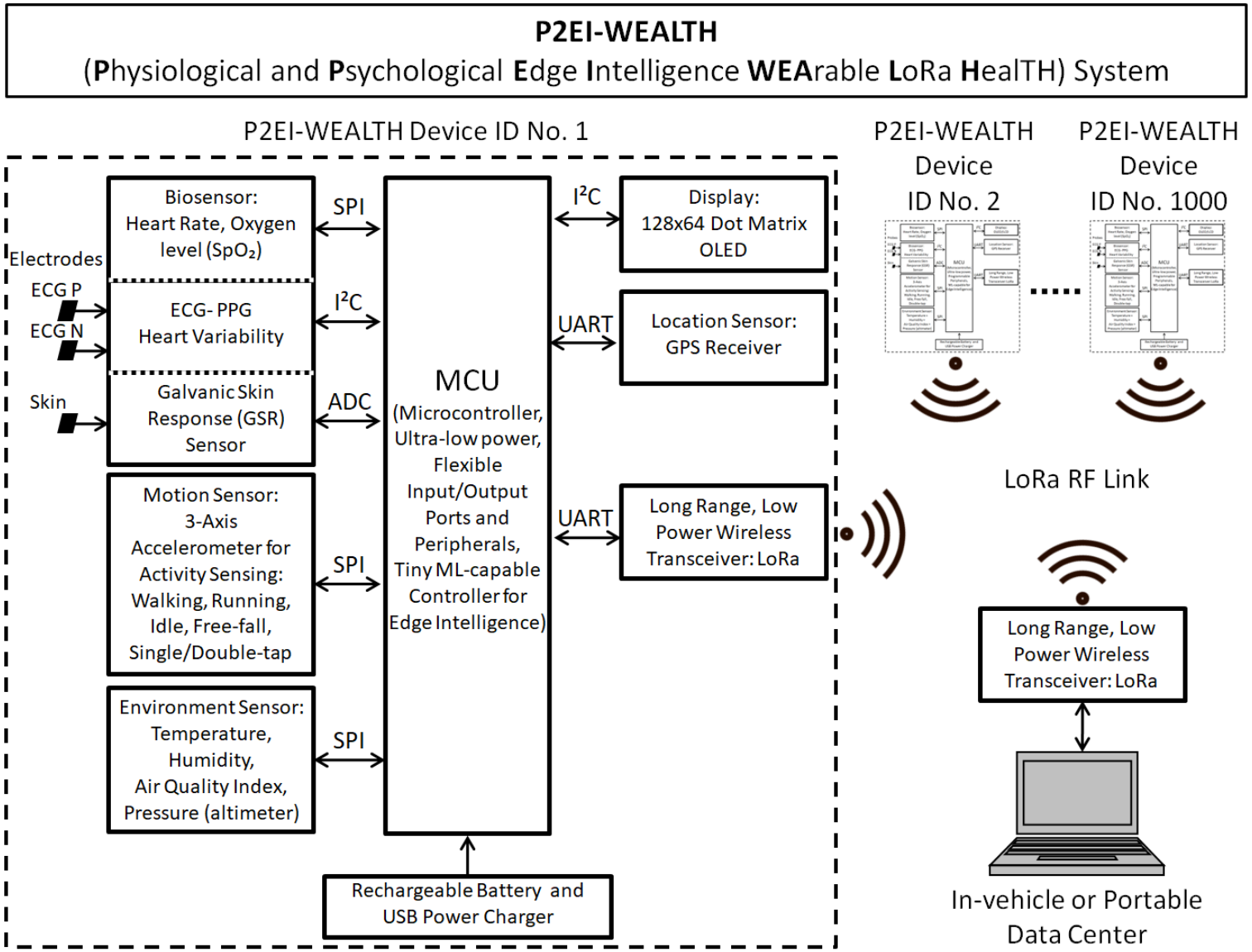
Project Budget (40,260 USD):
June 1st, 2022-May 31st, 2023 = 26,920 USD
June 1st, 2023-November 30th, 2023 = 13,340 USD

MAPÚA UNIVERSITY

Gtek Enterprise

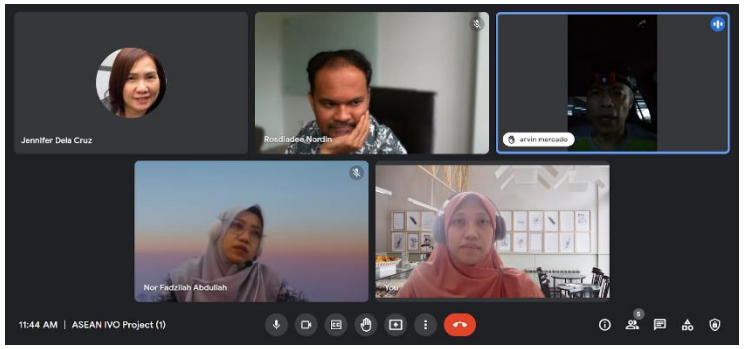
PROJECT ACTIVITIES (1)

Overview of the proposed P2EI-WEALTH system



PROJECT ACTIVITIES (2)

Date	Venue	Results
7th April 2022	Online meeting (1)	First meeting to construct the CRDA and documents upon award of grant
10th May 2022	Online meeting (2)	Finalizing the PCB design for P2EI-WEALTH
27-29th May 2022	Tasik Chini	Engagement with the indigenous community and co-planning LoRa network (*with ISIF-ASIA grant*)
27th June 2022	Online meeting (3)	Planning for multiple prototype production and finalization of CRDA and concern over QCDRRMO test
July-October	UKM	Kick-start the Literature Review for Edge Intelligence model and ethics obtention with 1 FYP and 1 MSc student
4th October 2022	Online meeting (4)	Finalization of planning for proposed site visit
09-11th November 2022	Site Visit Quezon City, Philippines	Engagement, demonstration of P2EI-WEALTH and user requirement validation with QCDRRMO, Philippines

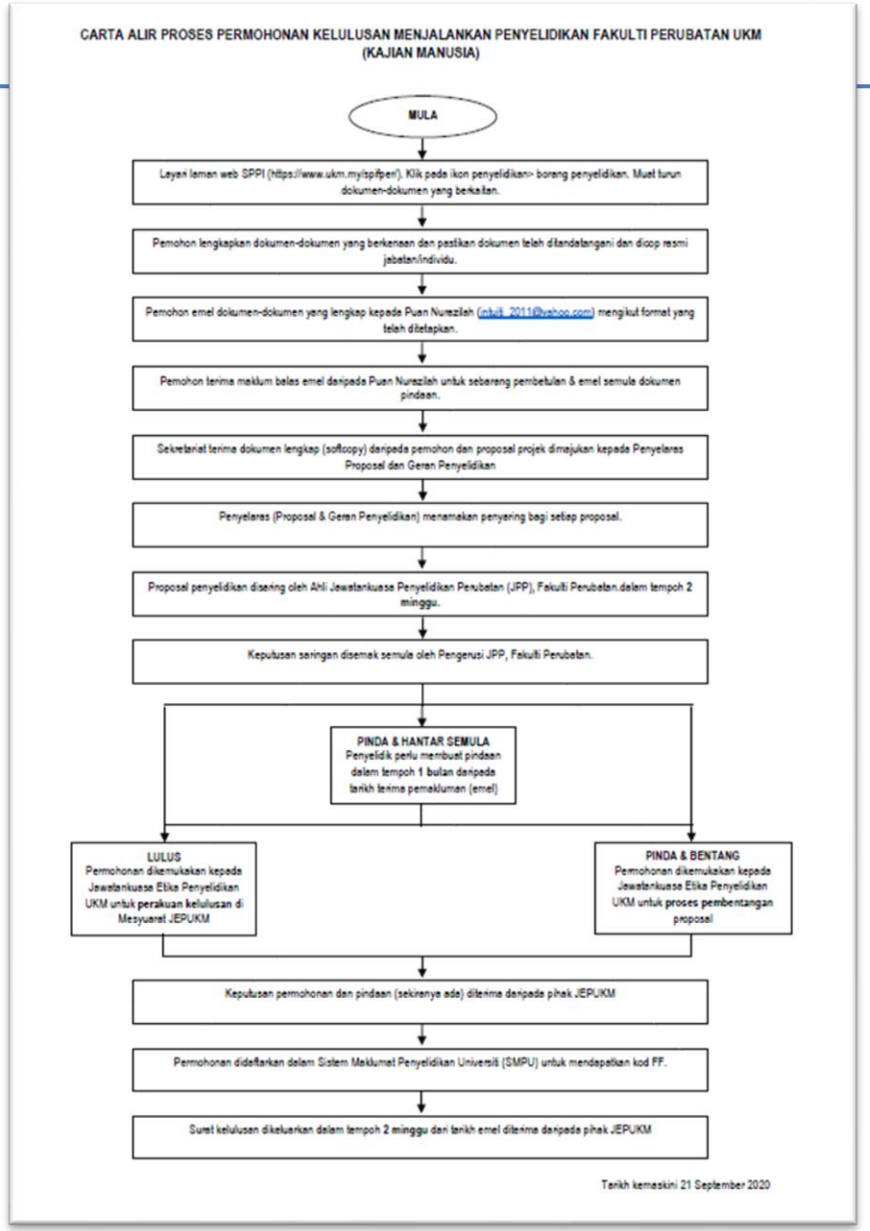


PROJECT ACTIVITIES (2)

Obtention of ethics – *Ongoing from July to now*

We have agreed to delay the testing in Philippines for this cycle of ASEAN-IVO project

Proceed with Tasik Chini indigenous community, but with larger samples, n=8



**The flowchart of ethics obtention in UKM*

PROJECT RESULTS (1)

Engagement with the indigenous community

With the rangers responsible to bring the team towards the gateway installation

Boat ride to the community

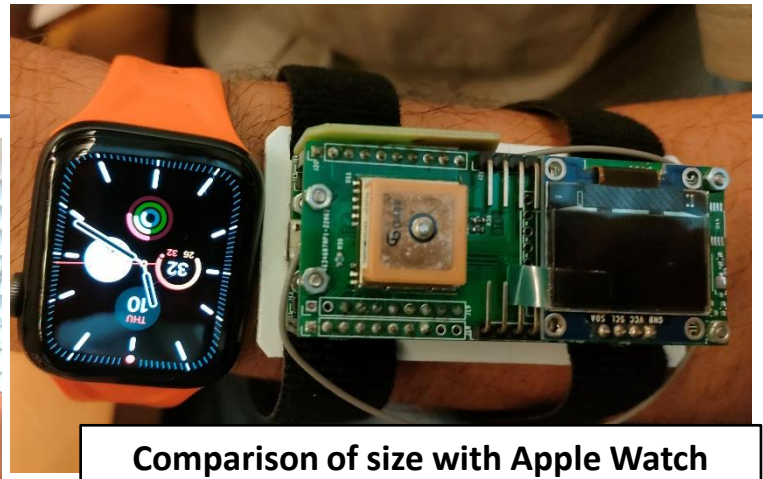
Entrance to 1/7 indigenous area

Drive test based on targeted gateway location

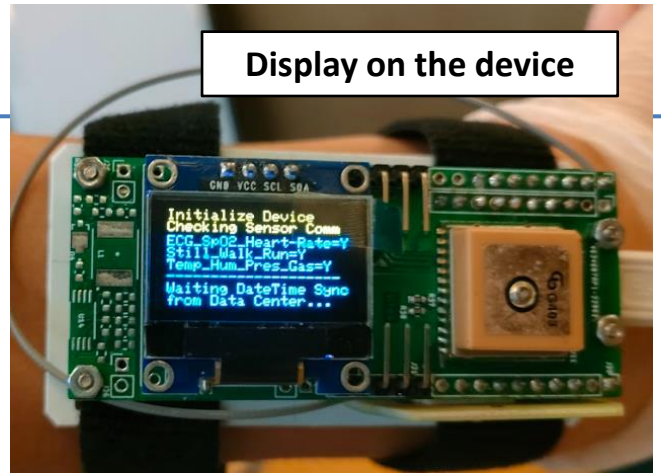
Enabled by : isif asia

PROJECT RESULTS (3)

Progress meeting and demonstration of P2EI-WEALTH



Comparison of size with Apple Watch



Display on the device

With Mapua University Dean and deputy deans

1. Overview of the system – From device to the data centre
2. Identification of design improvement - Additional sensors, size, battery, etc
3. Way forward – Prototype production, testing plan in Use Case 1
4. Additional networking - with the Mapua University School of Electrical, Electronics and Computer Engineering

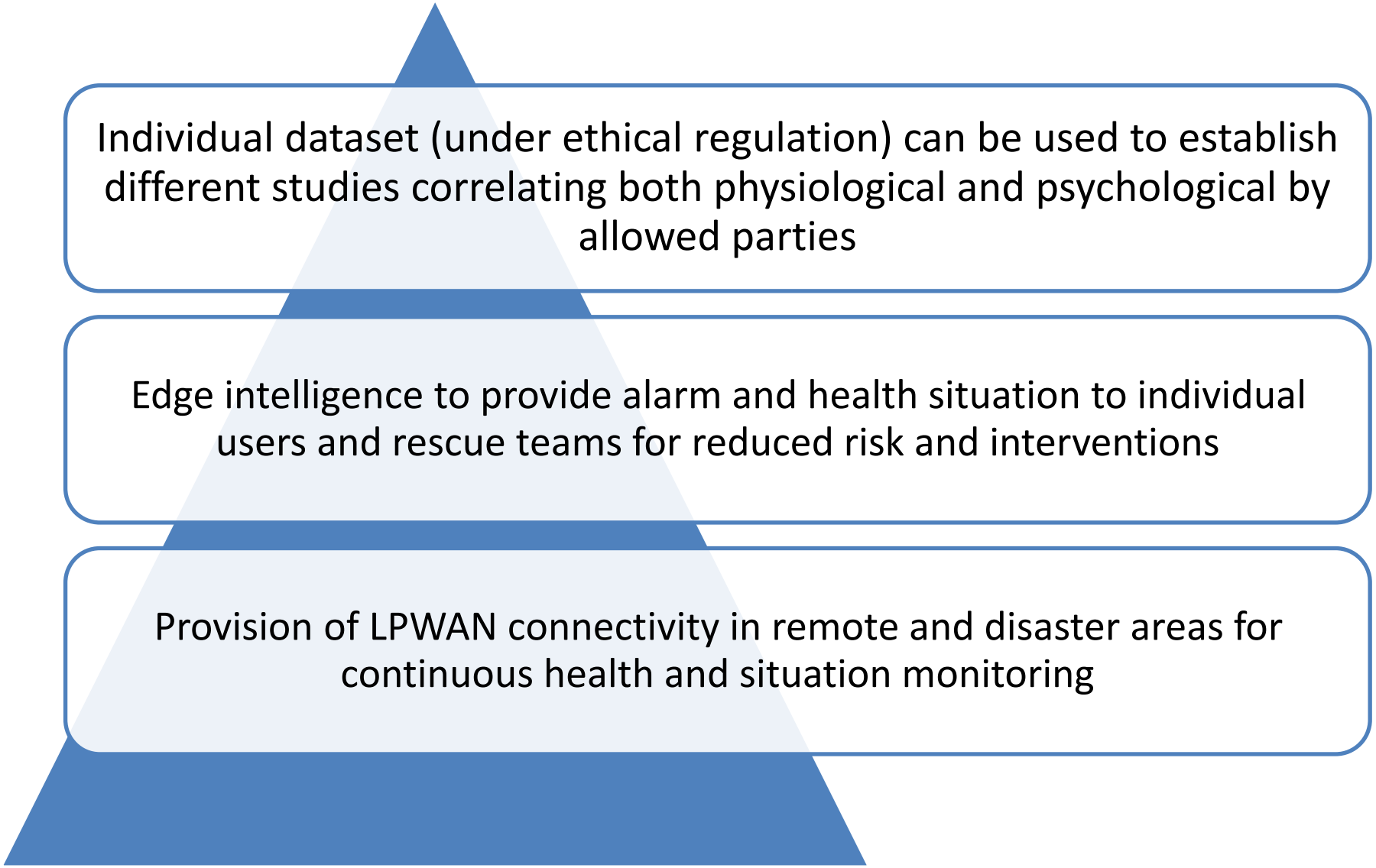
PROJECT RESULTS (3)

User requirement obtention with the QCDRRMO data communication centre

One of the existing monitoring dashboard which can be linked to different devices

User requirement obtention with the QCDRRMO data medical intervention team

SOCIETAL IMPACTS



Summary 6 months of progress include:

1. CRDA completion for all members

2. Application development and experiment
   a. Prototype 70% finished
   b. Disaster recovery centre user requirement validation through interviews
   c. Ethics obtention process for Tasik Chini indigenous community

3. Scientific and Technological Publication
   a. Initial study on correlation between bio-sensors measurement (Heart Rate, ECG, PPG, Sweat, SpO2 and stress)

4. Budget
   a. 0 USD (with 2000 USD in the process of claiming)

The remaining 1 year will be dedicated to:

1. Application development and experiment

Phases by Quarter of 3 months	PIC	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2024	Q4 2023
Device design, optimization and multiple prototype production	GTek	70%		**100%**			
Back-end data monitoring platform with LoRa Connectivity	UKM	50%		100%			
Edge intelligence modelling	UKM+Mapua U		25%	100%			
System testing in Tasik Chini	UKM			100%			
Back-end data data analysis frameworks and models	UKM+Mapua U				100%		
System testing and validation	UKM					100%	
Impact analysis and project finalization	All						100%

2. Scientific and Technological

a. 1 journal paper – Edge intelligence model and system using P2EI-WEALTH physio and psychological measurements

b. 2 conference papers – P2EI-WEALTH LoRa connectivity testing and correlation/ML model between the data

SCIENTIFIC CONTRIBUTIONS (Target)

Targeted International Conferences:

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
1.	28th Asia-Pacific Conference on Communications – October 2023	(all authors)	(full names of institutions)	(full name of the conference)	(e.g. dd-dd/mm/yyyy)	(venue, city, country)
2.	28th Asia-Pacific Conference on Communications – October 2023	(all authors)	(full names of institutions)	(full name of the conference)	(e.g. dd-dd/mm/yyyy)	(venue, city, country)

Targeted Journal Paper:

No:	Paper title:	Author names	Affiliation	Journal name:	The publisher of the Journal	The volume number and Pages
1.	MDPI Sensors/IEEE Access – June 2023	(all authors)	(full names of institutions)	(full name of the Journal)	(full name of the publisher)	(e.g. Vol. xx, No. yy, pp. zzz)