HIWeather Citizen Science Project

Draft concept paper

(further feedback welcome by 1 December 2019)

High Impact Weather Project (HIWeather), a 10-year research project, was established in 2016 by WMO (World Meteorology Organization) WWRP (World Weather Research Program). HIWeather is aimed at achieving dramatic improvements in the effectiveness of weather-related hazard warnings, following recent advancements in numerical weather prediction at km-scale and in disaster risk reduction.

This concept paper describes the HIWeather Citizen Science Project. With many new and ongoing citizen projects planned or underway within the High Impact Weather community, this project is designed to share information and to provide tools to help groups and agencies develop new activities.

What is citizen science?

Citizen science is a broad term, which encompasses a variety of different types of projects where the public (citizens) work with various public and private organizations, including academic researchers, to undertake scientific research. Citizen science has its beginnings in the physical sciences but has expanded to others areas, including natural hazard research (Bonney et al. 2009; Hicks et al. 2019; Blake et al. 2018; Orchiston et al. 2016). The motivations, design, and outputs of citizen science projects vary widely. Some projects are highly participatory, where the citizens are involved in the project design, data collection and analysis. In others, citizens provide data to projects designed and coordinated solely by the science agencies. Both ends of this spectrum are effective for creating new scientific outputs and enhancing citizen involvement in science (Bonney et al. 2014; Haklay 2013).

Citizen science typology

A typology has been developed by McLaren et al. (in prep 2019) to describe the range of citizen science initiatives (see Table 1). The rows in the table refer to different designs projects might have, with respect to the relative contribution of trained scientists versus citizens. The columns in the table specify the level of contributions that citizens might make in terms of project design and data collection. Contributions range from citizens contributing data as "sensors" (crowd-sourcing) through to collaborative approaches to problem definition, data collection and analysis (extreme citizen science). The various combinations have been categorised into numbers 1-5, reflecting increasing levels of citizen input into the science process.

Table 1. Citizen science typology (McLaren et al., in prep 2019; adapted from Bonney et al. 2009 / Shirk et al. 2012, and Haklay 2013; and consistent with concepts in IAP2).

	Crowdsource Citizens as sensors (active and/or passive)	Distributed Intelligence Citizens as basic interpreters	Participatory Citizens participate in problem definition and data collection	Extreme Collaborative science, problem definition, data collection and analysis
Contribute: Projects are designed by scientists and citizens contribute data	1	2		
Collaborate: Projects are designed by scientists and citizens contribute data, but may help in project design, analysis or dissemination		3	4	
Co-create: Projects are designed by scientists and citizens working together and at least some of the participants are actively involved through all/most of the scientific process				5

Illustrative Global Examples

Citizen Science Monsoon Precipitation Monitoring in Nepal

Citizen science, as a complement to ground-based and remotely-sensed precipitation measurements, is a promising approach for improving precipitation observations. https://www.frontiersin.org/articles/10.3389/feart.2019.00046/full

CoCoRaHS Network

The Community Collaborative Rain, Hail, and Snow (CoCoRaHS) Network is a group of volunteer observers who measure precipitation from their backyards in all 50 USA states. Citizen scientists and weather lovers of any age can participate by installing low cost equipment and recording their measurements online. The data is used by a wide variety of experts, ranging from meteorologists and hydrologists to insurance adjusters and engineers. The data collected contributes to severe storm warnings, water resource analysis, and regional drought monitoring. https://www.cocorahs.org/

WeatheX

The Australian-based WeatheX allows citizens to report the severity, location and timing of hail, wind damage, flooding and tornadoes. Participants can also capture a photo or add a description of the event. This information will be used by weather and climate researchers, including the ARC Centre of Excellence for Climate Extremes, Monash University and Australian Bureau of Meteorology.

What are the benefits of citizen science?

Citizen involvement in the scientific process provides a range of benefits, including:

- Collection of data to support modelling, prediction and forecasting

- Better understanding of impacts during an event

- Improved engagement between trained scientists and the community

- Enhanced community understanding of physical processes

- Capacity building for community members (e.g. training on measuring physical processes)

- Building community resilience (e.g. solving weather-related problems for communities, better understanding of how to respond to physical processes)

- Contribution to the effectiveness of the warning chain.

HIWeather Citizen Science Working Group

David Johnston[1] (Co-Chair), Julia Becker[1] (Co-Chair), Lisa McLaren[1], Hugo Remaury[2], Paolo Ruti[2], Qinghong Zhang[3], Michael Riemer[4], Deanna Hence[5], Jenny Sun[6], Brian Mills[7], Andrea Taylor[8], Sara Harrison[1], Helen Titley[9], Anna Scolobig[10], Rainer Kaltenberger[11] (others???)

1. Massey University, Wellington, New Zealand
2. WMO, Geneva, Switzerland
3. Peking University, Beijing, China
4. Johannes Gutenberg-Universität, Germany
5. University of Illinois, USA
6. NCAR, USA
7. University of Waterloo, Canada
8. University of Leeds, UK
9. UK Met Office, UK
10. University of Geneva, Switzerland
11. Bureau of Meteorology, Australia

The HIWeather Citizen Science Working Group will be open and a smaller Steering Group will be formed to coordinate activities.

Initial Proposed Activities

1)   Develop a guidance note for including citizen science in weather, climate and water projects

2)   Demonstration projects – current and new projects

3)   Journal Special Issue

4)   Workshops/conferences/training on citizen science

5)   Developing a Communication and Outreach Plan

1)   Develop a guidance note for including citizen science in weather, climate and water projects

This activity will involve the development of a "**A guidance note for including citizen science in weather, climate and water projects**", outlining the definition, a typology of Citizen Science projects, illustrative case studies, bibliography of both theoretical and practice guidance papers/reports and some "how to develop a Citizen Science project" worksheets.

2)   Citizen Science Demonstration projects

A range of citizen science activities can serve as demonstration projects. These may include existing or new HIWeather projects or other projects that illustrate citizen science methods. An initial phase of this activity will be the development of the selection criteria for projects. A suggested activity could be a "Citizen Science Grand Challenge", in which groups are invited to submit examples of innovative citizen science via a website in the form of short videos. Other activities could include Citizen Science Demonstration projects at the Beijing (2022) and Paris (2024) Olympics.

3)   Journal Special Issue on HIWeather Citizen Science

A special issue on citizen science of the Australasian Journal of Disaster and Trauma Studies will bring together accounts of the research, policy and practice initiatives from researchers, practitioners and the wider HIWeather and other DRR community. The resulting special issue will be published online, with open access at no cost to authors or readers. The call of papers is proposed for early 2020 and publication by the end of 2021. See Appendix 1

4)   Workshops/conferences/training on citizen science

HIWeather Citizen Science Working Group will explore a range of workshops/conferences/training on citizen science, aimed at sharing practice, creating new networks for knowledge sharing and collaboration. These will be both regional and international beginning in early 2020. A timeline of activities will be developed.

5)   Developing a Communication and Outreach Plan

To support the development and implementation of this project a Communication and Outreach Plan will be developed.

Timeline

Activity	Timeline	Lead	Supported by
1.1 Develop guidance note for including citizen science in WMO projects	Draft by end of June 2020	David Johnston	Post-doc, Julia Becker, Lisa McLaren
2.1 Develop concept note Citizen Science Demonstration projects (definitions and selection criteria)	Draft by end of June 2020	Anna Scolobig	Post-doc, David Johnston, others??
3.1 Journal Special Issue on HIWeather Citizen Science	Call for papers released December 2019	Julia Becker, Anna Scolobig, David Johnston	Lauren Vinnell
4.1 Develop plan of action for workshops/conferences/training on citizen science	Draft by end of December 2019	TBA	HIWeather ICO, David Johnston, others?????
5.1 Developing a Communications and Outreach Plan	Draft by end of January 2020	Scott McSorley	HIWeather ICO, WMO, David Johnston, others?????

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References

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Related links

White paper on citizen science for Europe - http://www.socientize.eu/sites/default/files/white-paper_0.pdf

Collection of citizen science guidelines from the European Citizen Science Association - https://ecsa.citizen-science.net/blog/collection-citizen-science-guidelines-and-publications

Appendix 1

DRAFT

Call for Papers

Citizen Science for understanding and improving the warnings value chain

Citizen science is a broad term, which encompasses a variety of different types of projects where the public (citizens) work with agencies and academic researchers to undertake scientific research. Citizen science has its beginnings in the physical sciences but has expanded to other areas, including natural hazard research. The motivations, design, and outputs of citizen science projects vary widely. Some projects are highly participatory, where the citizens are involved in the project design, data collection and analysis. In others, citizens only provide data to projects designed and coordinated solely by the science agencies. Both ends of this spectrum are effective for creating new scientific outputs and enhancing citizen involvement in science.

A special issue of the Australasian Journal of Disaster and Trauma Studies will bring together accounts of the research, policy and practice initiatives from researchers, practitioners and the wider HIWeather and DRR community. The resulting special issue will be published online, with open access at no cost to authors or readers.

The timetable for contributions is:

01/04/2020 - Expression of interest deadline (using the form available as a Word doc)

01/12/2020 - Manuscript submission deadline

01/04/2021 - Initial advice to authors

01/07/2021 - Revision deadline

01/12/2021 - Publication of the special issue of the Australasian Journal of Disaster and Trauma Studies

 All manuscripts should be prepared and submitted according to the requirements described at: http://trauma.massey.ac.nz/info/submissions.html

All submissions will still be subject to our standard blind peer review process. Guest Editors, David Johnston, Julia Becker and Anna Scolobig, will assist.

If you have questions or ideas for contributions that you would like to discuss, please contact the Managing Editor, Lauren Vinnell, at trauma@massey.ac.nz

On behalf of David Johnston (Editor), and Lauren Vinnell (Managing Editor)