Supporting information2: Description of the selected projects

Community Collaborative Rain, Hail and Snow Network (CoCoRaHS)

CoCoRaHS is a community-based network of volunteers working together to measure and map precipitation (rain, hail and snow) across North America. CoCoRaHS originated at the Colorado Climate Center at Colorado State University (CSU) in the spring of 1998 and is now the largest provider of daily precipitation observations in the United States and most of North America (CoCoRaHS, 2017; Reges et al., 2016). Data collection is done daily by recording precipitation observation using a standard rain gauge, in addition to optional reports on rain or hail intensity (Cifelli et al., 2005).

Goals- CoCoRaHSs' primary goal is to provide accurate high-quality precipitation data for natural resource, education and research applications.

Platform- Data is submitted in CoCoRaHS using an online form, application or by phone. Since the task of measuring precipitation includes several different activities, CoCoRaHS organizes face-to-face workshops and training session that help participants first learn how to install and use equipment and how to accurately read measurements (Cifelli et al., 2005). Training information is also available on the CoCoRaHS web page with specialized slides, videos and manuals.

Community- CoCoRaHS defines itself as a community-based network. As such, the barriers for participation are low, and children and adults of all ages and backgrounds can help and be involved. The network has an active website, blog, Facebook page and twitter feed with reports about project progress, developments and recent findings.

Dissemination- All meteorological information is available online and is presented in a daily precipitation map or as summarized in tables, bar charts, and graphs. Among the many end users of CoCoRaHS data, are the National Weather Service, meteorologists, hydrologists, emergency managers and more (Reges, Doesken, Cifelli, & Turner, 2008).

eBird

eBird is a global citizen-science project, based on online tools for collecting information on bird abundance and distribution (Sullivan et al., 2014). It was launched in 2002 by the Cornell Lab of Ornithology and the National Audubon Society, and provides a simple and intuitive web-based interface for submitting and viewing bird observations.

eBird is to date, one of the largest biodiversity data resources, with over one-million bird observations reported every month by tens of thousands of participants, with more than 100,000 people entering data every year, and over 300 million bird observations in total (Lagoze, 2014; Sullivan et al., 2017).

Goals- eBird's goal is to collect and maximize the use and accessibility of bird observations made by recreational and professional bird watchers, and power new data-driven approaches to science, conservation and education.

Platform- Bird observations are submitted using an online checklist program or the eBird application. Participants enter when, where, and how they went birding, then fill out a checklist of all the birds seen and heard during that time. Experienced volunteers further serve as reviewers of the submitted data and support the data quality verification. Learning information is available on the project website in addition to resources provided by the Cornell lab of ornithology.

Community- eBird builds on existing communities of birders and hence focuses on providing services that appeal to the birding community in their process of finding and identifying birds (Sullivan et al., 2009). The project has an active website, Facebook page and twitter feed with recent report about project progress, developments and interesting findings and photos. In addition, eBird provides a community based platform enabling birders to compare their birding accomplishments to those of fellow

birders and to improve and advance their bird observation skills by learning from others' experiences (Lagoze, 2014).

Dissemination- All birding information is available on the project website and can be accessed in English, Spanish, French, Portuguese and Chinese. Data can be presented as tables, bar charts, line graphs or presented on a map and are also available for download for further use and analysis

Foldit

Foldit is a multiplayer online game in which players compete and collaborate to find structures for folding proteins. Puzzles that are presented to players are not efficiently solvable by computational analysis, highlighting the players' contribution to science (Foldit, 2017).

The game was initially launched in May 2008 by a group of scientists from the University of Washington, and by September of that year had engaged 50,000 users. One year after launch there were about 200,000 active Foldit players and activity remains steady with about 2,000 active players who play more than once a week (Franzoni & Sauermann, 2014).

Goals- Foldits' primary goal is to produce accurate protein structure models through gameplay (Cooper et al., 2010). They further aim to promote protein design and protein engineering strategies and bring the structures designed to reality by constructing them un a lab (Foldit, 2017).

Platform- Foldit is a game which collects data by recording gameplay data from participants. Data collected includes biochemical structures, scores, algorithms, tool and algorithm usage, progress, and time played. Players download and play the game on their private computers, there is no app for playing the game since additional computing power is necessary.

Community- Foldit is open for users around the world. It was planned to fit the use of players with no scientific training and no previous exposure to molecular biology (Cooper et al., 2010). Some of Foldit earliest participants came from the Rosetta@home community, a project that was initiated by the same research group in the University of

Washington, which harnesses the power of home computers for protein structure processing.

Foldit also has a number of community building features including chat rooms, opportunities to share folding strategies and a wiki page written partially by the experience of Foldit players. Foldit maintains a blog where projects progression and outcome are presented and offers participants scheduled chats with scientist and developers of Foldit for a better look behind the scenes.

Dissemination- Final Scientific discoveries and publications are made available on the project website, and Foldit players are listed as joint authors on scientific publications. Work in progress is discussed on the project blog.

Galaxy Zoo

Galaxy Zoo is an online platform for visually classifying pictures of galaxies. The site was first launched on June 2007 and within 24 hours received almost 70,000 classifications an hour. During the sites' first year over 50 million classifications were received by more than 150,000 people (Galaxy Zoo, 2017).

Goals- Galaxy Zoo aims to classify telescopic pictures of galaxies, and assist astronomers in better understand our universe.

Platform- The Galaxy Zoo platform is very simple, submitting information is very easy and many classifications can be added in just a few minutes. No login is required and no training or tutorial are mandatory. Data collection is done by participants visualizing an image presented on the website or app and answering a series of simple questions as to the figure shape.

Community- Galaxy zoo also has an extensive discussion platform in which participants can have conversations and ask questions. In addition, there is a blog introducing new developments, research results and news.

Dissemination- Results and final products of the project are published on the website and blog. Raw data of galaxy classifications is available for download after initial analysis and organization by the Galaxy Zoo team.

Open air laboratories (OPAL)

OPAL is an initiative active across the UK, which motivates the public to get closer to their local environment while collecting scientific data. This is done with OPAL national surveys that combine observations of wildlife with data on air, soil and water condition. Lunched at 2007 and led by the Imperial College London, OPAL includes leading museums, universities and environmental organizations across the UK (OPAL, 2017) Opal has over half a million participants, studying more than 25,000 sites across the UK (Davis et al., 2013).

Goals- OPALs' primary goal is to carry out high quality environmental research with maximum public engagement and to promote environmental local knowledge in the community.

Platform- Data collection in OPAL is done by conducting national surveys including introduction of the topic, explanatory pictures and diagrams with clear multi-choice questions. With self-explanatory field guides designed for a wide age range of participants, data is submitted using an online form, application or via free post. The OPAL website has very detailed information, and include pictures, short videos and tips for things to look out for while monitoring.

Community- OPAL is open to all anyone who wishes to get involved, including people from different backgrounds, ages, disadvantaged communities etc. To do so, OPAL has invested much effort in designing resources and tasks that are suitable for all participants. The information available and the accessible and clear format of the work guides make it a fun and educational experience that people want to be a part of (Davies et al., 2011). According to the OPAL Community Environment Report (Davis et al., 2013), 50% of the surveys produced are distributed directly to schools. OPAL website

also has a scientist blog which provides news, updates and opinions from community scientists, and a newsletter is distributed quarterly via email.

The regional community-based science teams, helps promote community building and development of deprived areas working directly with local people motivating them to get involved in OPAL activities. These regional communities also have regional meetings, workshops and open days, enhancing public participation.

Dissemination- Scientific results and conclusions are presented online at the end of each survey period. Real time data is available graphically using results-maps for each of the surveys examined.

References

Cifelli, R., Doesken, N., Kennedy, P., Carey, L. D., Rutledge, S. A., Gimmestad, C., & Depue, T. (2005). The Community Collaborative rain, hail, and snow network. Informal Education for Scientists and Citizens. *Bulletin of the American Meteorological Society*, *86*(8), 1069–1077. https://doi.org/10.1175/BAMS-86-8-1069

CoCoRaHS. (2017). www.cocorahs.org. Retrieved from www.cocorahs.org

Cooper, S., Khatib, F., Treuille, A., Barbero, J., Lee, J., Beenen, M., … Players, F. (2010). Predicting protein structures with a multiplayer online game. *Nature*, *466*(7307), 756–760. https://doi.org/10.1038/nature09304

Davies, L., Bell, J. N. B., Bone, J., Head, M., Hill, L., Howard, C., … White, P. C. L. (2011). Open Air Laboratories (OPAL): A community-driven research programme. *Environmental Pollution*, *159*(8–9), 2203–2210. https://doi.org/10.1016/j.envpol.2011.02.053

Davis, L., Gosling, L., Bachariou, C., Eastwood, J., Fardera, R., Manomaiudom, N., & Robins, S. (2013). *OPAL community environment report. Exploring nature together*.

Foldit. (2017). https://fold.it/portal. Retrieved from https://fold.it/portal

Franzoni, C., & Sauermann, H. (2014). Crowd science : The organization of scientific research in open collaborative projects. *Research Policy*, *43*(1), 1–20.

Galaxy Zoo. (2017). www.galaxyzoo.org. Retrieved from www.galaxyzoo.org

Lagoze, C. (2014). eBird: Curating Citizen Science Data for Use by Diverse Communities. *International Journal of Digital Curation*, *9*(1), 71–82. https://doi.org/10.2218/ijdc.v9i1.302

OPAL. (2017). www.opalexplorenature.org/. Retrieved from https://www.opalexplorenature.org/

Reges, H. W., Doesken, N. J., Cifelli, R. C., & Turner, J. (2008). CoCoRaHS (the Community Collaborative Rain , Hail and Snow Network) - The accidental network: Evolving collaborations. *17th Symposium on Education, American Meteorological Society*.

Reges, H. W., Doesken, N., Turner, J., Newman, N., Bergantino, A., & Schwalbe, Z. (2016). CoCoRaHS: The evolution and accomplishments of a volunteer rain gauge network. *Bulletin of the American Meteorological Society*, *97*(10), 1831–1846. https://doi.org/10.1175/BAMS-D-14-00213.1

Sullivan, B. L., Aycrigg, J. L., Barry, J. H., Bonney, R. E., Bruns, N., Cooper, C. B., … Kelling, S. (2014). The eBird enterprise: An integrated approach to development and application of citizen science. *Biological Conservation*, *169*, 31–40. https://doi.org/10.1016/j.biocon.2013.11.003

Sullivan, B. L., Phillips, T., Dayer, A. A., Wood, C. L., Farnsworth, A., Iliff, M. J., …

Kelling, S. (2017). Using open access observational data for conservation action: A case study for birds. *Biological Conservation*, *208*, 5–14. https://doi.org/10.1016/j.biocon.2016.04.031

Sullivan, B. L., Wood, C. L., Iliff, M. J., Bonney, R. E., Fink, D., & Kelling, S. (2009). eBird: A citizen-based bird observation network in the biological sciences. *Biological Conservation*, *142*(10), 2282–2292.