

Citizen science on the Chinese mainland

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In: Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J. & Bonn, A. 2018. *Citizen Science: Innovation in Open Science, Society and Policy*. UCL Press, London. <https://doi.org/10.14324/111.9781787352339>

Introduction

Public engagement and direct contribution to scientific activities in China are limited. Recently, advances in low-cost sensors (Volten et al. in this volume) and information technologies (Novak et al. in this volume), as well as an increase in the level of education across the population (Haklay in this volume), mean that more citizens have become involved in citizen science projects. This set of case studies demonstrates that China is witnessing activities across the spectrum of citizen science – from bird watching to air quality monitoring and from biological observations to volunteer computing.

Bird watching

Bird watching is a popular activity in China as in other countries. Nowadays, about 24 bird watching societies have been founded, forming a network across the Chinese mainland. Participants can find their contact information via a website (<http://www.chinabirdnet.org/network.html>), which provides details on local programmes.

These societies have proposed targeted bird watching projects, such as the China Coastal Waterbird Census, initiated by The Hong Kong Bird Watching Society (HKBWS) in September 2005. In this project, participants conduct monthly surveys of 12 permanent and 3 irregular sites along the eastern coast of the Chinese mainland to study the distribution,

migration and seasonal changes of waterbirds and contribute to the conservation of China's biodiversity and Important Bird Areas (HKBWS 2015, ii).

Participants can use either use Birdtalker (an online record submission system), email or regular mail to submit their records (see Mazumdar et al. on multiple methods).

The China Ornithological Society (COS) collects, compiles and reviews bird watchers' observations and publishes the annual China Bird Report in Chinese and English. The China Bird Watching Database has also been established based on the China Bird Report (2003–2007). Over five years, the database compiled 30,936 records covering 1,078 species, representing more than 80 per cent of all bird species in China, which reveal bird distribution and changes (Li, X. et al. 2013, 649).

Plant classification

The Institute of Botany, Chinese Academy of Sciences, established a plant classification programme with citizens' help in 2007. Participants take photographs of plants and upload them to Chinese Field Herbarium (CFH) (<http://www.cfh.ac.cn>), a plant information collection and classification platform (Zhang et al. 2013, 747). There were over 10,000 registered users and more than eight million plant photographs, including one million with a GPS location, as of May 2017. More than five million photographs had already been identified and classified by this time (CFH 2017).

Air quality monitoring

FLOAT Beijing was a community-driven air quality monitoring project developed in 2012 using air-quality sensors and kites. The project founders held workshops with Beijing residents to demonstrate to them how to build the sensors. In addition, open online tutorials allowed more people to become involved.

The colour of an LED on the kites changes with the air quality condition. The kite sensors are based on the Carnegie Mellon Air Quality Balloons project (Maly 2012), which used Figaro's volatile organic compounds sensor (TGS 2620) and diesel/exhaust sensor (TGS 2201) (Kuznetsov et al. 2011). The minimum detection of TGS 2620 is 50 parts per million (ppm). The minimum carbon monoxide (CO) and nitrogen dioxide (NO₂) detection of TGS 2201 is 1 ppm and 0.1 ppm, respectively.

While China's ambient air quality standards (GB 3095-2012) shows that the limit of average concentration in one hour of CO and NO₂ is about 8.73 ppm and 0.11 ppm based on 25°C and 1 atmosphere, respectively, which means TGS 2620 cannot be used to monitor the CO and it would be difficult to monitor NO₂ with TGS 2201. Although TGS 2201 can be used to monitor the CO, its accuracy should be observed closely because this semiconductor sensor is designed for automobile ventilation control and also easily affected by air temperature and humidity due to its materials.

Water quality monitoring

Xiangjiang Watcher is a citizen science project initiated by Green Hunan, an environmental nongovernmental organisation (NGO) in China. The project engages participants to monitor the water quality in the Xiang River Watershed, Hunan Province. It has attracted more than 60 participants from 23 local cities and counties along the river, including industrial workers, farmers, students, professors and public officials. Participants periodically conduct basic tests of water quality at the monitoring sites, record any environmental changes in the watershed, photograph companies that are secretly discharging pollution into the river and advocate for solutions to the pollution (Yan 2012).

Using Weibo (the largest social network in China) means that participants can disseminate the pollution information on the internet, which has brought the issue to the attention of the environmental protection department and put pressure on the polluting companies. Participants hope to reduce pollution by using information technology for advocacy.

Computing for Clean Water

Computing for Clean Water (C4CW) is a scientific computation project launched by Chinese scientists in 2010, in collaboration with the Citizen Cyberscience Centre in Geneva. Participants can contribute their computing power to the project using desktop client software supported by IBM's World Community Grid (<https://www.worldcommunitygrid.org/>).

Researchers at Beijing's Tsinghua University use computing power from more than 50,000 participants to extend simulations to probe flow rates of just a few centimetres per second, significantly reducing computing time. This increased computing power enabled the study of

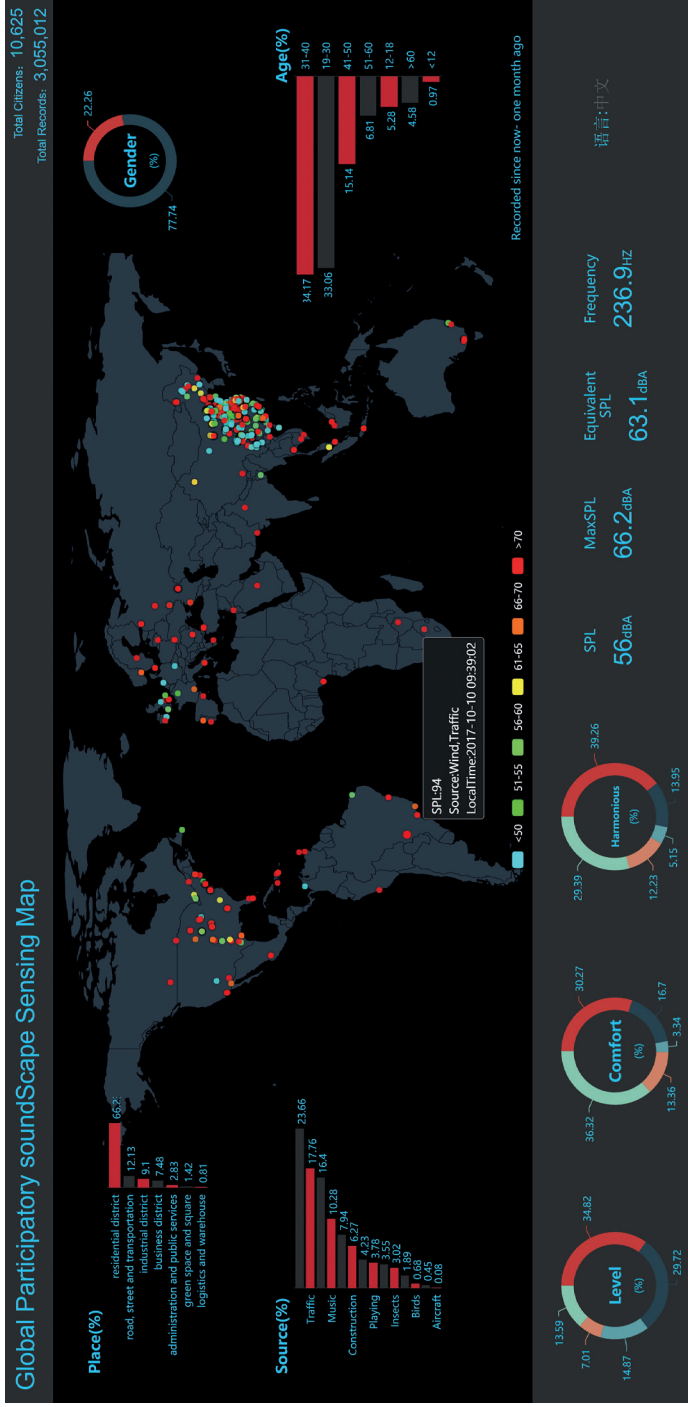


Fig. 12.1 Participatory soundscape sensing online analysis and visualisation website

the characteristics and working conditions of real nanotube-based filters (Ma et al. 2011, 1), which is useful for designing better low-cost, low-pressure water filters and making water purification cheaper and more accessible (Drollette 2012).

Soundscape evaluation

Participatory soundscape sensing (PSS) is an ongoing, worldwide soundscape investigation and evaluation project, initiated by the Research Center of Digital Urban Environmental Network at the Institute of Urban Environment, Chinese Academy of Sciences. The project collects soundscape data with the help of public participation and mobile phones equipped with SPL Meter software (see: <http://www.citi-sense.cn/download>).

The first version of PSS was launched in 2011 (Li, C. et al. 2013, 262) and collected little information, such as sound pressure level, sound frequency, GPS location and subjective feeling. The latest version was updated in March 2016 and has more useful functions, such as land use and sound source identification, soundscape evaluation (subjective evaluation of sound level, sound comfort level and sound harmony characteristics), online data analysis and visualisation (figure 12.1). The data collected supports the analysis of the temporal-spatial characteristics of soundscape, offers a high-quality evaluation model and facilitates the optimisation of urban sound environment policy.