Environment, Citizen Science, Libraries: Connecting the Dots

Divyashree Rana
Ph.D. Res.Sch,
National Centre for Biological Sciences,
Bengaluru, Karnataka, India
divyashreer@ncbs.res.in

Dr. Neelam Thapa
Assistant Professor, Dept. of Lib. & Inf. Sc.
Dr. Harisingh Gour University,
Sagar, M.P, India
nthapa@dhsgsu.edu.in

Abstract

Growing public and professional concerns regarding climate change, environmental degradation and species extinction has put a new focus in these fields. Environment is a key issue in the UN 2030 agenda for sustainable development growth and it is endorsed by IFLA. Libraries in western countries have embraced citizen science, which is playing a key role in the field of environment and biodiversity conservation. SciStarter, an online platform created by Arizona State University Library for promoting and facilitating citizen science projects from all over the world, is one of such initiatives by the libraries. This is a case study of SCiStarter to understand the role of libraries in facilitating citizen science. An attempt was also made to study the citizen science initiatives in India and the role of libraries as community hubs to disseminate community information and facilitate community participation in activities like citizen science. It was found that India has a large network of libraries which disseminate community information and act as community hubs. These libraries have potential to effectively disseminate information and provide a platform for citizen science projects. Emphasis should be laid on developing infrastructure, removing financial constraints, training of staff and promoting collaboration with different stakeholders. Legislative provisions and policies are required to strengthen the library system to provide innovative services like support to citizen science. Library professionals and library associations will have to come forward to advocate for the cause.

Keywords: Citizen Science, Community Information Centres, Community Hub, Library-Community Participation

Introduction

Citizen science, described as "active public participation in scientific research", has seen rapid growth since it was coined in the mid-1990s. Apart from growing interest within laymen, scientific research has benefited immensely from citizen scientists. For example there are more than 150 recorded publications from the popular citizen science program, iNaturalist. Fields of environment and biodiversity conservation have always relied on volunteer participation to gather scientific data. Therefore, the large spatial reach of citizen scientists along with emergence of readily available mobile technologies has significantly enhanced their importance in collating wide-ranging data for environmental monitoring, natural observation and biodiversity protection.

Growing public and professional concerns regarding climate change, environmental degradation and species extinction has put a new focus in these fields. Although environmental research is witnessing

a rise throughout the globe, experts predict this paradigm shift is essentially crucial in the biodiverse and developing regions of Asia-Pacific. Innovative citizen science projects could be the way forward to mapping and protecting the natural resources of Asia. However, browsing through SciStarter, the largest global repository connecting the public to available citizen science projects, revealed a steep lack of such efforts in Asia. This lack of attention does not signify a lack of activity. Influential projects, both completed and ongoing, in India, Japan and Hong Kong have validated their importance and impact, although their decentralized nature has been identified as a major hindrance.

With the emerging concept of "Libraries as community hubs", libraries hold potential in facilitating citizen science projects at local and regional scales. Libraries can play an important role, functioning as formal regulatory systems liaising between citizen scientists and researchers. Innovative partnerships and access to information is also aligned with the UNESCO 2030 Agenda for Sustainable Development and is endorsed by IFLA. Acting as community hubs for citizen science, libraries in the United States have promoted inclusive scientific practices while aiding scientists in protecting the environment. Incorporation of these latest and innovative trends in Indian libraries would help in expediting the growth of citizen science while adding potential to the scope of public libraries.

Objectives

This study attempts to highlight the role of libraries as facilitators bridging the gap between high-quality research and public participation by the platform SciStarter as a case study of SciStarter-University of Arizona.

Focusing on India, the objectives would include,

1. Gathering information on citizen science initiatives for the environment,
2. Understanding the role of libraries in facilitating citizen science, and
4. Suggesting ways to promote libraries as community centres for citizen science at a local scale, while finding synergies from the global case study

Methodology

The methodology involves case study of Scistarter, a citizen science initiative facilitated by libraries. An extensive search of databases SciStarter and CitSci.org was taken up to understand representation of Asian citizen science projects in these global databases. To gather data on citizen science initiatives being undertaken in India, local databases citsci-india.org, Centre for Citizen Science and Earthwatch India were scanned. The emerging role of libraries as community information centres in various sectors was explored through review of literature. The analysis of the data thus collected was used to identify the factors that hinder libraries in promoting citizen science and find synergies from the global case studies to suggest ways to promote libraries as community centres for citizen science.

SciStarter - a movement facilitated by libraries

SciStarter is an online platform for promoting and facilitating citizen science projects from around the globe which was founded in 2011 by Darlene Cavalier, professor at Arizona State University's School for the Future of Innovation in Society. This hub connects communities with projects, tools and associated resources to successfully participate in scientific research. This is enabled by National Science Foundation

supported APIs (Application Programming Interfaces) which allows researchers and organizations to amplify their projects and users to find suitable projects to contribute. Over 3000 projects, tools and related events have been registered on the platform by researchers and project leaders which are accessible to interested people for exploration and contribution. These citizen scientists belong to various age groups and may participate for curiosity, entertainment or even academic credits. Students in American schools are part of initiatives like Girl Scouts can participate in registered citizen science projects to earn credits which contribute to their academic coursework and experience. These features are provided in collaboration with its partners which include schools, colleges, universities, museums and libraries.

Such community-based organizations help in implementing and monitoring the projects offered via the SciStarter platform. SciStarter is a research affiliate of Arizona State University (ASU) and was founded by a group of researchers from the university. Libraries at ASU facilitate the citizen science hub by providing customized tool kits, celebrating Citizen Science Month and connecting ASU researchers to larger interested communities utilizing their library networks. Since its inception, the collaboration of SciStarter has expanded from ASU library to include public libraries in Arizona and California in the USA. Libraries are acting as community hubs training interested citizens, providing necessary resources for participation, monitoring progress and communicating feedback from researchers and citizen scientists. It not only engages the community but also provides an opportunity for assisting research in academic libraries. For example, North Carolina State University in association with SciStarter has established the first Citizen Science Campus. This is an innovative program to increase the research capacity of the university while enhancing the undergraduate experience. University libraries are playing an active role in this initiative by connecting different sectors of the university community, providing training and toolkits for participation in citizen science projects. Citizen science is not limited to any particular discipline. Academic libraries have access to a wide scientific community and can create opportunities for faculty members to demonstrate citizen science as an effective teaching tool, while utilizing data collected by citizen scientists in their research.

Team at SciStarter has also come up with a comprehensive guide to introduce the concept of citizen science and to help libraries and other community based organizations to induce citizen science within their network. This guide provides a brief introduction to the various STEM-related citizen science projects available on the SciStarter platform. It also highlights the role libraries can play in increasing engagement with such projects. It also provides opportunities for networking with libraries already working as community hubs for citizen science in the form of information to join their weekly live discussions, celebrating Citizen Science Month and various other events throughout the year. Their step-by-step guide is a freely accessible resource to induce citizen science through interested libraries and professionals.

Citizen Science initiatives in India

Our search of the global databases, SciStarter and CitSci.org, revealed very low participation in terms of citizen science initiatives from or targeted at Asia. The SciStarter project finder tool presented 804 when location was specified as "Asia". According to the database, 99% of these projects encompass global (like Ebird and Stream Selfie) or online (like Stall Catchers and Galaxy Zoo) projects available for citizen scientists throughout the world, including Asia. Only 3 projects forming less than 1% of the total were geographically specific to Asia which also included projects focusing on the environment and biodiversity in the tropical regions. CitSci.org is an initiative developed at Colorado State University to promote involvement of citizens in scientific research. Unlike SciStarter which provides a repository of active citizen science programs, CitSci.org also empowers researchers and concerned citizens to start and customize their

own projects. An exhaustive search of their global database showed that only 3.5% of the project headquarters were based in Asia resulting in 20 projects from the 583 globally recorded initiatives.

Limited number initiatives targeting on and initiating from Asia is alarming, especially given the dwindling biodiversity and expanding development in this region. In Asia, India is a rapidly growing economy which also harbours around 8% of the global biological diversity along with four out of the 34 biodiversity hotspots. In the global citizen science databases, SciStarter and CitSci.org, a significant proportion (66% and 30% respectively) of the Asian initiatives were from India. Hence, we tried to assess the status of citizen science targeting environment and biodiversity monitoring in India to understand its lack of representation and impact on the global platform.

Our search of Indian resources revealed records of 36 ongoing and/or completed projects which were identified as "citizen science projects" by citsci-india.org, Centre for Citizen Science and Earthwatch India. The names of these projects, their websites (where available) and the source of information is listed below in Table 1. This number is much higher than reported on the searched global databases which showcases lack of representation of Indian initiatives despite their significant prevalence.

Table 1. Details of the recorded Citizen Science projects in India

S.No.	Name	Link	Source
1	Big4mapping	https://snakebiteinitiative.in/snake/	citsci-india.org
2	Biodiversity Atlas - India	http://bioatlasindia.org/	citsci-india.org
3	BirdCount India – eBird India (BCI-eBird)	https://birdcount.in/	citsci-india.org
4	Butterflies in India	https://www.ifoundbutterflies.org/	citsci-india.org
5	Citizen Sparrow	http://www.citizensparrow.in/	citsci-india.org
6	Common Bird monitoring Project	http://www.ibcn.in	citsci-india.org
7	Community based monitoring of fisheries in Lakshadweep	https://www.dakshin.org/mobilizing-communities-for-sustainable-and-equitable-fisheries-governance-in-lakshadweep/	citsci-india.org
8	Dragonfly South Asia	https://dragonflysouthasia.wordpress.com/	citsci-india.org
9	Frogwatch	https://indiabiodiversity.org/group/frog_watch/show?pos=7	citsci-india.org
10	Hornbill Watch India	https://www.hornbills.in/	citsci-india.org
11	India Biodiversity Portal	https://indiabiodiversity.org/	citsci-india.org

12	The invasive Indian bullfrog on the Andaman archipelago	NA	citsci-india.org
13	eMammal Project	https://emammal.si.edu/museums-connect-india	citsci-india.org
14	Marine Life of Mumbai	https://www.marinelifeofmumbai.in/	citsci-india.org
15	OwlIndia	https://www.facebook.com/groups/owlsindia/	citsci-india.org
16	Pterocount - South Asia Bat monitoring Programme	https://pterocount.org/	citsci-india.org
17	Roadkills	http://www.roadkills.in	citsci-india.org
18	Roadwatch	NA	citsci-india.org
19	SeasonWatch	http://www.seasonwatch.in/	citsci-india.org
20	Village Wildlife Volunteers	https://www.tigerwatch.net/	citsci-india.org
21	Project Meghdoot	http://citizenscience.in/about/	Centre for Citizen Science
22	Khagol Vishwa	http://citizenscience.in/about/	Centre for Citizen Science
23	Satark Landslide Alert system	http://citizenscience.in/about/	Centre for Citizen Science
24	Project Sahyadri	http://citizenscience.in/about/	Centre for Citizen Science
25	Lonar	http://citizenscience.in/about/	Centre for Citizen Science
26	Light Pollution Monitoring	http://citizenscience.in/about/	Centre for Citizen Science
27	Maharashtra Drought Monitoring Program	http://citizenscience.in/about/	Centre for Citizen Science
28	Nature 24	http://citizenscience.in/about/	Centre for Citizen Science
29	Study of fireflies in Western Ghats	http://citizenscience.in/about/	Centre for Citizen Science

30	Hailstorm, Dust Storm, Thunderstorm monitoring	http://citizenscience.in/about/	Centre for Citizen Science
31	Pollinators	https://www.earthwatchindia.org/bees-and-butterflies	EarthWatch India
32	Bird Find	https://www.earthwatchindia.org/bees-and-butterflies	EarthWatch India
33	Butterflies and Bees	https://www.earthwatchindia.org/bees-and-butterflies	EarthWatch India
34	Frog Find	https://www.earthwatchindia.org/tree-watch	EarthWatch India
35	Spider Watch	https://www.earthwatchindia.org/tree-watch	EarthWatch India
36	Tree Watch	https://www.earthwatchindia.org/tree-watch	EarthWatch India

In India, the tradition of using public participation to gather scientific data is believed to be over a century old. However, unarguably the first recorded contribution of citizen scientists in ecological studies is believed to be in 1987 in the Asian Waterbird Census coordinated by prominent organization, Bombay Natural History Society (Rahmani, Laad, & Islam, 2003). The field of citizen science has grown and evolved since then to incorporate a larger spectrum and volume of projects ranging from initiatives monitoring snakebites (Big4Mapping) to diversity of life (Indian Biodiversity Portal). This growing interest is about a decade old with rapid reporting in both mainstream media and academic publications. With over 30 reports in the media annually and nearly 20 research papers from a single project (Biodiversity Atlas - India), the potential and prevalence of citizen science is being acknowledged in India and the world alike.

However, a recent and first-of-its-kind report titled "Citizen Science in ecology in India - an initial mapping and analysis" identified some key problems faced by these public participation driven initiatives in India. Apart from financial sustainability and ambiguity regarding data ownership, the chief limiting factor was lacking platforms for discussion and regulatory systems. Lack of support from government and centralized associations (like Association of Citizen Science in the United States of America, Australia and Europe) hinder these projects in realizing their true potential and reach (Sekhsaria & Thayyil, 2019).

Discussion and recommendations

Role of libraries as Community Information Centres, specially Public Libraries, has been emphasized at global level by UNESCO and IFLA and by National Knowledge Commission(2005) at national level. Community information centres are providers of community information i.e. information that is vital and needed to cope with crisis by the community such as information related to health, education, employability, natural disasters, culture, leisure activities, etc. Public libraries have been established in India at national, regional, state, district and village level in India. These libraries provide information to the local community and help in implementation of Government to Citizen(G2C)initiatives, Government to Business(G2B) initiatives and Government to Government(G2C) initiatives. Libraries as information centres play an important role in enhancing the quality of life of the local community. But,

there is a need for the libraries to collaborate. Karkee, Mazumdar and Ghosh (2015) opine that public libraries should collaborate with other information providing agencies such as NGOs, banks, government departments, educational institutions, local health centres, etc. to gather and disseminate information. Not only public libraries, but academic libraries also need to act as community information centres. Roy and Dasgupta (2015) stress that, "academic libraries should collaborate and reach out to the local community to empower the community and uplift and revive libraries as a social learning space".

As providers of vital information libraries as community information centres act as "Community Hubs" and hence have potential to facilitate citizen science. Literature review shows that libraries in India have used crowdsourcing to some extent for collection development and cataloguing (Hasan, Nabi, Khan, Rais & Iqbal, Jafar, 2017) but no instance of libraries facilitating environmental research through citizen science was found.

India has a rich biodiversity which needs to be protected. The Indian government recognizes the importance of biodiversity conservation and environmental research. Biodiversity centres, forest research institutes, institutes related to biological studies, departments of environmental science and related disciplines are all extensively involved in research in this direction. Researchers are also realizing the importance of citizen participation in scientific studies as is evident from this study. But there is a dire need for libraries to come forward and participate in this process.

Libraries, be it public libraries, academic libraries or research libraries, form that "third space" where community meets. It not only has an inflow of local community, it also has the infrastructure to support community events and trained staff to help and support scientific activity. Libraries can collaborate between researchers and citizens; develop necessary information databases for a citizen science project; help in training the community for the project and also provide the necessary infrastructure for the project. Libraries can prove to be the vital link between researchers and community and the life support for smooth implementation and conduction of citizen science projects.

Other than the immensely significant citizen science initiative SciStarter by Arizona University Library, many other libraries have embraced citizen science, to name a few, University College London, University of Barcelona, University of South Denmark, Qatar National Library (Ignat, T and others, 2018) and California Academic and Research Libraries (Cohen, Cynthia M. and others, 2015). The European Citizen Science Association has a Working Group called Citizen Science and Universities which has researchers and libraries from universities collaborating for citizen science. The American Library Association also promotes libraries to participate in citizen science projects through its initiative Libraries Transform. Libraries in India should study these citizen science initiatives being supported by libraries and come up with innovative ways to support scientific research in the field of environmental science through citizen science.

To provide effective community information service Chatterjee (2015) lays emphasis on community profiling i.e. recording all the relevant data regarding the community and the resources and facilities available to the community. The library as a community information centre needs to play an important role in community profiling and involve the stakeholders in the process.

Libraries can provide the platform that Sekhsaria and Thayyil (2019) find lacking in their study to support citizen science. But, this will require strengthening the libraries in all aspects i.e. infrastructure, budget, trained staff and ICT based facilities. Out of the total 28 states in India only 19 states have enacted the Public Library Act (Raja Rammohun Roy Library Foundation) and are able to establish a network of public libraries even in rural areas. Government has to make legislative provisions to establish and strengthen the public libraries to support effective community information services and innovative practices

like supporting citizen science. Library professionals and library associations will have to advocate actively for this cause.

Library professionals need to play a pivotal role in creating awareness about citizen science among all the stakeholders. We will need to convince the authorities, collaborate with scientists and provide them the required information and infrastructure support, and get the citizens to participate in the research. This will require proactive participation from our side.

Policies also need to be drafted so that libraries can collaborate with other organizations and the community, and facilitate research through citizen science. Issues like data ownership, data security, data evaluation, financial implications involved in resource sharing, training, etc. will require clear guidelines. Drafting policies will be a mandatory requirement for smooth implementation of citizen science projects with library involvement.

Conclusion

The primary objective of the libraries is to promote education and research leading to welfare of the society. The libraries have always been conscious about societal needs and have played an important role in giving support to the government and scientists in finding solutions to problems. IFLA has endorsed the UN 2030 SDG goals and libraries are developing their infrastructure and innovating their services to meet these goals. Citizen science is now being recognized as a powerful tool for environmental research and the libraries in western countries have been quick to partner in the process. Libraries in India also need to gear up to support citizen science projects. It cannot be denied that libraries here face many challenges related to infrastructure facilities and budget, but they need to collaborate and advocate in order to overcome these problems. Cigarini, A., Bonhoure, I., Vicens, J., & Perelló, J. (2021) have rightly said public libraries can offer leadership in the promotion of citizen science and contribute to the mission of public libraries to act as local community hubs.

References

1. Chatterjee, A. (2015). Community profiling for effective community information service. In Library Legislation and Community Information Services proceedings of IASLIC 30th All India Conference. Special Publication No.54 (pp.97-103). ISSN 09723668

2. Cigarini, A., Bonhoure, I., Vicens, J., & Perelló, J. (2021). Public libraries embrace citizen science: strengths and challenges. *Library & Information Science Research*, 43(2) . https://doi.org/10.1016/j.lisr.2021.101090

3. Cohen, C., Cheney, L., Duong, K., Lea, B., & Pettway Unno, Z. (2015). Identifying opportunities in citizen science for academic libraries. Issues in Science and Technology Librarianship http://www.istl.org/15-winter/article1.html DOI:10.5062/F4BR8Q66

4. Citizen Science and Universities(Working Group), European Citizen Science Association. https://ecsa.citizen-science.net/working-groups/citizen-science-and-universities/

5. Hasan, Nabi & Khan, Rais & Iqbal, Jafar. (2017). Crowdsourcing and Crowdfunding: An Opportunity to Libraries for Promotion and Resource Generation in the Changing Scenario. In proceedings of 20th National Convention on Knowledge, Library and Information Networking (NACLIN-2017), V 20, New Delhi.

6. Ignat, T., Ayris, P., Labastida i Juan, I., Reilly, S., Dorch, B., Kaarsted, T., & Overgaard, A. K. (2018). Merry work: libraries and citizen science. *Insights, 2018, vol. 31, p. 35*. http://hdl.handle.net/2445/128147

7. Karkee, P., Majumdar, K. & Ghosh, S. (2015). Cooperative role of public libraries in enhancing community information services. In Library Legislation and Community Information Services proceedings of IASLIC 30th All India Conference. Special Publication No.54, p.41-48. ISSN 09723668

8. Libraries Transform, American Library Association. http://www.ilovelibraries.org/librariestransform/libraries-empower-their-communities-take-part-scientific-discovery

9. Rahmani, A., Laad, S., & Islam, Z. (2003, November). Status of the AWC in India and future development. Newsletter of the Asian Waterbird Census, 4–5. Retrieved from https://south-asia.wetlands.org/wp-content/uploads/sites/8/dlm_uploads/2018/02/AWC-NL6.pdf

10. Raja Rammohun Roy Library Foundation, Ministry of Culture, Government of India. http://rrrlf.nic.in/StaticPages_PubLibSystem/PubLibScenario.

11. Sekhsaria, P., Thayyil, N. (2019) Citizen Science in ecology in India - an initial mapping and analysis. Delhi: DST Centre for Policy Research, IIT. https://www.academia.edu/39816694/Citizen_Science_in_ecology_in_India_an_initial_mapping_and_analysis