

# Exploring the entry points for citizen science in urban sustainability initiatives

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Citizen science is key to the success of Future Earth Initiatives for urban sustainability. Emerging research in urban land teleconnections highlights the benefits of incorporating theoretical insights from political ecology and participatory action research. Reviewing some of the forces propelling the recent popularity of citizen science, this article outlines challenges to processes of collaboration between scientists and non-scientists. We distinguish these concerns from others that may arise from the data or other products resulting from citizen science projects. Careful consideration of the processes and products of citizen science could engender a more fruitful relationship between professional scientists and their research communities and help universities to build effective partnerships with those in wider society whose expertise comes from their life experience.

## Addresses

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**Current Opinion in Environmental Sustainability** 2015, **17**:66–71

This review comes from a themed issue on **System dynamics and sustainability**

Edited by **Stephanie Pincetl, Laxmi Ramasubramanian**

For a complete overview see the [Issue](#) and the [Editorial](#)

Received: 19-5-2015; Revised: 16-11-2015; Accepted: 17-11-2015

Available online 2nd December 2015

<http://dx.doi.org/10.1016/j.cosust.2015.11.006>

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## Introduction

The Future Earth Initiative (FEI) aims to contribute to sustainable development goals outlined at the UN Conference on Sustainable Development (Rio+20) by working “with partners in society to co-develop the knowledge needed to support decision-makers and societal change” [Future Earth; URL: <http://www.futureearth.org/>]. The FEI uniquely focuses on opening up and applying new knowledge systems across a range of stakeholders, including business, universities, and citizens [1<sup>\*</sup>]. The FEI has outlined some priority challenges to global sustainability and possible deliverable products (i.e. large

data sets, open access platforms, etc.), including the need to ‘build healthy, resilient and productive cities by identifying and shaping innovations that combine better urban environments and lives with declining resource footprints, and provide efficient services and infrastructures that are robust to disasters [2<sup>\*\*</sup>]. Recognizing that urban areas face some of the greatest risks associated with climate change [3], the Livable Urban Futures project synthesized key questions focused on the impacts of increased urbanization on environmental change, threats to urban populations, and possibilities for urban livable cities [4].

This article aims to inform the growing number of university-community partnerships working in urban sustainability contexts by combining hybrid approaches from both land change science and political ecology [5<sup>\*</sup>,6<sup>\*\*</sup>]. Understanding sustainability in urban places means also making connections to other (distant, rural, etc.) places, as well as their systems of production and consumption [7]. As a result of the teleconnections between places, it is difficult to tease out urban from rural explanations of land-use/land-cover change in human-environment studies [8<sup>\*\*</sup>,9<sup>\*</sup>]. For instance, increasing urban preferences for beef have resulted in land grabs throughout the world [10]. Consequently, urban and rural landscapes can be thought of as co-produced. A more comprehensive conceptual framework for the FEI would consider urban and rural land as co-produced and view people, networks, and ‘things in the landscape’ as being in dynamic, rather than in static relationship to each other ([11]: 247). With this understanding, the quest for sustainability in urban spaces is inherently linked to transdisciplinary research agendas.

Establishing who is involved and engaged in land use processes across space and time is a grand challenge for urban sustainability research programs. Similarly, the universities and researchers engaged in community collaborations must seriously consider what citizen groups and what types of knowledge will be necessary to successful global collaborations [12<sup>\*</sup>]. In this article, we draw on ideas of social and environmental justice from participatory action research and power relations from political ecology to explore the possibilities for citizen science in urban sustainability initiatives. First, we discuss the emerging popularity of citizen science and current applications to urban sustainability research. Second, we illustrate how attention to both process and product in a

teleconnected world is key to building citizen science partnerships for “liveable” urban futures [2\*\*].

### Citizen science models for university-community partnerships

The emergence of the FEI parallels the growing global popularity of efforts at what has been variously called citizen science, community-based participatory research, and/or public science.<sup>1</sup> Recently, projects labeled citizen science have received significant injections of research funds and institutional support internationally.<sup>2</sup> This has been accompanied by the establishment of national and international associations.<sup>3</sup> In the context of sustainability, the term citizen science is often used to refer to strategies for geographic crowdsourcing [13,14] and environmental monitoring [15].<sup>4</sup> The role of on-line tools in promoting volunteer participation in citizen science is considered increasingly valuable [16], including social media, gaming, biodiversity monitoring apps,<sup>5</sup> and centralized websites for volunteer recruitment.<sup>6</sup> Many citizen science applications exist for addressing urban problems like transportation, public utility management, and public safety [17\*].

Citizen science holds potential for integrating human and natural systems research [18] and for ensuring that communities are at the center of the development of sustainable urban communities [19]. A key goal in advancing the term ‘citizen science,’ is, in part, to define it as a distinct field of inquiry [20,21]. However, to date, most projects have opted to ask questions formulated solely by formally trained scientists [22,23,24\*\*,25], compared to those that have drawn on the insights of people who have developed relevant expertise through lived experience. Contemporary literature relevant to those undertaking urban citizen science reflects the two ends of a spectrum between scientist-led efforts for urban planning and design [26,27], environmental monitoring [28], and community mapping [29] on the one hand, and processes led by civil society. Examples of bottom-up initiatives include studies of racial profiling by police undertaken by local communities<sup>7</sup> and a community of elders living with HIV overseeing

<sup>1</sup> A video about a case study by the CUNY Public Science Project provides a useful introduction for scientists. Available from: <https://vimeo.com/22363812>.

<sup>2</sup> See, *Rise of the Citizen Scientist* (editorial). In *Nature* 2015, 524 (7565):265. Available from: <http://www.nature.com/news/rise-of-the-citizen-scientist-1.18192>.

<sup>3</sup> For example, U.S. Citizen Science Association, Citizen Science Network of Australia, and European Citizen Science Association.

<sup>4</sup> For a community-centered approach see *Mapping for Change 2015, Barbican Citizen Science Documentary*. Available from: <http://mappingforchange.org.uk/2015/03/barbican-citizen-science-documentary/>.

<sup>5</sup> For example, iNaturalist, eBird, Nature notebook, Aurorasaurus.

<sup>6</sup> For example, CitSci.org, Zooniverse, SciStarter.

<sup>7</sup> For example, *The Morris Justice Project: A Summary of Our Findings*. Available from: <http://morrisjustice.org/report>.

the design and implementation of a public health project [30].

In recent decades, popular educational movements inspired by Paulo Freire [31,32] have influenced modes of community-university research partnership that extend beyond traditional methods of outreach and are often able to bring about research collaborations based on community priorities and with often excluded communities [33]. Attempts at setting up such initiatives, including but not limited to citizen science, have become increasingly common. However, a lack of meaningful alignment between academic priorities and the needs of communities is illustrative of calls for a more participatory framework in the design of citizen science programs and for the inclusion of worldviews and viewpoints outside of the scientific agenda [34\*,35].<sup>8</sup> As university-community partnerships for citizen science initiatives develop, two concerns should be considered. First, processes of citizen science should address how research is done and who gets to participate. Second, the products or outputs of citizen science should lead researchers to question the potential unintended consequences for those who become participants in such processes or those whose livelihoods or safety may be at risk.

### Process: putting the ‘citizen’ in citizen science

Many of the practices encapsulated by the more recent term ‘citizen science’ have been commonplace for many researchers working in global human-environment contexts for some years. Antecedent roots can be traced in literature about participatory action research in environmental and human health [36,37], conservation and development [38], and social-environmental [39] and political activist [40] movements. Contemporary citizen science is often presented as bringing benefits to empirical quantitative research for the general advancement of science, rather than for other purposes, such as its potential contributions to social and environmental justice [20,37]. By contrast, Irwin’s seminal text [41] represents a tradition of work with citizens which provides space and support to unofficial experts [42,43]. Under this human-centered approach, researchers with formal expertise engage in a process of mutual learning while respecting the knowledge and understandings that come from people’s life experience [44,45\*\*].

More boundary work is needed to shift the worldview of scientists engaged in citizen science to one that is truly transdisciplinary and follows the community-led models described in earlier accounts of citizen science. One example of inner city research projects recording racial profiling, the Morris Justice Project [46], was perhaps an

<sup>8</sup> Also see, Midgley, M: *Science and the Imagination*. Podcast, Coventry University; 2014. Available from: <http://coventryuniversity.podbean.com/category/critical-thinking/>.

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