



International Institute for
Applied Systems Analysis


Citizen science/Citizen-generated data for the SDGs

Dilek Fraisl

**Novel Data Ecosystems for Sustainability Research (NODES)
International Institute for Applied Systems Analysis (IIASA)**


Email: fraisl@iiasa.ac.at
Twitter: [@dilekfraisl1](https://twitter.com/dilekfraisl1)
Web: www.iiasa.ac.at
www.geo-wiki.org

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Mapping citizen science contributions to the UN sustainable development goals

[Dilek Fraisl](#) , [Jillian Campbell](#), [Linda See](#), [Uta Wehn](#), [Jessica Wardlaw](#), [Margaret Gold](#), [Inian Moorthy](#), [Rosa Arias](#), [Jaume Piera](#), [Jessica L. Oliver](#), [Joan Masó](#), [Marianne Penker](#) & [Steffen Fritz](#)

[Sustainability Science](#) **15**, 1735–1751 (2020) | [Cite this article](#)

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Abstract

The UN Sustainable Development Goals (SDGs) are a vision for achieving a sustainable future. Reliable, timely, comprehensive, and consistent data are critical for measuring progress towards, and ultimately achieving, the SDGs. Data from citizen science represent one new source of data that could be used for SDG reporting and monitoring. However, information is still lacking regarding the current and potential contributions of citizen science to the SDG indicator framework. Through a systematic review of the metadata and work plans of the 244 SDG indicators, as well as the identification of past and ongoing citizen science initiatives that could directly or indirectly provide data for these indicators, this paper presents an overview of where citizen science is already contributing and could contribute data to the SDG indicator framework. The results demonstrate that citizen science is “already contributing” to the monitoring of 5 SDG indicators, and that citizen science “could contribute” to 76 indicators,

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Citizen science and the United Nations Sustainable Development Goals

[Steffen Fritz](#) , [Linda See](#), ... [Sarah West](#) [+ Show authors](#)

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 An [Author Correction](#) to this article was published on 18 October 2019

 This article has been [updated](#)

Abstract

Traditional data sources are not sufficient for measuring the United Nations Sustainable Development Goals. New and non-traditional sources of data are required. Citizen science is an emerging example of a non-traditional data source that is already making a contribution. In this Perspective, we present a roadmap that outlines how citizen science can be integrated into the formal Sustainable Development Goals reporting mechanisms. Success

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Demonstrating the potential of Picture Pile as a citizen science tool for SDG monitoring

[D. Fraisl](#)^{a, b, c, d, e}, [L. See](#)^a, [T. Sturn](#)^a, [S. MacFeely](#)^c, [A. Bowser](#)^{d, e}, [J. Campbell](#)^f, [I. Moorthy](#)^a, [O. Danylo](#)^a, [I. McCallum](#)^a, [S. Fritz](#)^a

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Highlights

- Citizen science can contribute to the monitoring of the Sustainable Development Goals.
- Picture Pile is a citizen science tool for rapid image classification.
- Picture Pile could contribute to the monitoring of 15 SDG indicators.
- To realize this potential, use cases for PP and the SDGs need to be developed.

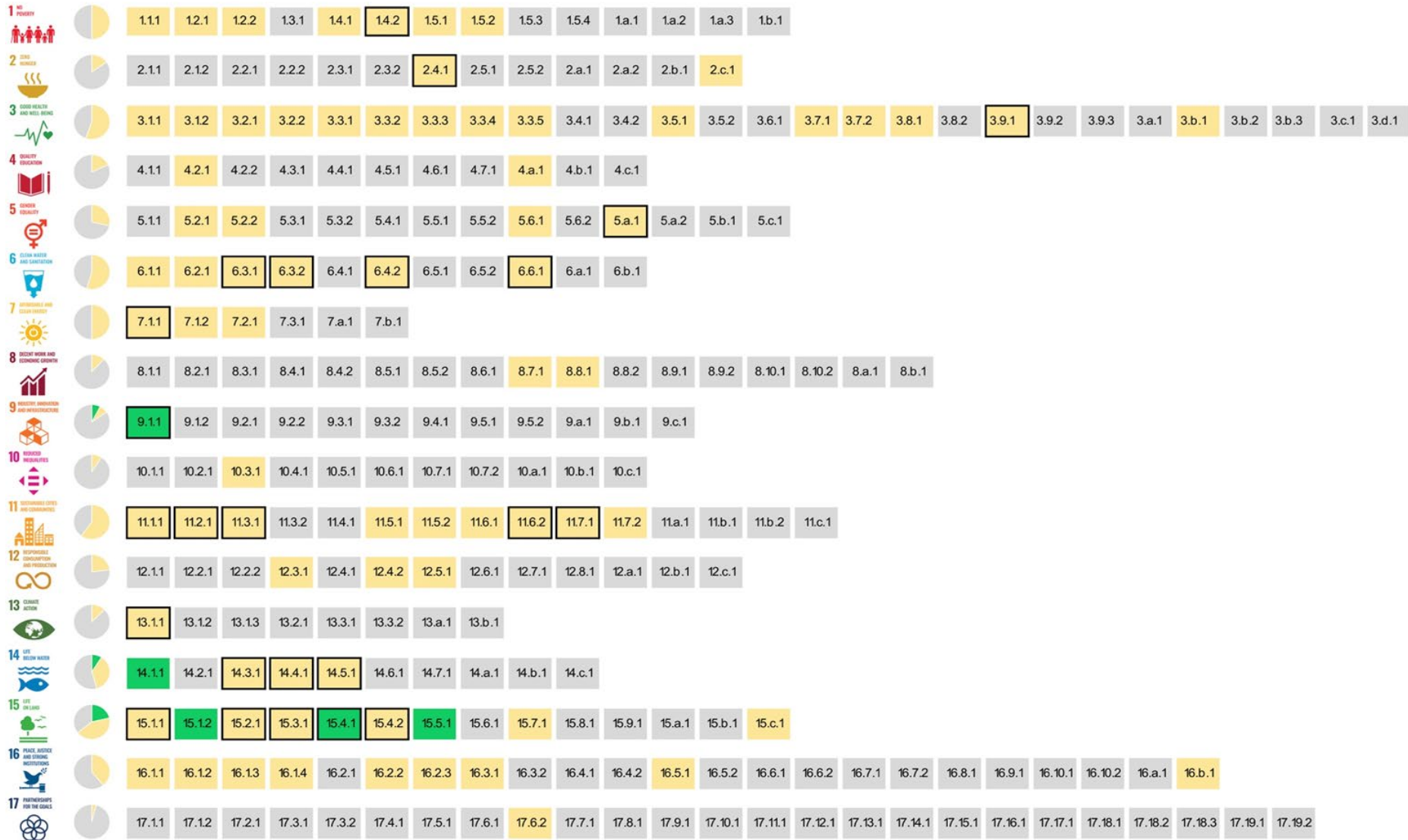


Citizen science could benefit the society by:

- Raising awareness of environmental and other societal issues
- Supporting science and scientific activities
- Contributing to decision and policy making



The SDG indicators where citizen science *projects* are 'already contributing', 'could contribute' or where there is 'no alignment'



The greatest contribution of citizen science data to SDG monitoring:





Source: Earthwatch Institute

6.3.2 Proportion of bodies of water with good ambient water quality

- **FreshWaterWatch:** Over 30,000 measurements from more than 1,200 water bodies in 32 countries (<https://freshwaterwatch.thewaterhub.org/our-data/global-trends>)
- There are more than 1,720 citizen science groups across the US, carrying out volunteer water quality monitoring (<https://acwi.gov/monitoring/vm/index.html>)

11.7.1 on the built-up area of cities that is open space for public use

< Zurück

Bitte bewerten Sie die Qualität des Punktes für folgende Attribute:

Wohlfühlen
Nicht wohl ————— Sehr wohl

Ruhig
Nicht ruhig ————— Sehr ruhig

Sicher
Nicht sicher ————— Sehr sicher

Sauber
Nicht sauber ————— Sehr sauber

Attraktivität
Nicht attraktiv ————— Sehr attraktiv

Ausstattung
Nicht gut ————— Sehr gut

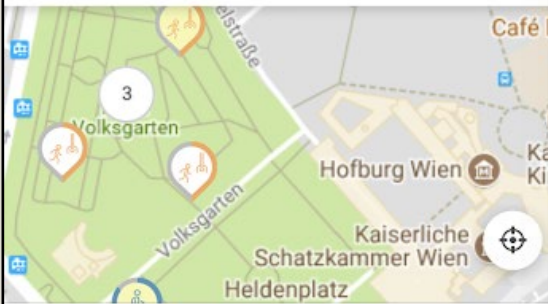
Weiter

< Wähle Aktivitäten

Radfahren Parcour Roller

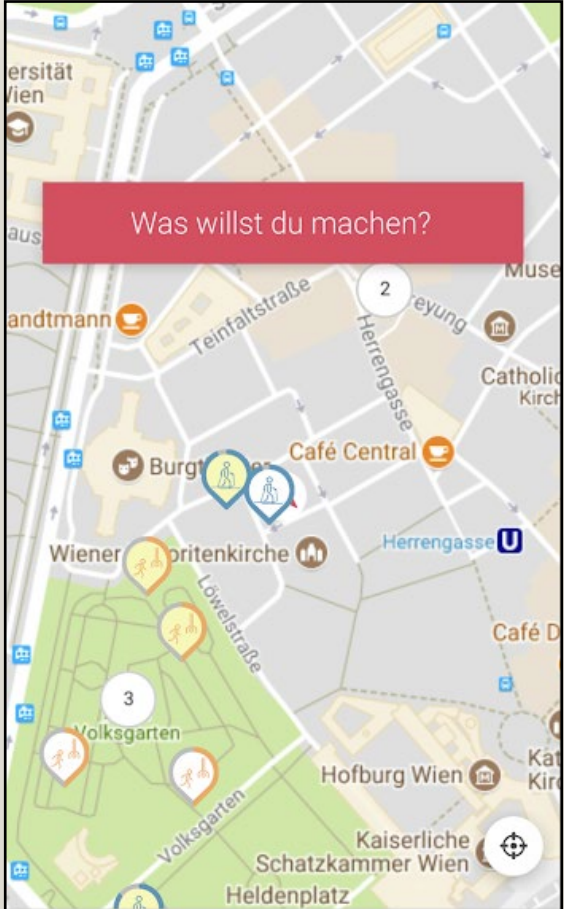
Skaten Ballsport Joggen

Auf Karte anzeigen



Map showing Volksgarten area with activity icons. The map includes labels for Volksgarten, Hofburg Wien, Kaiserliche Schatzkammer Wien, and Heldenplatz. A red button 'Auf Karte anzeigen' is visible above the map.

Was willst du machen?



Map showing Volksgarten area with activity icons. The map includes labels for Volksgarten, Hofburg Wien, Kaiserliche Schatzkammer Wien, and Heldenplatz. A red button 'Was willst du machen?' is visible above the map.



16.1.3 Proportion of population subjected to (a) physical violence, (b) psychological violence and (c) sexual violence in the previous 12 months



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Share Your Story
Have you been a victim or witness of a gender based crime? Tell us your story (anonymously) and help us spread the word for needed change.



Join a Campaign
Safecity organizes several campaigns to spread awareness about gender based crimes. Join one of our campaigns or use our resources to start your own.



Volunteer
Safecity is a completely volunteer based initiative. Volunteer your time and help us take it forward with our team of passionate and dedicated volunteers.

If you have been sexually harassed or abused in public spaces anywhere in the world, You can report anonymously in under 2 minutes.

FILTERS → ALL NEWS PICTURES VIDEO

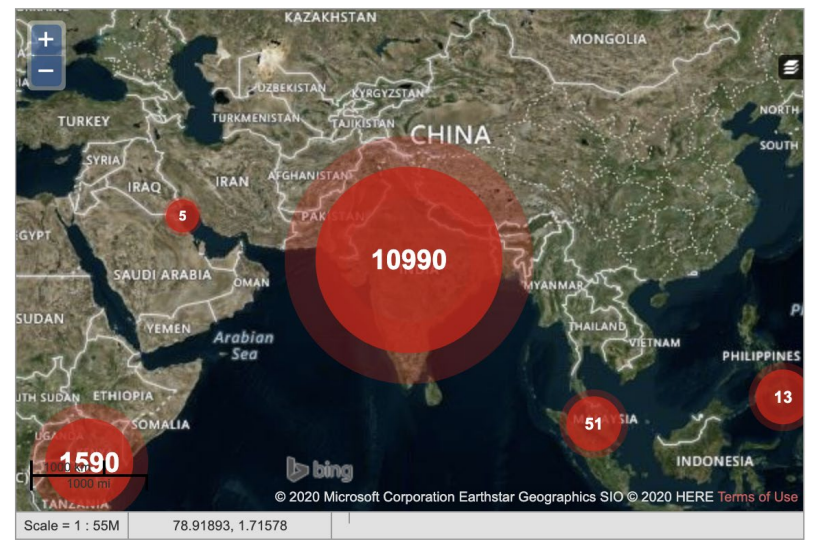


Table S1: Final Mapping Results

Target	Indicator	Initial Proposed Tier (By Secretariat)	Possible Custodian Agency(ies)	Partner Agency(ies)	Updated Tier Classification (by IAEG-SDG Members)	Already Contributing	Could contribute	No alignment at present	Link to References	Rationale for mapping	Direct contribution or supplementary information
Goal 1. End poverty in all its forms everywhere											
1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural)	Tier I	World Bank	ILO	Tier I		Dollar Street, Picture Pile		https://www.gapminder.org/dollar-street/matrix	This indicator focuses on income, with a highly rigorous and defined protocol. However, citizen science could provide supplementary information and inform the indicator on "poverty in all its dimensions", as it refers to purchase power, household living standards, as well as the challenges of measuring poverty through household surveys (e.g., timeliness, frequency, quality, and comparability, etc.). Dollar Street by GapMinder is a project where volunteer photographers document homes in countries. In each home, the photographer spends a day taking photos of up to 135 objects, such as the family's toothbrushes or their favorite pair of shoes. All photos are then tagged (household function, family name and income). The project is open to any sort of contribution worldwide such as photographing homes, writing or translating texts, suggesting volunteering a home to be photographed, etc. This project could provide supplementary information for this indicator. In addition, Picture Pile is a generic and flexible tool for ingesting imagery that can then be rapidly classified by volunteers. These images can be very high-resolution satellite images, orthophotos, images from UAVs or geotagged photographs. Picture Pile has been used to collect data on various issues such as deforestation, post disaster damage assessment and poverty mapping, which could help to understand spatial distribution of poverty and support this indicator.	Supplementary
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1 Proportion of population living below the national poverty line, by sex and age	Tier I	World Bank	UNICEF	Tier I		Dollar Street, Picture Pile		https://www.gapminder.org/dollar-street/matrix	This indicator focuses on consumption at a national level. Citizen science could provide supplementary information and inform the indicator on "poverty in all its dimensions". Dollar Street by GapMinder is an example, which is described in more detail in indicator 1.1.1.	Supplementary
	1.2.2 Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	Tier II	National Gov.	UNICEF, World Bank, UNDP	Tier II		Dollar Street, Picture Pile		https://www.gapminder.org/dollar-street/matrix	This indicator refers to the multidimensions of poverty such as health, education, and living standards, etc. Dollar Street by GapMinder is an example, which is described in more detail in indicator 1.1.1. As the indicator refers to the multiple dimensions of poverty, citizen science approaches such as Dollar Street could directly inform these dimensions.	Direct
1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	1.3.1 Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, newborns, work-injury victims and the poor and the vulnerable	Tier I	ILO	World Bank	Tier II			X		No alignment identified with any existing citizen science project.	N/A
1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of population living in households with access to basic services	Tier III	UN-Habitat	UNICEF, WHO	Tier II		Aqua, Action Research for Learning Bangladesh, Action Research for Learning Bangladesh		https://www.ndpi.com/2073-4411/10/3/284.htm , http://www.h2o-waternetters.com/news/updates/printArticle.php?id=201706&art=08 , Archived http://www.ibericivis.org/projects/aqua/?lang=en https://www.rtcwash.org/sites/default/files/lessonslearnit_washalliance01.pdf	Among different aspects of poverty, this indicator focuses on "access to basic services". Providing access to basic services such as safe drinking water, sanitation facilities, sustainable energy and mobility, housing, education, healthcare, etc., helps to improve the quality of life of the poor. Indicator 6.1.1 (Proportion of population using safely managed drinking water services) is about drinking water. Hence, the projects mapped in 6.1.1 (Aqua and Freshness of Water) as "could be used" could also contribute to the monitoring of this indicator. Aqua (Spain) aimed to control the quality of drinking water. Thousands of Spanish participants, particularly students, created a map with the measurements they made on water quality (chlorine, pH, flavor, smell). Freshness of Water (NL), on the microbiological stability of drinking water, enabled citizens to analyze samples from their own kitchen tap and test the water quality using test strips. In addition, Action Research for Learning Bangladesh, which was mapped as "could be used" for indicator 6.2.1 (Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water), could also support this indicator, as it included monitoring activities through a community-based monitoring (CBM) system, where women volunteers in five selected villages in Bangladesh visited 60 neighbours each month to ask where they collected drinking water, looked at the condition of the toilet, checked that all household members were using it and asked about handwashing facilities. These aforementioned projects could provide information on the functioning of basic services so they could be used to inform some of the underlying aspects of this indicator (e.g., water, etc.).	Supplementary
	1.4.2 Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure	Tier III	World Bank, UN-Habitat	FAO, UNSD, UN Women, UNEP, IFAD	Tier II		Open Tenure		http://www.fao.org/fileadmin/user_upload/nr/land_tenure/OPEN_TENURE.pdf	The Open Tenure initiative matches the type of citizen science project that could contribute to the monitoring of this indicator. It supports a crowdsourcing approach to the collection of tenure related details by communities. Once the community has discussed and agreed to the way tenure rights claims will be collected, moderated and displayed, a Community Server is then established (possibly as a cloud-based server) and community members with specific roles in this process are trained. Although Open Tenure can inform this SDG indicator, it can also inform surveys and data collection processes, which, in turn, provide data for the SDGs.	Direct
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	Tier II	UNISDR	UN-Habitat, UNEP, DESA Population Division	Tier II		Haze Gazer		http://www.anglobalpulse.org/projects/haze-gazer-a-crisis-analysis-tool	Haze Gazer is a crisis analysis and visualization tool that produces real-time situational data from diverse data sources, including: open data in the form of fire hotspot information from satellites and baseline information on population density and distribution, citizen science/citizen generated data such as from the national complaint system in Indonesia called LAPOR, citizen journalism from videos uploaded to an online news channel and social media data such as online video channels, like YouTube and Instagram.	Direct/Supplementary
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Tier II	UNISDR	UNEP, FAO	Tier II		Picture Pile, Humanitarian OpenStreetMap, Micromappers		Picture Pile: https://geo-wiki.org/games/picturepile/ Humanitarian OpenStreetMap: https://www.hotosm.org/ Micromappers: https://micromappers.wordpress.com/ https://revolutions.org/2014/12/12/micromappers-humanitarian-technology/	The metadata refers to direct economic losses, which are defined as the "monetary value of total or partial destruction of physical assets existing in the affected area - direct economic loss is nearly equivalent to physical damage". The following projects "could be used" for monitoring this indicator: Picture Pile (for post disaster damage assessment), where volunteers classify satellite images to identify damaged buildings after a disaster; Humanitarian Open Street Map, where volunteers create maps for disaster responders to reach those in need (e.g., by digitizing damaged	Direct



Citizen Science for the SDGs StoryMap: <https://dataforchange.net/strengthening-measurement-of-marine-litter-in-Ghana>

Citizen Science Data...

- ...for monitoring beach litter have been integrated into the official SDG monitoring and reporting mechanisms of Ghana in a sustainable way, which makes *Ghana the first country to report on SDG indicator 14.1.1b and first country to use citizen science data for that purpose.*
- ...will *serve as inputs to Ghana's Ocean Plan*, currently under development, as well as other relevant policies to address the marine litter problem.
- ...has helped to *bridge local data collection efforts with global monitoring processes* by leveraging the SDG framework.

Lessons

- Rather than the time- and resource-intensive process of designing a digital mobile instrument from scratch, using an off-the-shelf solutions such as CleanSwell requires fewer resources to implement and enabled the reuse of historical data.
- By tapping into **Smart Nature Freaks Youth Volunteers** and **Plastic Punch**, who are already established and sustainable networks, data could be efficiently collected as a by-product of existing activities.
- Importance of creating time and spaces for the government, international organisation and CSOs to meet, in order to **build trust**, common goals and **ownership** over the result.

Resources

- Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., Moorthy, I., Arias, R., Piera, J., Oliver, J.L., Masó, J., Penker, M., Fritz, S., 2020. Mapping citizen science contributions to the UN sustainable development goals. *Sustain Sci.* <https://doi.org/10.1007/s11625-020-00833-7>
- Fraisl, D., See, L., Sturn, T., MacFeely, S., Bowser, A., Campbell, J., Moorthy, I., Danylo, O., McCallum, I., & Fritz, S. (2022). Demonstrating the potential of Picture Pile as a citizen science tool for SDG monitoring. *Environmental Science & Policy, 128*, 81–93. <https://doi.org/10.1016/j.envsci.2021.10.034>
- Fritz, S., See, L., Carlson, T., Haklay, M. (Muki), Oliver, J.L., Fraisl, D., Mondardini, R., Brocklehurst, M., Shanley, L.A., Schade, S., Wehn, U., Abrate, T., Anstee, J., Arnold, S., Billot, M., Campbell, J., Espey, J., Gold, M., Hager, G., He, S., Hepburn, L., Hsu, A., Long, D., Masó, J., McCallum, I., Muniafu, M., Moorthy, I., Obersteiner, M., Parker, A.J., Weisspflug, M., West, S., 2019. Citizen science and the United Nations Sustainable Development Goals. *Nat Sustain* 2, 922–930. <https://doi.org/10.1038/s41893-019-0390-3>
- Citizen Science for the SDGs StoryMap: <https://dataforchange.net/strengthening-measurement-of-marine-litter-in-Ghana>

Thank you!

Dilek Fraisl

International Institute for Applied Systems Analysis (IIASA)
on behalf of the WeObserve SDGs CoP

Email: fraisl@iiasa.ac.at
Twitter: [@dilekfraisl1](https://twitter.com/dilekfraisl1)
Web: www.iiasa.ac.at
www.geo-wiki.org



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