Map 4 Census: experimenting answers to how civil society can partner with governments to monitor the SDGs with data.

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In 2015, UN member countries pledged their commitment to advancing the ambitious 2030 Agenda for Sustainable Development. Although a considerable number of countries have made significant strides in measuring progress towards sustainable development, many specific indicators still require basic inputs. This article describes and analyzes a case study in the frame of the growingly considered concept of third-party data from civil society for the sustainable development goals (SDG). The paper departs by modelling citizen 2 government data partnerships, then illustrated in a real-life practice. The featured case study, called Map4Census, is an experiment developed by GeoCensos Foundation, a non-governmental organization that essayed a prototype of data partnership supported the IADB to assist the National Statistical Office of El Salvador. Findings conclude evaluating the outcomes of data partnerships from non-governmental organizations (NGOs) with governments for the SDGs. When discussing in depth the issue, it asserts positive tradeoffs between data quality validation and bottom-up data disaggregation in participative agendas. The research also warns about conditions to be revised in these kinds of initiatives for the 2030 Agenda.

Research question: How NGO initiatives could or would start on their account collaborative or independent data collection processes to input the SDG endeavor

1. Conceptual considerations regarding citizen at large involvement in official statistics

In 2015, countries pledged their commitment to advancing the ambitious 2030 Agenda for Sustainable Development. With its visions and Sustainable Development Goals (SDGs) of the agenda comes more than 232 unique indicators that countries need to produce regularly to measure progress. Countries have made significant strides in generating the SDG indicators, but many specific indicators still require basic inputs, such as those of geospatially enabled statistics. As international communities of experts have proposed that to grant the production of gaps in the SDG indicators, especially those falling out of the official statistical regular processes, data is to be provided by third parties using innovative practices. Public involvement in the SDG monitoring endeavor, especially for least conventional indicators of tiers II and III, is expected as feasible by many experts and practitioners. This is the case of Citizen at Large Involvement in Official Statistics (CLIOS), i.e., cases where a participative citizenry along with a committed statistical authority decide to work together through trusted data partnerships.

Once the need to collaborate from citizenry to governments in the SDG endeavor is recognized, it is necessary to typify these kinds of arrangements, especially aiming to identify the ethos of the relationships, including incentives, intentions and overlaps in producing and using data for the SDGs from different sources.

Citizen science, Citizen Generated Data (CGD), Crowdsourcing and other kind of data management arrangements are available for NSOs and also endorsed within fit-for-purpose conditions by the IAEG-SDG body of member countries (MacFeely and Nastav, 2019). The proposed solutions, nevertheless, still need to be proven feasible and accepted to produce SDG indicators. The expected prototypes of these methods of co-produced data collection should involve some kind of data quality assurance, self-assessment, data stewardship, and/or certification models to grant trusted data gaps in domains where the frequently non ubiquitous public scope of statistics cannot reach.

If governments are expected to adopt these statistical innovations and other solutions to the challenge of monitoring the SDGs soon, filling data gaps through third parties will require a standard framework to distinguish the relationship between third-party data producers and the (official) party that reuses or enriches the data. Since the launch of 2030 Agenda in last years, partnerships for sustainable development, whether intended for monitoring or implementation, have been defined in a broad, and in many cases loose, sense. Some literature characterizes them as composed indistinctly by multiple stakeholders (Dodds, 2015). However, a deeper understanding of partnering with data requires a closer study of involved relationships, scrutinizing the partnering framework by accounting the involvement of each type of actor with the other. A comprehensive understanding should additionally include identifying motivations, tensions, constraints, and impacts, among other features.

To narrow down the complexities embedded in the interaction of partners sharing data, this paper revisits a systematized analytical framing to characterize the sharing of data by informing the potential and limitations that the civil society actor has when partnering with a given government as a data provider. To identify formally partnerships and their more relevant features this paper builds upon the framing that created the concept of Citizen to Government data partnership (Carranza-Torres, 2021). This umbrella concept is defined for the purposes of this paper as the *long run venture of two different actors, civil society, and government, that formally and voluntarily agree to undertake transformative actions to respond to the demands of monitoring sustainable development.*

The idea of actions like data partnerships initiated from civil society to aid the decision taking processes of governments recognizes the influence of the concept of citizen science by the

pioneer Alan Irwin who defined it as "science which assists the needs and concerns of citizens" (Irwin, 2001). The knowledge to provide to the needs and concerns of the people requires a close partnership to produce measurements enabled to successfully grant true representation of all interests at stake. Also defined by the previously cited author as "a form of science developed and enacted by the citizens themselves", C2G dp has additional commonalities with citizen science. This is because the developed forms to collect evidence to understand local realities embedded in the exchanged data offered for a partnership with governments are clearly enacted by the perceptions, needs and influence of common people.

In the present, scholars more broadly define citizen science as "public participation in scientific research and knowledge production". In this case, knowledge production as understood in the concept of C2Gdp is the actual production of indicators for SDGs and other sustainable development frameworks. The array of interlinked concepts onvolving citizen science is presently evolving in its global outreach, and it is used in a wide range of scientific domains, usually associated to environmental and ecological sciences (Fraisl et al., 2022). The concept of Citizen 2 Government data partnerships aims to be specific to the ambitions of the sustainable development's quest as it specifically refers to the demand of to respond to the demands of monitoring sustainable development.

For simplification purposes, the proposed concept of Citizen to Government data partnership will be shortened in this paper referring to it with the acronym C2G dp. As, the relationship of parties is not specifically defined within the monitoring and implementation of SDGs, but instead referes in general to "data partnerships", all relationships will hereinafter be referred to as with the shortened sub code "dp". The generalization of table 1 shows in the rows data producers and in the columns actors that integrate and add value to their statistics and for the benefit of their data processes. The classification of actor`s relationships could be easily adapted for the purposes of implementing the SDGs as partnerships for acting upon SDGs.

Table 1 Types of relationships of data partnerships and corresponding examples

Actor	Civil Society Organizations or NGOs C (for "Citizens")	Government (NSS or NSO) G (for "Government")	Business companies B (for "Business)
Civil Society Organizations or NGOs C (for "Citizens", includes academia)	C2C dp cases: Citizen Science, Citizen Generated Data Global Open Data Index, Ushaidi platform, Openstreetmap, Groundtruth 2.0.	C2G dp cases: Citizen Science, **IIASA/ Ghana NSO / UNEP (SDG 14.1.1b), Uwezo initiative with NSO Uganda, Map 4 Census El Salvador by GeoCensos, Data4Good.**	C2B dp cases: Crowdsourcing practices i.e. Booking.com, Tripadvisor, Google Maps Local Guides
Government (NSS or NSO) G (for "Government", includes International Organizations	G2C dp cases. redATAM Software, European Big Data Hackathon, Base Adresse Nationale" – BAN (Etalab)	G2G dp cases: Data Infrastructures in the NSS, Integration of administrative registers with statistics.	G2B dp cases: Statista Portals and visualizations, redATAM Software, Experian MKT Services with ONS
Business companies B (for "Business), includes IT Companies	B2C dp cases: Data4Good, Bing Satellite imagery for Openstreetmap Database.	B2G dp cases: Twitter Big Data citizen sentiment index (INEGI), ESRI, Global demographic data	B2B dp cases: Global compact report, Google Data Studio

Source: Carranza-Torres, 2021.

To illustrate the systematization of relationships it is indicated that an arrangement noted by the acronym G2B and sub code dp means that the Government actor is providing data in a data partnership with a business company as in the case when a private data portal arranges to provide comparisons of inflation processing official databases to follow up on a specific indicator of 2030 Agenda. Alternatively, a B2C dp arrangement occurs when a private company provides freely available data, such as base maps from satellite imagery, for citizenry providing thematic geospatial data layers for a natural disaster response. The red bubble speech figure in table 2 highlights Citizen-to-Government data partnership selected out of the three-by-three classification matrix relating actual actors to assert that stakeholders are willingly collaborating with data based on formal settings, whether it is from and to NSOs, business companies and Non-Governmental Organizations or NGOs.

To assure that data partnerships are reliably conformed, formal sustainable agreements need to be arranged. The approach to the analysis assumes that the role of participation of citizenry, of for that matter any other actor, for data production occurs if it grants a mandate from the NSO to produce data chained as part to a broader statistical system, beyond the 2030 Agenda. The key to justify a C2G dp arrangement lies in the fact that the "citizen" actor is an integral part of the data system providing a trustworthy input in the statistical production process.

Table 2 Actors, actions, potentialities, and limitations for data partnerships

Actor	Actions	Potentialities	Limitations
Government	Capture new sources of data Stewardship of quality of the data Provide security to data scientists on the field Adopt citizen science practices	Update data collection practices Learn on existing data collection practices Make available unedited datasets Essay innovative data solutions	Official statistics principles of privacy and security Lack of experience to work with third parties Limited knowledge of data partnership practices
Academy	Coordinate citizens Select reference literature Select analytical frameworks Report and disseminate lessons from best and worst practices	Availability of new data sets and practical knowledge Enlarge the publishing scope Confirm theories	Difference in the uses of technical language Peer review dynamic Slow publishing processes Limited data infrastructures
NGO	Commit and engage participants to data projects Signaling of "feel good" values Train in the statistical field and learn from official survey processes Facilitate linkage with local communities Formalize lessons in a handbook	Strengthen relationships with local communities Increase volunteered time resources Function as a translator to other parties Populate now casting data bases Facilitate the dissemination of findings	Unfamiliarity with traditional statistical practices Overlapping missions and differences in practices among NGOs Non-for-profit goals collapsing with the continuity of NGO payrolls
Private sector	Provide training of state-of-the-art technologies Advice on data science best practices Support production of new data with sponsored funding schemes	Increase available data sets Integrate new data technologies with traditional statistical techniques Strengthen public reputation Produce synergies with other sustainable development frameworks	Unfamiliarity with the statistical scientific method Short-run result seeking Diverging copyright frameworks

Source: Own elaboration.

An illustrative example of a nascent C2G dp is the one from the NGO Uwezo in Uganda, initiated by citizens of an NGO in 2009 to produce data outcomes reporting national government. The project Twaweza ("we can make it happen" in Swahili), arranged a data partnership with the Ministry of Education to provide a data collection system.

The potentialities and limitations that Ugandan civil society anticipated to initiate such a project was to rely on institutional and technical support from a recognized university to define surveying techniques and implement representative sampling. The government converged in the rationale of counting with technically updated knowledge and innovating in the field, receiving the benefit of untapped resources.

As other similar considerations could be postulated for other involved actors, the following table features examples of actions, potentialities, and limitations that all possible actors to conform data partnerships.

2. The Map 4 Census data partnership project

This section portrays a case study to demonstrate that a G2C-cooperation pilot is feasible in more recent terms. The Map 4 Census project is an innovative initiative to provide potential inputs to the requirements of census cartography surveying in El Salvador. Although there are several available initiatives coming from civil society in collaboration with governments for different purposes, very few are formally discussed in the statistics realm (Carranza, J. A., 2020). Instead, Map4Census was pitched to directors of NSOs at international fora and proved to be well heard among officers.

After several networking iterations, the Inter-American Development Bank (IADB) provided support in 2019 to run a demonstration pilot with DIGESTYC from El Salvador. A fully formulated project was implemented as an exercise to be co-created with civic groups and the NSO of El Salvador. From the start of the project to its completion, an ecosystem of two kinds of actors intervened in the implementation of the initiative, i.e., an NSO and a provider of funding to it, and an NGO with a local community.

Involved actors include national government, represented through the Dirección General de Estadística y Censos and the Inter-American Development Bank as an advisor to the government. Local civil society from El Salvador included GeoCensos Foundation and two militant groups for the advocacy of gender and poor community's rights, custodian of local inhabitants in deprived communities of the Municipality of Ciudad Delgado in the metropolitan area of San Salvador.

The surveyed areas included deprived population affected by the influence of Maras. These are organized groups of young people, engaged in criminal and illegal activities (Landeros, 2022). The project prioritized activities for the summoned actors that were specifically framed within the underlying recommended targets of SDG 17 to strengthen NSO's capacity building for Least Developed Countries.

In particular, the deployment of the project sought to develop technical and organizational workshops for the updating and the collection of data. Its' objectives included demonstrating the use of non-proprietary source software and open datasets, introducing concepts and tools to manage open geospatial data aimed to train the staff of the Salvadoran NSO and summoning civil society groups through a targeted call to co-create.

Combining transfer of knowledge with dynamic interactive workshops and promoting empowerment with the use of the Openstreetmap (wiki.openstreetmap.org, 2017) open geographic data platform, participatory exercises of documenting and data collection were tested and adapted accordingly to the needs expressed by the NSO and the local population.

Table 3 Actors, actions, potentialities, and limitations in Map 4 Census

Actor	Actions	Potentialities	Limitations
Directorate-General for Statistics and Censuses DIGESTYC (G)	Supervise Input information Escort surveyors to the deprived areas with a social worker Attend modules and participate in workshops	Learn census cartography Learn on open data Make geospatial datasets available Essay new cartographic solutions	Concern and lack of trust from NGOs Safety for officers in the field
GeoCensos Foundation. Local advocacy groups **(C)**	Train on census cartography, open data principles and tools Facilitate a workshop Run workshops Co-create a survey taking handbook Survey with officers Map points of interest	Outreach to NSO and local communities Essay a solution to C2G dp Learn from the facilitation methodology Populate OSM data base Publish and share findings	Discomfort with traditional analogue cartographies Disagreements among NGOs Overburden of red tape and dealing with stakeholders
Inter-American Development Bank (G)	Provide funding Advice on hard to count populations Execute loan and development plans Select reference literature Report the experience Asses the project	Institutional strengthening of the NSO Implement and evaluate funding schemes Support National Planning System Learn from documented innovations	Unfamiliarity with the method Diverging and short-sighted objectives Lack of experience with statistical practices by NGOs
Inhabitants of Deprived areas of Municipality of Ciudad Delgado **(C)**	Establish ground rules for mapping Provide input Learn about open mapping New skills for territorial planning Re use and dissemination of the information	Gain understanding of own territory Self-awareness of local issues Document territory Claim support for public works needed	Distrust from external people, including government and surveyors Lack of knowledge of digital tools

Source: Own elaboration based on Terms of Reference of the project and mission report.

The location of Ciudad Delgado in the San Salvador metropolitan area was selected for a field deployment of the open census cartography with 6 days out of a total duration of 30 days of the full project, including planning and reporting actions. The implementation of the collaboration was coordinated with relevant officials and managers of DIGESTYC, involving strategic personnel, experts in local and social security and the Executive Directorate of the statistical office in the headquarters' locations and other external facilities.

During the experiment, a task team of three especially trained members of GeoCensos held interviews and/or technical preparation meetings with nine officials of the NSO. The role of the interviewers was determined within a previously prepared plan of seven basic remote and in person contacts, including eliciting views from civil society groups and technicians from the Ministry of Environment and the Ministry of Public Works. The plan satisfactorily completed a tool prepared for the assessment of the census cartography. The guide for the interviews was adapted from the well-known "Tool for Assessing Statistical Capacity" from the census bureau of the United States (Sen and Azar, 2021). After several rows of meetings and recording of written interviews were undertaken, the following specific actions the team executed the deployment of the plan:

- Introductory presentations to establish the context that justifies the benefits of using an Open Data platform with officials from key areas of DIGESTYC, in addition to other external institutions (1 day).
- Workshop to review and update the census cartography handbook already used in DIGESTYC to support all statistical activities related to the territory (1 day).

- Knowledge transfer to involved field staff and local NGOs, including field orientation, review of basic mapping concepts, spatial object identification and classification, open-source software training on the Openstreetmap platform and the Field Papers tool, data uploading, error correction and production of base cartography (2 days).
- Assessment of available technical resources, including knowledge and technological availability (resource analysis). (1day)
- Compilation in a report of evaluation results for the unit of demographic statistics, data collection, and elaboration of proposed strategies and guidelines, as well as the identification of critical success factors for the application of open geospatial technologies in the census process. (1-2 days)

Following the above listed preparatory actions, the project attained its general objective on the field in the framework of an event called mapathon – a marathon of mapping and data collection - to field test open source and data applications to support the updating of census cartography. The collection exercise consisted in applying a survey to the target population in the selected territory conducted by a selected group of cartographers. Through participatory exercises the transferred knowledge was applied by 8 groups formed by 8 cartographers from DIGESTYC combined with amateur mappers from civil society on site.

The selected group paired individuals with diverse profiles, composed of an equal number of cartographic enumerators and system experts applied in the field the "Field Papers" tool for each selected area (Stamen Design, 2012), This is a tool based on the Openstreetmap platform with which it was possible to complement analogue cartographic information with digital geodatabases for the DIGESTYC system. The tool used in the exercise provided a simple way to edit Openstreetmap satellite images and rich geodatabases by printing a simple paper map. The integration of available systems at DIGESTYC was possible as the implemented tool used geo-referenced quick response (QR) codes and allowed the use of paper maps for the mapathon.

The available data of the produced maps was photographed with user-owned smart phone cameras (with a minimum of 200 dpi resolution) and was uploaded to the cloud of DIGESTYC. Subsequently, it was transformed to an open standard format designed for representing simple geographical features, along with their non-spatial attributes and other features used in geoformation services of the NSO, such as Shape Files or Keyhole Markup Language.

The potentialities of running the experience producing synergies out of the work of two intervening actors were diverse and range from operative goals, such as supporting census cartography update or training agents to more strategic ones, such as awareness of the urban environment to local sovereignty. These potentialities elicited from different parties were not contradictory and showed the potential exponentiality of benefits for the C2Gdp.

Synthetizing the conclusions of the report of the project, the most valued potentiality, shared by both parties, NGO and NSO, was the possibility to provide with open data, whereas enhanced processes for the NSO or for international organizations plus the availability of datasets for NGOs or mapping coverages for local commoners.

3. Positive outcomes and alerts

This investigation examines citizen participation in the pursuit of data partnerships for the measurement of SDG indicators. Potentialities of using alternative forms of data production with C2G dp for the statistics' realm are diverse: Updating data collection practices, learning about existing innovative data collection practices, making available unreleased datasets, strengthening relationships with local communities, increasing volunteered time resources, among others. Far than proposing a radical change of the official statistical functions, bottom-up approaches like C2Gdp should be considered in the SDG realm by NSOs more as complements of traditional statistics than substitutes, integrating these approaches and its

contributions vis-à-vis streamline top-down approaches. Advocacy for inclusion and willingness to integrate data coming from civil society to complement statistics in governments is a permanent claim that concerns many grassroots and international NGOs (Development Initiatives, 2021)

Regarding limitations, table 3 examines Map 4 Census project and suggests that the framing of this C2G dp, will face the challenge of providing a trustworthy input. Also, future interested practitioners should consider this as a new practice developed to support an experimental input. As civil society groups are still not considered formally in the official statistics processes and ecosystems, at least in LMIC countries like El Salvador, as alternative sources, institutional matters should be fully considered for future versions of a potential C2Gdp. Although the Map 4 Census experience was successful, new formulations of C2G dp projects should assure the integration of these practices in the processes of the target NSO. This is crucial to push forward regarding other limitations of both parties.

An educated speculation regarding the future developments for science in the statistical realm, could point to come out of the ongoing debate addressing the need of a Global Data Convention or Compact (World Economic Forum, 2020). A convention on data could help to establish ethical principles and create a multiparty global architecture involving quality assurance standards and privacy arrangements for compliance in all countries. Broadening more open principles could build up the confidence of parties. If citizen participation is to be considered in any NSS plans, the need of standards requires also to achieve foreseeable outcomes, methodological consistency, and statistical quality to maintain and escalate regular records of the population.

Finally, an interesting issue to be studied in future research work is how these initiatives will be funded and promoted in the sustainable data agendas. As seen, although the bottom-up data collection phenomenon is embedded in the 2030 global agenda, these practices are not prioritized, exemptions made, in the actual framings of data partnerships at NSOs.

The previous conclusions synthetize the answer to the research question of how NGO initiatives could or would start on their account collaborative or independent data collection processes to input the SDG endeavor. A key to a broader answer is to channel data resources for the SDGs through productive consensus and broader dissemination of available experiences.

Notes

(1) This short article is part of broader research in citizen science undertaken by GeoCensos Foundation to be released soon.

(2) Views and opinions expressed in this article are those of GeoCensos Foundation and not necessarily those from other stakeholders involved in Map4 Census.

(3) The Map4Census project aims to fill the gap of lack of statistics for deprived areas and statistical skills in society involving governmental organizations by developing innovative data partnerships. When considering the co-creation and co-production theories, Map4Census falls under the definition of co-creation following the public administration point of view and it represents a complementary service.

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