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Experiences from Recent Geo-Wiki Citizen Science Campaigns in the Creation and Sharing of New Reference Data Sets on Land Cover and Land Use

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Geo-Wiki is an online platform for involving citizens in the visual interpretation of very high-resolution satellite imagery to collect reference data on land cover and land use. Instead of being an ongoing citizen science project, short intensive campaigns are organized in which citizens participate. The advantage of this approach is that large amounts of data are collected in a short amount of time with a clearly defined data collection target to reach. Participants can also schedule their time accordingly, with their past feedback indicating that this intensive approach was preferred. The reference data are then used in further scientific research to answer a range of questions such as: How much of the land's surface is wild or impacted by humans? What is the size of agricultural fields globally? The campaigns are organized as competitions with prizes that include Amazon vouchers and co-authorship on a scientific publication. The scientific publication is the mechanism by which the data are openly shared so that other researchers can use this reference data set in other applications. The publication is usually in the form of a data paper, which explains the campaign in detail along with the data set collected. The data are uploaded to a repository such as Pangaea, ZENODO or IIASA's own data repository, DARE. This approach from data collection, to opening up the data, to documentation via a scientific data paper also ensures transparency in the data collection process. There have been several Geo-Wiki citizen science campaigns that have been run over the last decade. Here we provide examples of experiences from five recent campaigns: (i) the Global Cropland mapping campaign to build a cropland validation data set; (ii) the Global Field Size campaign to characterize the size of agricultural fields around the world; (iii) the Human Impact on Forests campaign to produce the first global map of forest management; (iv) the Global Built-up Surface Validation campaign to collect data on built-up surfaces for validation of global built-up products such as the Global Human Settlement Layer (<https://ghsl.jrc.ec.europa.eu/>); and (v) the Drivers of Tropical Forest Loss campaign, which collected data on the main causes of deforestation in the tropics. In addition to outlining the campaign, the data sets collected and the sharing of the data online, we provide lessons learned

from these campaigns, which have built upon experiences collected over the last decade. These include insights related to the quality and consistency of the classifications of the volunteers including different volunteer behaviors; best practices in creating control points for use in the gamification and quality assurance of the campaigns; different methods for training the volunteers in visual interpretation; difficulties in the interpretation of some features, which may need expert input instead as well as the inability of some features to be recognized from satellite imagery; and limitations in the approach regarding change detection due to temporal availability of open satellite imagery, among several others.