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Access to exact National Forest Inventory plot locations must be carefully evaluated

Reply to Gessler *et al.* (2024) 'Finding the balance between open access to forest data while safeguarding the integrity of National Forest Inventory derivedinformation'

National Forest Inventories (NFIs) are conducted to gather reliable information that can be used for a variety of purposes such as official statistics for policymaking, informing stakeholders, and sustainable management (Tomppo *et al.*, 2010; FAO, 2017). There is ongoing controversy on whether the locations of NFI plots should be openly accessible or only accessible in justified exceptions (Nabuurs *et al.*, 2022; Gessler *et al.*, 2024; Päivinen *et al.*, 2023). The authors support the notion by Gessler *et al.* (2024) that the availability of environmental data in the communication between science and policymaking is important. We welcome a discussion on the matter and want to further elaborate the statements made by Päivinen *et al.* (2023).

National forest inventories have sound scientific bases, but they are not primarily conducted for scientific purposes. Therefore, the general open access rules for sharing research data do not necessarily apply to them. If there is any risk that opening the data for scientific purposes could jeopardise its function for the original use, that is policy formulation and evaluation, the latter should always be prioritised.

We strongly emphasise the need for the exact location of NFI sample plots to remain unknown to the public because revealing the plot coordinates opens the door for a different management. This would violate the representativeness and randomness of the sample and estimators based on such a sample could contain a bias which is impossible to detect with reasonable effort. Since the adverse effects of revealing sample plot coordinates are well-known to those responsible for conducting NFIs, plot coordinates are typically confidential. However, as mentioned by Gessler *et al.* (2024), a study on the behaviour of landowners regarding their awareness of plot locations could be conducted on sites that are not linked to NFIs. Since no such studies are available yet, we offer a list of practical examples that show adverse effects of sharing plot locations.

In 2012, members of an environmental NGO replaced newly planted Douglas firs with beech seedlings in Germany, claiming the land owner had violated nature conservation laws (Sebald, 2012). While this was not the case here, it can be argued that providing the exact location of NFI sample plots gives way to such instances. The Heads of NFIs in several countries reported being contacted by landowners that had observed field workers during NFI assessments and asked if they should not touch stands that contain NFI plots as to not tamper with the results of the inventory (J. Breidenbach & K. Schadauer, pers. comm.). It stands to reason that not every landowner puts in as much effort to find out who is in charge and contact them, but instead may just not harvest in the vicinity of the plots, if plot coordinates were openly available. This would alter the sample and make it unrepresentative. The Swedish Head of NFI reported being asked for the locations of sample plots by county administrators so they could lime sites with bad soil status (J. Fridman, pers. comm.). Similarly, after an inadvertent leak of a sample site location for game damage around Gmunden, Austria, a tree stand was set up just next to the plot to improve hunting conditions (see Fig. 1). This was likely done to mask the severity of game damage in the upcoming sample period, thus impairing the integrity of the sample (K. Schadauer, pers. comm.). In addition to all these examples, the problem of observer bias has been described extensively in other works (e.g. Beetson et al., 1992; NSDNR, 2004; Curtis & Marshall, 2005; Köhl et al., 2006; Picard et al., 2010; Räty & Kangas, 2019).

While the FAO (2017) supports the notion for sharing data, they also suggest not making the exact locations of plots accessible. The IPCC (2006) guidelines for greenhouse gas monitoring also consider the secrecy of plot locations as good practice where there is no temporary control sample, due to the risk of management differing from other areas nearby and the subsequent unrepresentativeness leading to the above-mentioned problems including a potentially biased estimator used for the report. Countries may face severe consequences if their reporting deviates from good practice.

Data from NFIs are often directly used by statistical offices and form an integrative part of their published official statistics. Thus, the NFIs, as well as statistical offices, have to follow statistical codes. One example is the European Statistics Code of Practice (CoP) setting standards for developing, producing, and disseminating European statistics (European Commission, 2017). In the 16 principles, clear statements on privacy and data protection as well as on accuracy and reliability can be found, which are in contrast to openly accessible coordinates of raw data. For instance, principle 5 states: 'The privacy of data providers, the confidentiality of the information they provide, its use only for statistical purposes and the security of the data are absolutely guaranteed' (European Commission, 2017, p. 11). Furthermore, indicator 5.6 states: 'Strict protocols apply to external users accessing statistical microdata for research purposes' (European Commission, 2017, p. 11). Similar statements can be found in the statistical codes of Argentina, Costa Rica, Nigeria and the Philippines that each include a section on guaranteeing the confidentiality of information used to produce official statistics (INDEC, 1999; Federal





Fig. 1 Tree stand for hunting in the background built up next to National Forest Inventory (NFI) site location in Gmunden, Austria. The stand was built up to improve hunting conditions, thus distorting the sample.

Republic of Nigeria, 2007; Philippine Statistics Authority, 2013; INEC, 2019).

Additionally, publishing the exact location of NFI plot locations may also breach the EU's General Data Protection Regulation (GDPR). By looking up the plot locations' coordinates in the land registry, the owners of the properties can be unambiguously assigned. Therefore, these data can be classified as 'personal data' according to article 4 of the GDPR. According to the GDPR, the processing of personal data, which includes its distribution, is only lawful under certain circumstances, such as the data subject giving consent to the processing of their personal data.

Taking all the arguments listed above into consideration, there is a need to make case-by-case decisions for granting access to the locations, as studies requiring NFI data are so diverse that a general framework might not ensure adequate data handling in all cases. Nevertheless, we fully support Gessler et al.'s (2024) notion of the need for a fully transparent and harmonised process for granting access to data. Two main aspects have to be considered when taking the decision to grant access to plot information. On one hand, if the purpose of the study is in conflict with the credibility of NFIs in general, the partners have to prove that they are solely scientifically interested in these data and do not hold a political, economical, or other conflict of interest. This is corroborated by the Swedish NFI that has turned down applications where researchers had projects with commercial companies, highlighting the need for case-by-case decisions (J. Fridman, pers. comm.). On the other hand, compliance with Section 26 of the GDPR must be ensured. If a semi-automated data-sharing facility was to be implemented it should follow the general principles mentioned above.

The European National Forest Inventory Network offers several examples that used plot information for remote sensing studies,

New Phytologist (2024) **242:** 347–350 www.newphytologist.com

which can be found in Lanz *et al.* (2019) and within contracts with the EU's Joint Research Centre. In particular, these examples can be found in the specific contracts no. 7, 9, 13, 17, and 19 under the framework contracts 2007/S 194-235358, 2012/S 78-127532, and 2017/ 934 340 (K. Schadauer, pers. comm.).

It is important to mention that Gessler et al. (2024), Päivinen et al. (2023) and subsequently this paper have an emphasis on arguing from a Northern hemispherical, more specifically from a European perspective. However, the challenges of forest inventories in the Global South are different to those in the North. In tropical rainforests, the work is generally considered more expensive, and it requires a particularly profound knowledge of the ecosystem (ForestPlots.net et al., 2021). Yet, most countries in Latin America and the Caribbean stated that financial sustainability is a common concern for NFIs (Brandeis et al., 2022). Meanwhile, institutions requesting open access to forest data are often wellfunded and situated in the Global North (de Lima et al., 2022). The imbalance in funding and equity highlights the need to take socioeconomic factors into account in this discussion as well. Additionally, tenure can be contested or overlapping and illegal logging common as reported for Southern Africa (The SEOSAW partnership, 2021). Especially in situations like these, revealing the location of valuable species may pose a risk to forest owners and their forests (de Lima et al., 2022).

Just as stated by Gessler *et al.* (2024), we also presume that some of our methods for sharing data are consistent with theirs, and we are also interested in maintaining a balance between the openness and credibility in general. There are several ways to work around the disclosure of plot locations such as only making aggregated data accessible or providing only approximate locations (see also McRoberts *et al.*, 2005; FAO, 2017). If accurate co-registration between remote sensing and plot data is essential, for example for

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modelling purposes, NFIs can provide such a required data set by intersecting the data themselves, returning a complete data set without providing plot locations. The quality of the resulting models is not compromised by this approach. However, the approach would require additional funding, as it is most likely not covered by the existing budget of the NFIs, especially in the global south. In conclusion, researchers' data needs can often be satisfied without the exact location.

Acknowledgements

We thank Iciar Alberdi for the valuable insights on National Forest Inventories in Latin America.

Competing interests

None declared.

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Key words: National Forest Inventory (NFI), observer bias, plot coordinates, remote sensing, statistics code.

Received, 6 October 2023; accepted, 17 January 2024.