

Repeatability and transparency, why code belongs in the main text

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NSTF Discussion Forum:
Research software as enabler and research output

8 October 2026



South African
Journal of Geomatics

Publisher: CONSAS Foundation, Dolphin Road 73, Bloubaerg, 7441, South Africa

ISSN: 2225-8531



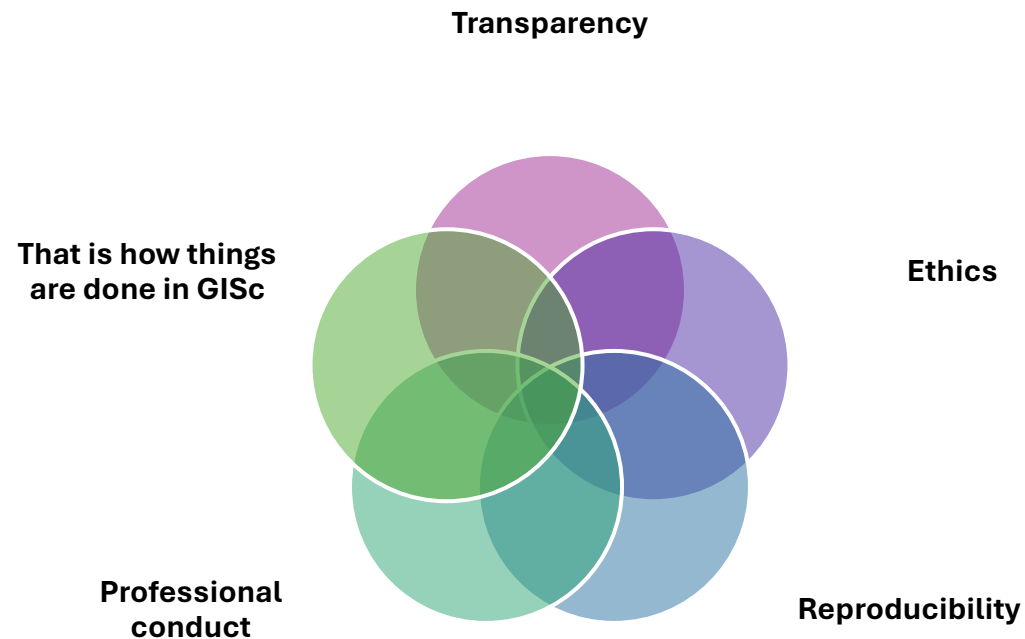
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A bit about me

- Staff at the University of Pretoria
- Worked in the GISc industry, registered with the South African Geomatics Council (SAGC): [GPr GISc1194 \(SA\)](#)
- Training in physical geography and geomatics
- Not a programmer but know how to program
- Voracious (responsible) user of AI, predominantly LLMs, but also ML
- Section Editor for the South African Journal of Geomatics (SJAG) since 2019
- Current Editor of the [SAJG](#)
 - That is how Anelda found me...

Open data and code in geomatics



- Aligning South African geomatics scholarship with national & international open science policy and frameworks
- Open data and code are not new in geomatics

Who is the SAJG?

- First published in 2012
- Revival of the South African Journal of Surveying and Geo-Information
- Which was a revival of the South African Survey Journal, founded in 1923
- Approved by the South African Department of Higher Education & Training
- Fully OA (Diamond), no APCs
- 2 issues a year
- Peer-reviewed original papers
- Broad discipline of Geomatics
 - Surveying techniques, technology, and applications
 - Mine surveying
 - Hydrographic surveying
 - Cadastral systems
 - Land tenure
 - Development planning
 - GIS; photogrammetry; and remote sensing
 - GISc education
- Access at <https://www.sajg.org.za/>

Recent changes at the SAJG

- Author guidelines limited manuscript to 12 pages to reduce printing costs (only hard copies available in 2012)
- Now fully online – new author guidelines in 2026
 - Review of existing guidelines for geomatics journals internationally
 - Experience and own views

Who requires/encourages code inclusion?

Journals with strict code-sharing policies

- Computers & Geosciences (Elsevier)
 - Mandates open code submission
- Geoscientific Model Development (GMD) (Copernicus / EGU)
 - Requires a dedicated "Code and data availability" section in every manuscript
- Applied Computing and Geosciences (Elsevier)
 - Requires open-source code and reproducible workflows deposited in public repositories

Journals with strong open-science & code-sharing policies

- Journal of Spatial Information Science (JOSIS)
 - Encourages sharing
- ISPRS International Journal of Geo-Information (IJGI)
 - Requires a code and data availability statement
- Computers, Environment and Urban Systems (CEUS) (Elsevier)
 - Requires a code and data availability statement
- Transactions in GIS (Wiley)
 - Encourages sharing

Open data repositories

General purpose

- Zenodo (integrates with GitHub for citable DOIs)
- Figshare
- Harvard Dataverse
- Open Science Framework (OSF)
- Mendeley Data
- Dryad

Specialised & domain specific

- PANGAEA
- IEE DataPort
- Environmental Data Initiative (EDI)

What does this mean?

Limitations

- SAJG explicitly encourages authors to submit both a Data Availability Statement and a **Code Availability Statement** alongside manuscripts
- Not a requirement, but strongly encouraged
 - Not prescriptive
 - Not peer-reviewed
 - Not checked for AI

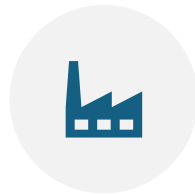
Advantages

- Citable script DOIs ensure long-term preservation and credit for research software contributions
- Openness
- Transparency
- Knowledge transfer

So why a code statement?



The scientific
method



Geomatics industry



South African data
and research
landscape

The scientific method

- Code as a primary method
 - In modern geomatics, raw spatial data is transformed through complex analytical scripts, algorithms, and models
 - Written text in 'Methods' sections can no longer fully capture intricate GIS and remote sensing workflows without the underlying executable code
- Reducing 'Black Box' science
 - Keeping spatial scripts closed creates opaque 'black box' research where calculation errors or biased parameters remain hidden
 - Open scripts allow peer reviewers, researchers, and public practitioners to directly inspect transformation algorithms
- Enabling true verification
 - True scientific validation requires both data accessibility and computational reproducibility
 - Submitting runnable scripts alongside spatial datasets empowers the global community to re-run, verify, and extend findings

South African research landscape

NRF & DSTI open access policies

- Public grant bodies (NRF, DSTI) require Data Management Plans (DMPs) enforcing 'as open as possible, as closed as necessary'
- National Open Science Policy mandates public accessibility for government-funded research publications and raw datasets
- Grant compliance strictly monitors data deposit, but Code Management Plans (CMPs) remain largely absent from funding criteria

SASDI & SAGC professional governance

- Spatial Data Infrastructure Act (Act 54 of 2003)
 - Establishes SASDI and an electronic metadata catalogue to eliminate duplication and data silos
 - The legislative goal of preventing spatial data duplication must logically extend to sharing open geomatics scripts and software
- SAGC ethical code
 - [South African Geomatics Council \(SAGC\)](#) mandates honesty, integrity, and public accountability—requiring transparent workflows

Geomatics as a profession – the role of FOSS, FAIR & CARE

Open source/access culture

- Geospatial discipline heavily relies on open software platforms, including QGIS, SAGA GIS, GeoDa, and gvSIG.
- Links to Research Software Alliance (ReSA)
 - Global movement championing research software as a first-class scholarly output alongside research data
- Software sustainability is implied
 - Recognising that custom computational scripts require ongoing maintenance, citation, and institutional support

FAIR & CARE as guiding principles

- FAIR for software (technical)
 - Ensuring spatial code and data are Findable, Accessible, Interoperable, and Reusable across platforms.
- CARE Principles for indigenous/sensitive data:
 - Collective Benefit, Authority to Control, Responsibility, and Ethics—balancing openness with protection
- Ethical geomatics
 - Combining FAIR and CARE guarantees technical interoperability without compromising privacy, POPIA compliance, or community rights
 - Direct link to the SAGC

The way forward?

For researchers

- Code practices/best practices
 - Implement version control (Git/GitHub)
 - Submit analytical scripts alongside journal manuscripts
 - Archive code in persistent, citable repositories (Zenodo, Mendeley Data, et.c) associated with DOIs

For policy makers

- Code plans
 - Frameworks should require mandatory Code Management Plans (CMPs)
 - Align code infrastructure with SASDI spatial metadata goals

The way forward?

For journals and reviewers

- A code review?
 - Transition from 'encouraged' code statements to mandatory requirements
 - Develop structured peer-review checklists for computational scripts
 - Ensure scripts run cleanly and produce declared spatial outputs

My personal view

Open geospatial data and open analytical code together form the irreplaceable bedrock of trustworthy, ethical, and reproducible geomatics research in South Africa.

Thank you for your time!

You can contact me at christel.hansen@up.ac.za

And please submit to our journal!



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