Designing A Land Use Planning Solution for Land Degradation Neutrality

The GEO-LDN Competition

Concept Note, 04/08/2020

Earth observations (EOs) have never been in more demand than today. On the supply side, meeting this demand will require innovation and collaborative action, especially given the potential risk of budget revisions for EO-related data supply programmes due to the on-going impacts of COVID-19 on the global economy.

The Group on Earth Observations Land Degradation Neutrality (GEO-LDN) Initiative is sponsoring an international technology innovation competition to design and build software analytics solutions to support the development of an open source tool to assist land use planning in the context of Land Degradation Neutrality.

The competition will culminate in a prototype demonstration and award ceremony at the occasion of the nineteenth session of the UNCCD Committee of the Review of the Implementation of the Convention in the first quarter of 2021 in Bonn, Germany, where decision-makers will have the opportunity to provide real time feedback, vote their top prototype and further develop their capacity to use EO data in preparation for the UNCCD 2021-2022 national reporting process.

1. Background

Earth observations (EOs) have never been in more demand than today. The COVID-19 pandemic has fast-tracked the need for EO data and services, especially Big Data Analytics, for crisis monitoring, for analyzing the impact of the disease outbreak on the global economy, for planning responses and for scenario development.

Building back better after this pandemic will require understanding and addressing another global crisis, the crisis in unsustainable land use. As leading contributors to the loss of wild habitats and terrestrial biodiversity, changes in land cover and land use are recognized as a primary transmission pathway for emerging infectious diseases, and more optimal use of land will be central to building back better in the wake of the pandemic. The sustainable management of land and its restoration provide a wide range of benefits to society, reduce pressure on natural systems and contribute to climate change mitigation and adaptation. Land Degradation Neutrality (LDN) – "a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems" (decision 3/COP.12, UNCCD, 2015a) - remains a key mechanism in the global response to the challenges posed by the COVID-19 crisis and has the potential to act as an accelerator and integrator for achieving the Sustainable Development Goals (SDGs). To date, over 120 countries have committed to setting LDN targets. More than 80 countries – over two thirds – have already set their targets, and many have secured high-level government commitment to achieve LDN.

The Group on Earth Observation Land Degradation Neutrality (GEO-LDN) Initiative - a unique stakeholder-driven initiative with a clear policy mandate from the United Nations Convention to Combat Desertification (UNCCD) - aims at helping national and local actors in all countries use EOs to achieve LDN, as set out in the SDG target 15.3. It promotes and supports the collaborative development, provision and use of EO datasets, quality standards, analytical tools and capacity building to avoid, reduce, and reverse land degradation, thereby addressing some of the most common bottlenecks in the use of EOs.

2. The GEO-LDN Competition: Designing A Land Use Planning Solution for Land Degradation Neutrality

Working Group 3 (WG3) of the GEO-LDN Initiative is working to support the development of an open and collaborative data analytics platform – a system of systems – to support planning, implementation, and monitoring of actions to achieve LDN from EO and other data sources. These tools and methods are being developed using a modular approach, so that tools can evolve as technology and user needs change. The WG can therefore leverage work already conducted under related initiatives (Trends.Earth, Open Foris, openEO, EO4SDG, CEOS, etc.).

With a view to inspire innovation as well as collective and coordinated action towards its goals, the GEO-LDN Initiative, in collaboration with the UNCCD Science-Policy Interface, is sponsoring a competition to support data analytics around land use planning in the context of LDN, with the aim of connecting the technical and software development expertise of third party groups or organisations with end users at the forefront of the on the ground action that is needed to achieve LDN.

3. Challenge

The GEO-LDN Competition is an international technology innovation competition to design and build software analytics solutions to support more transparent and well-informed land use decisions at the local to national level across the globe. Winning solutions will be promoted by the GEO-LDN Initiative and the UNCCD for use by all countries committed to set voluntary LDN targets and to monitor and report on SDG Indicator 15.3.1 "Proportion of land that is degraded over total land area".

The challenge is to develop a software tool to implement, or support the implementation of a "neutrality mechanism" for LDN within a well-established open source model that allows for trade-off analysis, and which can then be adapted for use by any other such modelling tools. See the competition rules for specific information on how each entry will be evaluated.

A "neutrality mechanism" refers to a no net loss land use planning module that would allow users to generate scenario maps of the anticipated future impact of all land uses for a given area in net terms. The resulting "neutrality maps" would allow the visualization and quantification of gains (where interventions are planned to reverse past land degradation), stable areas (where the land-based natural capital can be maintained through good management), and anticipated losses (where realistically it is determined that land degradation may not be avoidable). No net loss would occur when the planner is able to generate a scenario where all anticipated losses can be counterbalanced with planned gains for each land type, while the integrity of all other land is maintained.

Because land degradation is driven by many competing social, economic and environmental demands for land resources, the tool also needs to have the capacity to analyze trade-offs in ecosystem services.

Specific ecosystem services will have different values in different places to different stakeholders, and human values may change over time. Where decisions involve trade-offs between ecosystem services, or between environmental and social goals, transparent participatory processes should be applied to prioritise between different ecosystem services, based on needs and goals of the stakeholders.

More details about the neutrality mechanism for LDN are available in Cowie et al. 2018, and in Module C of the Scientific Conceptual Framework for Land Degradation Neutrality.

The overall aim is that that the tool will not only be useful (i.e. data and information meet information needs) and usable (i.e. the tool allows easy access) but that it will also be used. Therefore, it is important not to design *for* the users but to design *with* the users from the very beginning, in line with the Principles for Digital Development. Users must be actively involved in the co-design and development of the prototype, which should serve a concrete use case on the ground. Competitors should *demonstrate* that their solution works, in the context of this concrete use case and corresponding data sets. Further details on these requirements are listed in the competition rules.

By addressing this challenge, the competition will contribute to fulfill decision 18/COP.14, in which country Parties requested the UNCCD Science-Policy Interface to stimulate the development of "a demonstration, resulting from an open call, of how LDN can be incorporated into existing open source land use planning and trade-off analysis tools."

4. Why participate?

All participants will benefit from:

- Valuable feedback on their ideas from potential end-users;
- Access to and support from internationally acknowledged technical experts in the field of Earth Observation, big data analysis, land use planning and LDN;
- Support and facilitation in development of the prototype;
- Access to a vibrant community of practice under the auspices of the GEO-LDN Initiative.

The top three competitors will benefit from:

- A license for free access to use Google Earth Engine (GEE) as part of their solution. The duration of the license will be for a 2-year period;
- In-kind technical support and mentoring by EO Data Science through an outreach programme to help their solutions obtain the results needed from GEE. EO Data Science is a dedicated Earth Observations company and a leading GEE partner globally.

The winner(s) of the competition will benefit from:

- Opportunity to develop the tool for the benefit and use of over 120 countries committed to set LDN targets;
- Financial and technical support valued at USD 100,000 for the transformation of the prototype into an operational and scalable tool;
- Opportunity to further showcase the tool(s) at the fifteenth session of the UNCCD Conference of the Parties and at the GEO Week 2021.

5. Timeline

The competition will run from July and conclude with a final judging and award ceremony at the occasion of the nineteenth session of the UNCCD Committee for the Review of Implementation of the Convention (CRIC 19) in the first quarter of 2021, in Bonn Germany.

The full timeline is below:

- **July 20, 2020, Competition announcement**
- **August 3, 2020, Virtual briefing session**: Interested competitors will be invited to attend a virtual briefing session where the competition organizers will provide guidance about the product(s) to be developed.
- **August 3-21, 2020, Matching process:** The organizers will support a matching process to aid individuals interested in applying that have not already identified a consortia.
- **August 31, 2020, Proposals due:** Interested competitors will submit a proposal using the template provided in the call for proposals. Only proposals within the scope of the competition will be admitted to the virtual pitch event.
- **September 30, 2020, Virtual pitch event**: Admitted competitors will pitch their ideas to a wider range of users and a technical jury in a virtual event open to all competitors where they will get immediate, actionable feedback on their ideas. Based on votes from both the users and the technical jury according to defined transparent criteria, the top ten viable ideas will move-on to the next stage in the competition. Viable ideas from individuals or micro-businesses will receive 5,000 USD in seed funding for the development of their prototype;
- **November 16, 2020, Sneak preview virtual workshop:** The top ten competitors will present beta versions of their prototypes to the users and to the technical jury who will both be invited to vote according to defined transparent criteria. The top three competitors will then flesh their ideas out into full-fledged prototypes that match users' needs;
- **First quarter of 2021, Demo session and award ceremony at CRIC 19**: The top competitors will be invited to present their full-fledged prototype at a special event in front of a technical jury as well as government representatives that have gathered at the occasion of CRIC 19, as potential end users of the tools. For a more direct interaction between developers and users, demo stations will be set up outside the main meeting room and developers will remain available throughout the session for live demonstrations that will allow up close showcase of what the tools can actually do. In a closing award ceremony, users will be invited to vote their top tool alongside the technical jury according to defined transparent criteria.

6. What is expected at each stage of the competition?

The competition will be a staged, iterative process, in which competitors will be expected to show steady progress in terms of the design and functionality of their prototype tools. Teams should focus on ensuring their work is directly responsive to the challenge (see Competition Rules below) and on addressing the needs of users. The judges are not looking for teams to spend significant time on graphic design or on development of flashy presentation materials. It is understood that teams are developing a prototype – the winning entry does not need to be a completed tool that is ready for market, but it will be expected to address the key elements outlined in the Competition Rules.

The below outlines the expectations of what judges will be looking for at each stage of the competition:

- **Virtual pitch event (September):** Teams will present slide presentations outlining the key elements of their proposals, and how each proposal responds to the key elements of the

challenge (see Competition Rules). Teams' presentations should make clear the expected final state of the prototype that they will produce by the first quarter of 2021, including the functionalities that will be present, and how they will demonstrate the tool at CRIC 19 if they are selected to advance to the final stage of the competition.

- **Sneak preview virtual workshop (November):** At this stage of the competition initial versions of the prototypes should be under development, and in addition to describing the status of the development and demonstrating any functionalities already present in the tool, teams might choose to present user stories with respect to any functionalities that are to be developed later in the process.
- **Demo session (First quarter of 2021):** At the demo session at CRIC 19, the final prototype including all functionalities described in the initial proposal and virtual pitch event should be complete. Teams will be expected to demonstrate these functionalities live using real data. Teams should also highlight how further support and co-development with UNCCD, GEO-LDN, and other stakeholders would further advance the tool (in terms of functionality, increased uptake, linkage with other tools, or any other relevant advances). Judges will be focusing on how teams address the key elements of the challenge as outlined in the Competition Rules.

7. Competition rules

- Assessment of the proposed solutions will be based on the opinion of the GEO-LDN leadership group (the Judges), reviews of the proposals from an expert panel, and votes in support of proposals from the GEO-LDN community. The Judges decision is final.
- Judges will score each criterion out of a maximum of 3 points:
    - 3: Excellent (accept the proposal as is)
    - 2: Good (accept proposal with minor revisions)
    - 1: Poor (major revision needed)
    - 0: Reject (no revision possible)
- Entries must meet all of the below requirements to qualify for an award:
    - Entries must be directly responsive to the challenge, including:
        - Introducing a neutrality mechanism into land use planning
        - Working within a well-established open-source model
        - Having the capacity to analyze trade-offs inherent in land use planning
        - Be able to be adapted for use with other modeling tools
    - Copyright for all entries will be retained by the submitters. Entries must be developed on an open source platform, and be made freely available under the GNU General Public License version 3 or later. Exceptions to this license requirement (for example for those competitors wishing to release code under an alternative open source license) may be granted, but exceptions must be submitted at the proposal stage of the competition, and reviewed and approved by the GEO-LDN leadership group.
    - Entries must be able to be connected to, integrated with or to process outputs from, Trends.Earth (this could be by direct linkage through technical means such as code written to link the two, or by allowing users to import or export results from one tool for use in the other, for example).
- Using the FAIR data principles and the Principles for Digital Development as guiding principles, proposals will be additionally evaluated on three main criteria: Excellence, Impact and Implementation.
    - Excellence will consider factors such as:

        - Is the scientific base of the tool clearly and convincingly using the state-of-the-art knowledge in this field?
        - Are the methods implemented in the tool consistent with those presented in the Scientific Conceptual Framework for LDN and Good Practice Guidance for SDG Indicator 15.3.1?
    - Impact will consider factors such as:
        - Does the tool demonstrate the use of appropriate datasets and analytics to address a specific concrete use case on the ground (for example information and/or outputs that could feed into ongoing (sub-)national land use planning process)?
        - Does the proposal show a user-centered design and does it consider country/ region / community specific structures or needs?
        - Does the tool have potential for ready uptake by users globally?
        - Does the tool demonstrate the potential for continued co-development and co-implementation with the UNCCD, GEO-LDN Initiative and relevant stakeholders/end users?
        - Does the proposal demonstrate how long-term stakeholder support and long-term use of the innovation is envisioned?
        - Does the tool provide process guidance for the implementation of the LDN framework throughout the planning process?
    - Implementation will consider factors such as:
        - Does the tool work within a well-established open source model? To what extent and how easily can it be adapted for use with other modeling tools?
        - Is/are the software tool(s) able to access, process, store, retrieve and connect EO, spatial and other datasets?
        - Does the tool include measures to address data protection for sensitive data (e.g.: country owned data)?
        - When a proposed innovation makes use of cloud computing, does the proposed solution allow code to function across cloud processing platforms (for example tools like those being developed by openEO (https://openeo.org/)?
        - Are the current readiness of the proposed tool and expected readiness level at the end of the competition adequate?
        - Is the work plan for tool development coherent and credible?
        - To what extent does the tool use the FAIR data principles?

8. Who is eligible?

- Any person or organization of any kind is eligible to participate;
- Successful teams will require a range of skills (technical, policy, planning, etc.). Therefore applications will be accepted from consortia. Consortia must consist of a minimum of:
    - At least one technical implementer;
    - At least one representative of a (sub-)national stakeholder group (i.e. data user) – such as a local government institution involved in territorial planning, a civil society organization engaged in sustainable land management, an indigenous community fighting against land degradation and land take, a farmer group managing the

conversion to organic farming, or any other governmental[1] or non-governmental[2] stakeholder involved in avoiding, reducing and reversing land degradation;

- Employees or affiliates of the UNCCD, GEO or any of the organisations affiliated with any member of the GEO-LDN Leadership team can enter the competition, but will not be eligible to receive the financial component of the award.

9. Application Form (please submit your application using the online Application Form)

- Contact details of the team leader:
  - Name:
  - Agency/institution:
  - Mailing address:
  - Email:
  - Phone:

- Consortium details (1 page max)
  - Technical implementer (name of the individual or organization in the consortium with technical programming and/or planning expertise. Indicate all collaborating individuals and organizations, and the relevant focal points from each, with contact information):
  - Representative(s) of a (sub-)national stakeholder group (i.e. data user) – include at least one organization (indicate all collaborating individuals and organizations, and the relevant focal points from each, with contact information):
  - Other collaborators (indicate all collaborating individuals and organizations, and the relevant focal points from each, with contact information):
  - How will the stakeholder group be engaged in the design / co-creation?
  - Are any individuals or organizations participating in the consortium employees or affiliates of the UNCCD, GEO or any of the organisations affiliated with any member of the GEO-LDN Leadership team? (Such individuals or organizations can enter the competition, but will not be eligible to receive the financial component of the award).

- Executive summary (1 page max)
  - Concisely summarize the problem that the tool addresses, how the tool addresses it, and what the anticipated impacts are, especially in terms of how they support national efforts to achieve Land Degradation Neutrality. Describe the analytics and data sources incorporated into the tool, its implementation and your assessment of its potential impact.

- Questions on qualifying requirements (3 pages max)
  - Describe how the tool will introduce a neutrality mechanism into land use planning.
  - Within which well-established open-source model for land use planning will the tool run?
  - Will the tool have the capacity to analyze trade-offs inherent to land use planning? Indicate what trade-offs will be considered, and how they will be analyzed.

[1] This may include, but is not limited to the National Focal Points of the UNCCD.
[2] This may include, but is not limited to civil society organizations accredited with the UNCCD.

- Does the tool have the potential to be adapted for use by other open source land use planning modelling tools? Indicate for what other modeling programmes will the tool be adaptable for use.

- Please confirm the consortium accepts to adopt the GNU General Public License version 3 or later for the tool. If you wish to release the code under an alternative open source license, please specify the specific license, and the reason you would like to use that license instead of the GNU GPLv3.
- How will the tool connect to Trends.Earth?

- Project plan (2 pages max)
  - Describe the readiness of your proposed tool to be implemented, and the work required before it could be implemented globally. Describe your existing ability and resources to implement your proposed tool. Describe how you will take advantage of this engagement opportunity if your proposal is selected. Describe your willingness to support the implementation of your proposed tool beyond the duration of the competition.

10. More information and contacts

For more information please visit the competition's website at https://www.geo-ldn.org/, or contact the competition's organizers at info@geo-ldn.org.