B-TEAM: Biodiversity Tools for Ecosystem Assessment and Management

ABSTRACT

2000 chars...

Project Information

Short Title: B-TEAM ;P

Project Abstract

Give us the cash, we're awesome! (2000 Chars)

Details of Research

Background and Problem Statement

(3000 Chars) *Provide a brief introduction to the proposed project and indicate why the project is needed.*

Habitat loss and habitat degradation are the primary threats to plant diversity in South Africa[1] and likely threaten all forms of indigenous biodiversity. While the prevention of land cover transformation of biologically sensitive areas is mainstreamed into land use planning through the listing of threatened ecosystems under the National Environmental Management: Biodiversity Act (NEMBA - Act 10 of 2004), there are a number of gaps in the knowledge value chain from data collection to decision support that inhibit appropriate development decisions. Firstly, there are major gaps and biases in our primary biodiversity data (collections data and related) and derived products (e.g. the VegMap), as recognised by the FBIP programme and others, and current data products give no indication of this uncertainty. Secondly, our knowledge of the implications of the threats to biodiversity and how to incorporate them into ecosystem threat assessments is far from perfect - currently only 3 of the 8 recognised criteria used to identify threatened terrestrial ecosystems are applied across all ecosystems, and many potential threats are not included in the criteria (e.g. climate change). Thirdly, there is huge variation in the quality and rigour of environmental impact assessments (EIA), and while there are many regulations in place, monitoring and policing of both EIA standards and the implementation of or compliance with EIA recommendations is almost non-existent[2]. In addition, the EIA review process is typically slow, gaining the perception as a barrier to progress among developers and politicians, often leading to political interference and administrative malpractices. Lastly, while great effort is made to share biodiversity knowledge and provide decision support tools (e.g. http://bgis.sanbi.org/), these systems are largely designed for the unidirectional flow of information to end users, limiting engagement and eliminating incentives to improve the knowledge value chain. For example, academia demands that scientists "publish or perish" and waste as little time as

possible on peripheral activities despite their potential value to society. If the system designed to share biodiversity knowledge and provide decision support tools is not accessible to and amenable for research purposes then research outputs are unlikely to be aligned with or readily assimilated into the knowledge value chain. This is clearly evidenced by repeated recognition of ecosystem condition and land cover change as research priorities in South Africa[3,4], yet there have been no proposals of methods to assess this criteria in the identification of threatened terrestrial ecosystems.

The key to developing an effective knowledge value chain (and regulatory system?) is providing a structure that serves the needs of all parties and allows multidirectional transfer of relevant information at appropriate scales, facilitating collaborative learning. Fortunately this is readily doable in the context of South African environmental management. Here we propose a research programme aimed at:

1. Assessing the uncertainty in key spatial datasets relevant to biodiversity (vegmap, land cover, protected areas)

2. Developing an ecosystem condition monitoring tool based on remote-sensing time series that can be used to identify changes in ecosystem condition or land cover type.

3. Boosting South African ecosystem threat assessment research and integrating it with international ecosystem redlisting efforts (Rodriguez2010).

4. Developing an EIA decision support tool that:

   (a) allows EIA practitioners to upload a polygon or draw the boundaries of their proposed development parcel and returns a report that:

      - indicates the threat status of the vegetation in the proposed parcel,
      - calculates the impact that transformation of that parcel will have on the threat status of the ecosystems impacted,
      - indicates the level of certainty in the data,
      - provides a list of recommendations.

   (b) records data submitted by EIA practitioners that can be vetted against approved/rejected development applications and used to:

      - assess whether development has begun on the land parcel prior to submission of the EIA,
      - monitor development progress and compliance with EIA recommendations,
      - calibrate land cover type transitions observed using remote sensing.

5. Semi-automated reporting of spatial biodiversity statistics for the National Biodiversity Assessment and similar national and international biodiversity reporting needs.

Proposed Activities and Work Plan

(3000 Chars) *Provide a brief explanation of what will be done, how, and if possible where, as well as who will be involved in each activity, and what the timeframes are (i.e. the start and end date of each activity).*

Potential Outcomes and Impact

(6500 Chars) *Indicate the relevance of the proposed research in relation to the following expected outputs:*

- *What will be produced by the project in line with the programme objectives? An indication of the extent of these outputs is encouraged (how many?) (300 words)*
- *Impact on Global Change understanding and /or the Bio-Economy knowledge field(s). Include a brief description of what will change because of the project, who will use the knowledge and information, and for what purpose. (500 words)*
- *Explain how you will ensure alignment between needs of users and what the project produces, and how the outputs from the project will be taken up and applied by users. (500 words)*

Major outcomes/impact (needs splitting up by section above):

- Collection of primary biodiversity data to aid in estimating uncertainty in spatial biodiversity datasets and ground truth remote sensing analyses.
- Facilitation of global change and conservation research at scales relevant to development and biodiversity conservation and management in South Africa (see Ackerly et al work in California)
- Tools to assess and monitor ecosystem condition, but that may also be of value to land managers in terms of identifying unexpected changes on ecosystem condition in parks and nature reserves.
- Bring South African ecosystem threat assessments in line/harmonized with international redlisting initiatives such as the IUCN Red List of Ecosystems (Rodriguez2010, Keith et al)
- Provide a tool to improved the quality of EIAs, but that could also be used to regulate and monitor EIA practitioners and standards by:
  - reducing GIS errors
  - vet/rating reports submitted by EIA practitioners
- Reduced turn-around time for many EIA applications (dependent on policy changes).
  - Sites with low biodiversity value and low data uncertainty would require less intensive EIA procedures.
  - Sites with high biodiversity value and low data uncertainty could be rejected out of hand or require very intensive EIA procedures.

  - Sites with high data uncertainty may require an iterative EIA procedure.

- Capture feedback and data (i.t.o EIA ground assessment and development/land cover change) that can be used for both improving baseline datasets and monitoring progress and compliance.

- Semi-utomated updating of baseline data and threat status and reporting (e.g. to NBA)

Financials

- Operating Costs

- Research Materials and Supplies

- Research/Technical/Ad Hoc Assistants

- Local Conferences Attendance (Travel and Subsistence)

- Local Travel (Travel and Subsistence)

- International Conferences (Travel and Subsistence)

- International Visits (Travel and Subsistence)

- Student Support

- Financials: Other Sources

CV

References

1. Raimondo, D. *et al.* *Red list of South African plants 2009*. (South African National Biodiversity Institute, 2009).

2. Saidi, T. *Environmental Impact Assessment as a policy tool for integrating environmental concerns in development* (Africa Institute of South Africa (AISA), 2010).

3. Reyers, B. *et al.* Ecosystem services, land-cover change, and stakeholders: finding a sustainable foothold for a semiarid biodiversity hotspot (2009).

4. Gillson, L., Midgley, G. F. & Wakeling, J. L. Exploring the significance of land-cover change in south africa. *South African Journal of Science* **108**, 03–05 (2012).

Notes - ignore

Factors key to the success of community-driven open source projects

- A "relatively clearly defined vision and a mechanism to communicate the vision early in the project's life"
- A clearly defined set of users who have a need that can be met by the software
- Well-articulated and clear goals established by the project's leaders
- Good project communication — a quality website, good documentation, a bug-tracking system and a communication system such as an email list or forum.
- Once a project has achieved its initial release, a software architecture that is modular — so future development tasks can be carved out at different levels of complexity for other developers to work on. (Modular architecture alone isn't enough — many abandoned projects were also modular, Schweik said.)

Challenges of EIA (Saidi 2010)

Lack of universally standardised impact prediction methodologies -"most predictions these days lack any scientific basis and validity" - Weaver and Sibisi

Ethical challenge - "Are the lives of butterflies or chameleons more important than that of human beings?"

Limited resources and technical abilities - "the volumes of EIA work required far exceed the expertise available to execute the EIA with the rigour and quality standards" - "the same situation repeats itself on the side of EIA review authorities"

Logistical problems - "assessments are sometimes undertaken too late in the planning process to contribute to decision-making, and are used instead to confirm that the environmental consequences of the project are acceptable" - "environmental impact management plans discussed in EIA reports are often not implemented; and the monitoring of compliance is almost non-existent" - "the listing of activities that require a mandatory EIA blind authorities from focusing on novel non-listed activities that may have more significant impact on the environment than some of the listed ones"

Wrong and undefined assumptions - "EIAs also look at projects as a 'point-source' of potential impacts. Thus, the possibilities of cumulative impacts coming from a number of different projects in a particular area is excluded, and this is a serious problem. In reality, it is these cumulative impacts rather than impacts from one particular project that gives rise to detrimental impacts on ecosystems. Related to this is the issue of boundaries: ecosystems, eco-zones and other larger ecological units are not self-contained."

Recommendations - "The more rigorous protocols for detecting and predicting impacts as outlined in the earlier writings (including text books) on EIAs should be re-visited and fine-tuned to suit current conditions and technological developments. These should then be adopted for use in EIA processes to reduce subjectivity that characterises most of the EIA work in the contemporary world."

Related: “Late payment has improved, but delays in the approval of engineering certificates and environmental impact assessments have to be attended to urgently” - South African Chamber of Commerce and Industry CEO Alan Mukoki in relation to government housing development schemes - Business Day Live, May 12 2016.

Trash text

The transfer of primary biodiversity data through the value chain from knowledge generation to application for decision-making is hugely hindered by lack of appropriate incentives and benefits for the various groups involved in collecting, processing, serving and using the data. Academia demands that scientists ”publish or perish”, and waste as little time as possible on peripheral activities despite their potential value to society. Data management staff are mandated with building and maintaining efficient information infrastructure, but achieving this mandate doesn’t guarantee job security if their products are not well conceived, marketed and, ultimately, used. Lastly, information brokers (consultants) and decision makers must ”shop” for information of value to their cause or to guide decisions, but are typically pressed for time and are rarely seriously berated for skimping on their research. Unfortunately, evidence-based decision making is unlikely to occur unless all participants in the knowledge value chain are incentivised to engage in the knowledge creation and dissemination process. While funding initiatives like FBIP may help get scientists in line, this is unlikely to last beyond the funding cycle, and is unlikely to aid data managers or affect end users.

[Consultants feed data back into the system... - revised vegmap, species records (with photos or collections), etc.]

In the absence of short-term economic benefits that occasionally accompany developments and land cover change, biodiversity conservation efforts must have a knowledge advantage.