

Environmental conservation

Improved confidence in mapping of wetlands for informed mining decision

A Water Research Commission (WRC) study has been completed on supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands.

Background

Water resource conservation authorities and developers, such as the departments of Environmental Affairs, Water and Sanitation (DWS), and Minerals continue to make development decision in a complex environment with competing needs, often resulting in the degradation of natural ecosystems, including wetlands. To improve decision-making in resource development, departments produce guiding documents to enhance regulation, such as the National Freshwater Ecosystem Protected Areas (NFEPA).

While NFEPA provided a tremendous step forward in consolidating existing knowledge and generating new knowledge on the distribution, type and condition of freshwater ecosystems, experience in its use has shown that there is room to improve the underlying data (particularly the wetland layers) used to identify the freshwater ecosystem priority areas, and that this has implications for the confidence that can be attached to the information on ecosystem typing, condition and threat status generated.

The NFEPA report acknowledges that, being of national scale, the datasets would not be completely accurate at fine scale and that there is an ongoing need to refine these datasets over time using more localised approaches. In fact where NFEPA maps are already being used in regulatory decision-making by DWS and other authorities, the concern is that they may be challenged by applicants if elements of the data upon which decisions are based are perceived to be flawed.

Rationale for the study

NFEPA data underpins tools being developed, such as an atlas of high risk freshwater ecosystems and guidelines for wetland offsets, both of which are initially being directed primarily at mining. The high risk atlas has been tailored specifically for regulatory authorities and mining houses, and identifies those freshwater ecosystems that are of particular value for biodiversity targets and/or the provision of ecosystem services.

This decision-support tool allows both regulators and mining companies to identify the level of risk attached to mining in particular ecosystems. Risk in this context is a multi-dimensional concept that ranges from risk to environment and human well-being due to loss of ecological infrastructure and ecosystem services, to business and reputational risk to the mining company.

There is a bewildering range of biodiversity-related data available, which regulators and applicants alike are expected to take into account in planning and decision-making, including NFEPA maps, threatened and protected ecosystems and species, protected areas and priorities identified under provincial systematic biodiversity conservation plans. Covering the coal-mining areas of the Mpumalanga Highveld, the atlas refines, collates and integrates existing spatial data to provide a single, coherent product accessible to both specialist GIS users and general users.

This is aimed at improving decision-making, providing clarity to mining houses and regulators, and ensuring everyone is using the same easily and freely available spatial data.

Associated with the task to identify high risk wetlands atlas is a project to develop offset guidelines for wetlands. As regulators, particularly DWS, increasingly require that the permanent, residual impacts of mining on wetlands be compensated for by means of offsets, a demand for consistent guidance on how such offsets should be implemented has arisen. The current project is expected to develop a set of best practice guidelines.

This WRC study came at the appropriate time, providing the most needed ground-truthing and refinement of the wetland data layers critical to ensuring better protection for wetlands in Mpumalanga. The manual was also developed to standardise the typing/classification of wetlands which will contribute significantly to setting the basis for potentially listing specific freshwater ecosystem types as 'Threatened' under the provisions of NEM: Biodiversity Act.

This listing is dependent on robust data on freshwater ecosystem type, condition of wetlands and threat status. Currently data are not of sufficient quality to allow this listing. The study then improved typing of aquatic habitats in Mpumalanga ensuring effective coverage by this legislation.

Methodology

A total of 365 quinary catchments spread across four Water Management Areas (WMA) within the Mpumalanga Highveld were targeted by the project. This study area was chosen such that it encompasses the majority of the opencast coal mining activities taking place in Mpumalanga.

A three-step approach was taken in the refinement of wetland data within these areas. The approach was developed with the intention of being applicable throughout the country, in order to support similar validation exercises of wetland spatial data in other areas. Firstly, desktop preparation was conducted with a thorough review of existing data. Wetland boundaries were delineated using aerial imagery and topographic data.

Secondly, a subset of selected wetlands was visited in the field for further ground-truthing and validation of the digitised data. Finally, the field and desktop data were collated and reviewed by wetland and GIS specialists. At each of these steps, data on wetland boundaries, type and condition were collected.

Training on wetland identification and desktop delineation was conducted during the course of the project. The primary result was an updated spatial dataset for the wetlands of the Mpumalanga Highveld. Additional analysis was conducted on this dataset to determine changes to ecosystem threat status, protection level and Freshwater Ecosystem Priority Areas (FEPAs) arising from refinement of the wetland data. The updated wetland data are now available for integration into a number of decision support tools and guidelines.

Key findings

Due to huge size of Mpumalanga province, the study focused on most contested mining area, the Highveld. The rest of the province still needs to be studied. An updated spatial dataset of wetlands in the Mpumalanga Highveld was developed (MHWet).

Wetlands, amounting to a total area of 590 391 ha, have been mapped representing 19.8% of the surface area in the study area. This contrasts strongly with the previous best state of knowledge, in the form of the National Wetland Map 4 (NWM4) or NFEPA mapping, which contained wetlands amounting to only 213 579 ha (or 7.2%) in the same area, a difference of 376 812ha wetlands that were not identified.

The final MHWet map identified 49 wetland ecosystem types in the study area, including one that has not been previously mapped in the country (Mesic Highveld Grassland Group 7_Floodplain), and two types that were not previously identified in the study area (Central Bushveld Group 1_Floodplain and Central Bushveld Group 2_Seep).

Approximately 30% of wetlands in the region are now mapped with a high degree of confidence. Datasets show that, for the study area, the national-scale NWM4 data had a low wetland detection accuracy, hence missing some wetlands. The area of FEPAs in the study area increased from 27% of the wetland area in the Mpumalanga Highveld to 36%.

The updated wetland data is being incorporated into the *Mining and Biodiversity Guideline*, *Wetland Offsets Guideline* and the *Decision support tool for high-risk wetlands*. The current project has significantly improved the quality and reliability of the wetland data in the area of concern and will result in a major improvement in the *Decision support tool for identifying high-risk wetlands and related landscape features for coal mining in the Highveld of Mpumalanga*.

Over 1 000 participants have attended training workshops, from a range of stakeholder organisations including mining houses, non-governmental organisations, consultants and government. Most of the participants felt that the training was effective in improving understanding of the key content of the guidelines and integrating biodiversity issues into mining more effectively.

The improved wetland data as a result of this project has thus strengthened existing tools and will enable mining houses and regulators to take full cognisance of wetland, water resource and biodiversity issues, in pursuit of a set of optimal development scenarios for the Mpumalanga Highveld.

In addition, the project also produced a *Wetland Inventory Manual*, which provides a standardised set of guidance to those interested in mapping wetlands at a systematic, landscape scale or to those involved in improving the National Wetland Map.

Conclusions and Recommendations

This study has contributed to the refinement of data on the extent, distribution, condition and type of wetlands in the study area. Standardised methods for ground-truthing and refining the NFEPA data have been developed, providing a consistent methodological platform for improving the quality of spatial wetland data in other parts of the country. Additionally, accuracy and confidence of wetland data have been significantly improved.

It is strongly recommended that development of a high confidence wetland inventory for the entire Mpumalanga Province and the other sensitive areas where NFEPA was used in decision-making be revised using the standard approach used in this study. Other products that draw on NFEPA, such as wetland risk map and wetland offset must incorporate the new knowledge generated by this study.

Further reading:

To order the report, *Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands*. (**Report No. TT 614/14**) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.