Increasing Environmental Department Profitability: EDA Technological Innovation (Newsletter)*

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EISs can take years to complete because of natural ecosystem complexity, decision criteria subjectivity, and inadequate analyses of baseline environmental data. Technical innovations in environmental data analysis (EDA) and decision-making can substantially decrease the time and costs of the process.

Applications for new or renewed environmental permits can be subjected to increased restrictions and constraints by regulators afraid of being sued. When compliance with the constraints becomes too costly the project is abandoned. Properly analyzing existing environmental data makes the application stronger by objectively addressing potential concerns.

Water constituent concentrations exceeding generic thresholds may result in fines, penalties, or costly remedial actions. Proof of adverse impacts to specified designated beneficial uses is not required. Technical innovations in data analysis provide environmental context and quantify likelihood of measurable harm.

Premiums for mined lands reclamation bonds can be costly and release criteria may be subjective delaying bond release. Statistical comparisons of plant communities of varying ages and degrees of disturbance allow a reclaiming area to be appropriately classified and support earlier release of those bonds.

The appropriate application of recently developed statistical models helps environmental departments address regulator concerns, decrease permit application preparation costs, put compliance monitoring data into meaningful environmental contexts, and communicate clearly and effectively using objective analyses that are technically sound, legally defensible, and understandable to non-technical decision-makers.

Regression models are statistical tools that demonstrate relationships of single or multiple explanatory variables on a response variable. In simple regression models, the slope of the line relates the mean response value to explanatory variable values. Environmental data often have unequal variance due to complex interactions among the explanatory variables. Unequal variance implies that there is more than a single slope (rate of change) describing

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the relationship between a response variable and predictor variables. Quantile regression estimates multiple rates of change (slopes) from the minimum to maximum response variable values, providing a more complete picture of the relationships between variables.

The EPA and most states consider 'aquatic life' the most sensitive designated beneficial use. Attainment of this use is frequently measured by applying various indices (e.g., Index of Biotic Integrity, species diversity, or the EPT index). The critical flaws in all these are the lack of objective criteria between 'good' and 'not-good' and the ways they are tuned to support a priori results. These flaws provide openings for administrative and legal challenges that delay projects and increase costs. Because all biological communities consist of components such as species or functional feeding groups, compositional data analysis (CoDA) is the appropriate statistical model. Because CoDA results are objective, technically sound, and legally defensible operational and regulatory decisions can be made with greater confidence than when relying on indices.

Other less-well-known valuable statistical tools include correct analyses of chemical data containing values below laboratory detection limits, mixed effect models that incorporate name variables (e.g., season or river) as explanatory variables in regression analyses, and Bayesian methods that use knowledge of past data to more accurately predict future conditions. Your existing data contain a wealth of hidden and highly useful information that can be uncovered only by using these new technological innovations.

Although environmental departments do not produce revenue, they can substantially reduce unnecessary expenses and significantly increase profits. Environmental departments are profit centers, not cost centers. Taking advantage of innovations in environmental data analyses throughout project life cycles is an excellent path to increased profitability.
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