

Data Quality Objectives process

The Data Quality Objectives (DQO) process is a step-by-step approach used to plan how to collect and analyze environmental information. This process helps to ensure that the data are accurate and useful for making decisions.

Here's what the DQO process does:

- Breaks planning into clear, logical steps
- Clarifies the goals of the study
- Identifies the type of data needed and the conditions for collecting it
- Defines performance and acceptance criteria for the data
- Defines acceptable limits for errors in decision-making
- Encourages support from management by including decision makers from the start
- Ensures data is defensible by documenting the process

In short, the DQOs help the team determine the quality and quantity of data needed to support the decision.

Here are the seven steps of the DQO process. The bulleted lists under each step cover a variety of project types so most, but not all, items will apply to your project. Before using this tool, verify that your project is not required to follow federal DQOs.

1. State the problem – What's the issue and what resources are required to resolve it?

- Briefly describe the problem, its impact on health or the environment, and any related regulations.
- List resources available like budget, personnel, and equipment, as well as deadlines.
- Choose the team members based on the problem's size and type (e.g., samplers, chemists, engineers, modelers).
- Pick a decision-maker who has final authority.

2. Identify the goal of the study – What is the main question and what needs to be done?

- Define the main question of the study (e.g., "Is pollution degrading groundwater?").
- Connect this question to potential actions (e.g., "remove leaking barrels that are polluting the groundwater").
- Break complex problems into smaller, manageable steps. A flowchart can help visualize the decision-making process.

3. Identify information inputs – What information is needed to answer the study question?

- Determine the key variables needed for measurements (e.g., chemical properties).
- Identify the sources of information (e.g., field measurements, environmental samples, past data, regulations).

- Determine the action levels based on risk assessments or regulations.
- Make sure there are appropriate methods available to analyze the samples and/or data.
- Review the information inputs and remove any that are not needed to answer the study question.

4. Define the boundaries of the study – When and where will the study take place?

- Provide a detailed description of the problem's physical boundaries and the timeframe during which data will be collected.
- Choose the sampling times, considering weather and seasons.
- Identify the area that's most affected by the issue (e.g., focus on the top six inches of soil in a playground).
- Account for practical challenges like weather, access, and available resources.

5. Develop the analytic approach – What are the criteria for action?

- Set action levels based on regulations or risk assessments (e.g., soil with concentrations of contaminants that exceed Toxicity Characteristic Leaching Procedure thresholds need to be sent to a hazardous waste landfill).
- Develop a decision rule to guide actions based on the data (e.g., "If the benzene concentration in the soil decision unit exceeds 0.5 mg/L, send the soil to the hazardous waste landfill; otherwise, leave the soil intact."

6. Specify performance or acceptance criteria – What happens if the study results are inaccurate? What level of inaccuracy is acceptable?

- Set acceptable limits for false positives and false negatives based on their impact.
- Define a "gray area" where errors won't have serious consequences, including typical analytical or sampling mistakes.
- Determine the necessary data quality and sample size for accurate site assessment.
- Ensure that the data are of high enough quality and that the sample size is large enough to make accurate conclusions.

7. Develop the plan for obtaining data – What is the best way to do all of this?

- Check that the information from the previous steps matches the project's program requirements.
- Develop sampling strategies (e.g., random, systematic) and figure out the sample size for each strategy.
- Choose the most efficient approach that meets the data quality objectives.
- Write up the sampling and analysis plan in the Quality Assurance Project Plan (QAPP), which must be approved by signature before starting the project.

Conclusion

The DQO process can be repeated to refine the data collection plan. In each round the strategy becomes more precise and effective, ensuring the right data are collected in the best way to produce informed, accurate decisions.

For more detailed information please refer to this EPA guidance document:

Environmental Protection Agency. (2006). *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4, EPA/240/B-06/001). Retrieved from <https://www.epa.gov/quality/guidance-systematic-planning-using-data-quality-objectives-process-epa-qag-4>

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